



RISK: RISK MANAGEMENT VIA AN INNOVATIVE SYSTEM BASED ON KNOWLEDGE



# **RISK - Risk management via an Innovative System based on Knowledge**

**FINAL REPORT  
December 2014**

**Grant Agreement n. ECHO/SUB/2012/638448**

European Commission

Directorate General

Humanitarian Aid & Civil Protection - ECHO

Directorate A – Strategy, Policy and International Cooperation

ENV.A.5 - Civil Protection Policy – Prevention, Preparedness and Disaster Risk Reduction

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Promotional material including the memory card containing the most important project deliverables

## **1. GENERAL REMINDER OF PROJECT OBJECTIVES, PARTNERSHIP AND EXPECTED DELIVERABLES**

### **PROJECT SUMMARY**

RISK focuses on the challenges of adapting to climate change and preparing for natural disasters facing diverse areas of the EU. The project intends to integrate these two plans as they widely overlap and complement each other.

### **OBJECTIVES**

The general objectives of the project are:

- 1. to assess the vulnerability of the project areas to the impact of climate change and natural disasters;**
- 2. to prepare adaptation action plans which if implemented would make such areas more resilient; and**
- 3. to engage stakeholders in related decision-making.**

The purpose of RISK has been to propose an integrated approach on community and local government level that can guide decision-makers to reduce and manage risk of natural disasters. The specific objective of the current project has been to develop a methodology to

- systemise and harmonise the presentation of risk information from community level,
- improve the capacity of decision-makers on local, regional and national level to measure key elements of disaster risk and vulnerabilities towards risk of communities,
- provide comparative parameters to monitor changes in disaster risk, as a measure of evaluation of effects of policies and investments in disaster management, and
- point at the major deficiencies in confronting natural disasters and thus indicate possible areas of intervention.

The impact of climate change and natural disasters is not limited within the boundaries of a country but manifests itself on a regional scale. The entire territory of the EU is foreseen to be heavily impacted by climate change, and their vulnerability to natural hazards is increasing due to reasons such as urban development, land use, etc. Unfortunately, the institutional set up and the approach to risk management are very different between European countries. As a consequence, priorities related to climate change adaptation and natural hazard awareness are different for each country. Therefore, it is of utmost importance to promote collaboration at the regional level to avoid strong differences in the adaptation and awareness strategies, in order to avoid unbalancing effects on the regional socio-economic framework and related consequences, such as conflicts for resources and other threats to socio-economic stability.

In order to enable such coordinated approach, a common framework for assessing vulnerability of different contexts and preparing adaptation plans is required.

The project aims at encouraging key actors of the involved areas and related countries to work together in analysing climate change and natural disaster impacts, risks, vulnerabilities and in finding suitable adaptation responses that can be integrated into their development plans.

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**APPLICANT AND PARTNERS**

Applicant: University of Sannio - Department of Science and Technology Via dei Mulini - 82100 Benevento, Italy Contact people: Francesco Maria Guadagno (project leader) – Paola Revellino (project co-leader)	
Partner (1): Amministrazione Provinciale di Avellino Piazza Libertà 1 (Palazzo Caracciolo) 83100 Avellino, Italy Contact person: Fausto Mauriello	Partner (2): University of Ljubljana Faculty of Civil and Geodetic Engineering Jamova 2 1000 Ljubljana, Slovenia Contact person: Goran Turk
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**MAIN EXPECTED RESULTS**

The main expected results can be summarised as follow:

- Project Website;
- Scenario-based risk-analysis software tool;
- Guidelines for the detailed assessments of future climate change and probabilistic risk assessment of natural disasters, with a specific implementation in the project areas;
- Guidelines for the detailed analysis at geological, topographical, hydrological, and environmental level, with a specific implementation in the project areas;
- Guidelines for the detailed vulnerability assessment of the infrastructure assets, with a specific implementation in the project areas;
- Guidelines for the detailed growth assessment of the urban agglomerations, with a specific implementation in the project areas;
- Guidelines for the creation of a multi-layered GIS including vulnerability and risks maps, with a specific implementation in the project areas;
- Guidelines for the detailed evaluation of the socio-economic costs of the impacts of climate change and natural disaster risks, with a specific implementation in the project areas;
- Guidelines for the detailed assessment of the roles and activities of national and local institutions that are currently responsible for the territorial planning, provision of infrastructure and services, and for disaster preparedness, with a specific implementation in the project areas;
- Guidelines for the creation of an Action Plan, containing
  - specific recommendations in terms of land-use and territorial planning, with a specific implementation in the project areas;
  - specific recommendations concerning the physical investments that will be required to protect or upgrade the infrastructure assets and systems, with a specific implementation in the project areas;
  - specific recommendations concerning the institutional preparedness and emergency plans, with a specific implementation in the project areas;
  - detailed economic evaluation of the recommended remedial adaptation actions against the costs of the impacts of climate change and natural disasters, with a specific implementation in the project areas.

## **2. GENERAL SUMMARY OF PROJECT IMPLEMENTATION PROCESS**

### **2.1 General overview of the process**

The formal starting date of the 24-month RISK Project was the 1<sup>st</sup> of January 2013 and the Consortium held its first project meeting in February 2013.

Regarding the partner 'Province of Avellino', a prolonged political uncertainty connected with the abolition of this kind of Public Body in Italy, did not permit their formal adhesion to the project Consortium up until the end of November 2013. Fortunately, at this stage, a clearer orientation of the Italian government towards the future of Provinces allowed the signature of the Partnership Agreement. Before the signature, the Province of Avellino acted as an "observer" of the project, remaining tuned in to it. After the signature, they started to actually work on RISK, recovering the lost time.

In the first period of the project (Jan – Dec 2014) the Consortium was able to reach interesting results, for instance the kick off meeting in Brussels, four project meetings, some bi-lateral meetings, several deliverables. Besides this, the Consortium realised an advanced prototype of RMST (Risk Management Software Tool), the web portal and vulnerability maps of the project areas. Furthermore, 2 newsletters and 2 local workshops contribute to the dissemination of the project outcomes.

In the second, crucial period of the project (Jan – Dec 2014), the Consortium was capable of achieving a significant number of outcomes like four project meetings, some bi-lateral meetings, all the remaining deliverables, 2 local workshops, 3 Newsletters, the participation in an International Congress, various promotional materials and the final conference.

The state of RISK at the end of December 2014 was fully consistent with the activities indicated in the approved project. The Consortium worked well and all participants contributed, both in quantity and in quality, in an excellent way.

## 2.2 Comparative analysis of initial and actual time schedule

Some changes to the project Time Schedule have been planned and approved during the eight project meetings. In the following table, these modifications are shown:

Task	Action	Initial schedule		Actual schedule		Motivation of change
		Start Date	End Date	Start Date	End Date	
B. Creation of a Risk Management Tool	Action B.1: Ideation, design and implementation of the software tool	1/1/2013	31/8/2013	1/2/2013	30/11/2014	The main results connected with the Action have been achieved within the scheduled deadline, but a new work-group from the University of Sannio joined the project in November 2013. They developed brand new tools for evaluating Structural Damage Scenarios for seismic events and the related Mean Damage Ratio. Considering the relevance of the earthquake risk in the project areas, the Project Board decided to considerably lengthen the timespan of the Action B1.
C. Vulnerability Assessment	Action C.1: Providing updated and complete scientific assessments of future climate change and probabilistic risk assessment of natural disasters	1/1/2013	30/6/2013	1/2/2013	28/3/2014	The main results connected with the Action were achieved before the end of November 2013. We decided to prolong the Action to prepare a more comprehensive and detailed Report related both to the main and secondary areas of the project.
C. Vulnerability Assessment	Action C.2: Conducting an in-depth analysis of the geological, topographical, hydrological, and environmental nature of the 5 areas	1/1/2013	31/7/2013	1/2/2013	28/3/2014	The main results connected with the Action were achieved before the end of November 2013. We decided to prolong the Action to prepare a more comprehensive and detailed Report related both to the main and secondary areas of the project.

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Task	Action	Initial schedule		Actual schedule		Motivation of change
		Start Date	End Date	Start Date	End Date	
C. Vulnerability Assessment	Action C.3: Assessing the vulnerability of the infrastructure assets present on the 5 areas	1/1/2013	30/9/2013	1/2/2013	28/3/2014	The main results connected with the Action were achieved before the end of November 2013. We decided to prolong the Action to prepare a more comprehensive and detailed Report related both to the main and secondary areas of the project.
C. Vulnerability Assessment	Action C.4: Projecting the growth of the urban agglomerations present in the 5 areas at the 2030 scenario based on the current demographic and urbanisation trends, on the master plans and development plans	1/1/2013	15/12/2013	1/2/2013	28/3/2014	The main results connected with the Action were achieved within the deadline. We decided to prolong the Action to prepare a more comprehensive and detailed Report related both to the main and secondary areas of the project.
C. Vulnerability Assessment	Action C.5: Constructing multi-layered GIS vulnerability and risk maps based on the previous actions	1/1/2013	31/1/2014	1/2/2013	31/7/2014	The main results connected with the Action were achieved within the deadline. We decided to prolong the Action to prepare a more comprehensive and detailed Report related both to the main and secondary areas of the project.
C. Vulnerability Assessment	Action C.6: Evaluating the socio-economic costs of the impact of climate change and natural disaster risks in the five areas	1/1/2013	31/1/2014	1/2/2013	31/7/2014	The main results connected with the Action were achieved within the deadline. We decided to prolong the Action to prepare a more comprehensive and detailed Report related both to the main and secondary areas of the project.

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Task	Action	Initial schedule		Actual schedule		Motivation of change
		Start Date	End Date	Start Date	End Date	
C. Vulnerability Assessment	Action C.7: Assessing the roles and activities of national and local institutions in the territorial planning, infrastructure provision and disaster preparedness relevant to the five areas	1/1/2013	29/2/2014	1/2/2013	31/7/2014	The main results connected with the Action were achieved within the deadline. We decided to prolong the Action to prepare a more comprehensive and detailed Report related both to the main and secondary areas of the project.
D . Action Plans	Action D.1: Territorial planning recommendations aiming at minimising the vulnerabilities and risks identified	1/3/2014	30/6/2014	1/3/2014	10/9/2014	The main results connected with the Action were achieved within the deadline. We decided to prolong the Action to prepare a more comprehensive and detailed Report related both to the main and secondary areas of the project.
D . Action Plans	Action D.2: Recommendations concerning the physical investments that will be required to protect or upgrade the infrastructure assets and systems	1/3/2014	30/9/2014	1/3/2014	30/9/2014	The main results connected with the Action were achieved within the deadline. We decided to merge the Action D.2 with the previous Action D.1 and to prepare a single Report including both the topics.

### 2.3 Comparative analysis of planned and used resources

#### ***Personnel***

All the partners participated in the project activities providing more than the originally planned resources. For example, the University of Sannio added a new work-group composed of a Professor and researchers from the Department of Engineering in order to reinforce the practical usefulness of the Action B.1.

Furthermore, Paola Revellino, who assumed the role of co-leader, supported the project leader Prof. F. Guadagno in this function.

The project exhausted the amount of time foreseen in the Financial Plan for all the personnel hours, abundantly, before its termination. In particular, in order to realise all the deliverables, including technical and financial reports, the project needed of a significant amount of additional time. This amount is approximately distributed within the partnership proportionally to Personnel global workload foreseen in the Financial Plan.



***Travel and subsistence***

The total amount of money allocated to travel and subsistence for project partners was significantly reduced because most of the partners sustained fewer expenses than originally planned.

**2.4 Comparative analysis of expected and actual results**

All the project deliverables have been realised. The Deliverables related to the Actions D.1 and D.2 have been mixed into a single document.

We decided to convert the five Workshops Proceedings on CD-ROM into a single product. In particular, we produced a memory card that contains all the main project deliverables. This card was distributed, together with the paper brochure and other promotional material, in the main project events (IAEG International Congress and final Conference).

In addition, other materials have been produced to reinforce the promotional activity (e.g. some scientific posters).

Finally, a mapping mashup, based on the Web 2.0 methodologies, has been realised and inserted into the online software tool ([www.risk-project.net](http://www.risk-project.net)) in order to arrange an innovative environment to spread information connected with disastrous earthquake and landslide events. This mapping mashup works in connection with: a) "Censimento di vulnerabilità degli edifici pubblici, strategici e speciali nelle regioni Abruzzo, Basilicata, Calabria, Campania, Molise, Puglia e Sicilia". This is a huge census of the public and strategic buildings vulnerability produced by the Italian Civil Protection and the GNDT (National Group for defence against earthquakes); b) IFFI landslide database (Inventory of Landslide Phenomena in Italy).

As said before, during the project meetings, some changes to the project Time Schedule were planned and approved. These modifications have not affected the final consistency and content of the project outcomes that are listed in the following table:

Task ID	A	Task Title	Project Management
<b>Deliverables</b>			
Minutes of meetings			
Evaluation report on the intermediate results			
Evaluation report on the final results			
Interim Report			
Final Reports			

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Task ID	B	Task Title	Creation of a Risk Management Tool
Deliverables			
Risk Management Software Tool			
Short User Guide			

Task ID	C	Task Title	Vulnerability Assessment
Deliverables			
Report containing the detailed assessments of future climate change and probabilistic risk assessment of natural disasters for the main project areas and for some of the secondary areas			
Report containing the detailed analysis of the geological, topographical, hydrological, and environmental nature for the main project areas and for some of the secondary areas			
Report containing the detailed vulnerability assessment of the infrastructure assets for the main project areas and for some of the secondary areas			
Report containing the detailed growth assessment of the urban agglomerations present in the main project areas and in some of the secondary areas			
Detailed multi-layered GIS vulnerability and risk maps of the main project areas			
Report containing the detailed evaluation of the socio-economic costs of the impact of climate change and natural disaster risks for the main project areas and for some of the secondary areas			
Report containing the detailed assessment of the roles and activities of national and local institutions that are currently responsible for the territorial planning, provision of infrastructure and services, and for disaster preparedness in the main project areas and in some of the secondary areas			

Task ID	D	Task Title	Action Plans
Deliverables			
Action Plan (Part 1) containing: a) specific recommendations in terms of land-use and territorial planning; b) specific recommendations concerning the physical investments that will be required to protect or upgrade the infrastructure assets and systems; for the main project areas and for some of the secondary areas			
Action Plan (Part 2) containing specific recommendations concerning the institutional preparedness and emergency plans for the main project areas and for some of the secondary areas			
Action Plan (Part 3) containing detailed economic evaluation of the recommended remedial adaptation actions against the cost of the impact of climate change and natural disasters for the main project areas and for some of the secondary areas			
Action Plan (Appendix) containing various scenario analyses for the main project areas			

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Task ID	E	Task Title	Dissemination
Deliverables			
Communication Plan			
Newsletter N. 1, 2, 3, 4 and 5			
Web site including a Discussion Forum / Virtual Community			
Paper brochure			
Memory Card including the main project outcomes			
Reports on Awareness and Dissemination Activities			

### **3. EVALUATION OF PROJECT MANAGEMENT/IMPLEMENTATION PROCESS**

#### **3.1 Positive aspects / opportunities**

In general, the Consortium worked well. The main strengths of the partnership have been the technical and scientific affinity, a satisfactory level of reciprocal trust, the immediate tuning in on common objectives, a good level of human relationships and ease in the exchange of information. These points permitted to recover the slight delay that RISK accumulated during the first part of its activities and most importantly, allowed the project to achieve all its objectives.

We can underline a set of aspects/positive elements that contributed to the success of the project and of its activities.

1. One of the most positive aspects resulted from the interest working together, from the high competences of the several technicians and from the exchange of experiences and possibilities of using advanced technological resources. In addition, the two Public Bodies that participated in RISK appreciated this form of collaboration, expressing their hope for the participation in future similar experiences;
2. The effective awareness of the need to work with different organisations is finally giving practical results, having been possible in 2013/14 to develop various collaborations and actions among the various project teams;
3. Another positive opportunity connected with the dissemination of the project and its results in an International setting. In particular, RISK was presented in Turin (Italy) in a special work-session of the IAEG XII Congress (a poster was also exhibited in the specific area of the Congress and a large amount of promotional material was distributed to a very qualified and selected audience).

#### **3.2 Internal and external difficulties encountered**

There were some obstacles and difficulties (e.g. delay in the formal involvement of the Province of Avellino), but these circumstances did not change the operational objectives of the project and on a final analysis, they enriched the project, allowing the construction of its own path.

Generally speaking, as experienced in previous similar projects, the main difficulty was connected to the organisation of the civil protection services with different levels of development and with different demands within the different EU countries. Some Bodies are more interested in developing risk aspects, others protection plans, others plans to recover the injured areas and others plans related to preparedness and prevention. We also worked to conciliate several interests and to determine a common view of the risk management problem for Civil Protection within the EU area.

#### **3.3 Partnership/core group cooperation**

The partnership of RISK was carefully selected according to what each could bring to the project. The diverse elements that composed the partnership came from different working areas. This strategy brought solid benefits. The project was achieved within a straightforward, open and cooperative working sphere, which allowed greater productivity, maximisation of resources and knowledge transfer (e.g. from Universities to Public Administration).

The partnership will be partially maintained in the future because an upcoming common working programme has already been hypothesised.

So, one of the positive consequences of the project was the raising of contacts between the involved organisations that established a cooperation network in a broad sphere for future working actions.

Concerning the technical input, all the partners demonstrated commitment to the project tasks and all of them were competent in the execution of activities. The organisation of various technical meetings confirmed fundamental to providing some redirection to the project partners also in reviving some of the initial fervour that had perhaps diminished since the first three meetings.

From an organisational point of view, the communication amongst the project partners occurred routinely by e-mail and by skype. During the eight project meetings, main discussions about the life of the project were held and all the most important decisions were made. The personal communication and expertise exchange on these dedicated meetings was indispensable for an accurate project implementation.

Before every meeting, agendas, draft documents and/or presentations were made available via e-mail to all the partners.

The minutes and reports were distributed and reviewed by the project partners by e-mail correspondence too.

A small negative point, notwithstanding the fact that the project leader provided a short training session on the procedures to be followed to ensure correct financial reporting, it was necessary to provide the project partners with a support in the administration of the financial aspects of the project.

### **3.4 Cooperation with the Commission**

The kick off meeting in Brussels was a very valuable event. In fact, in this occasion, we better understood the importance of our project at an EU level and, at the same time, we appreciated very much the effort of the Commission to create a sort of community among Institutions operating to support Civil Protection around the EU.

Furthermore, the other interactions with the Commission were smooth and effective in answering all our necessities.

Various moments for verification with the Commission were extremely useful for the project leader and partners in overcoming minor difficulties that had been encountered in the project and in ensuring that the implementation of project activities was in line with the Commission requirements.

The Intermediate Progress Report and Financial Summary were communicated by mail as described in the Grant Agreement.

### **3.5 Comments on European added value**

Civil Protection issues are always more relevant at a European level. Arising sensibility and providing guidelines that can improve the safety of people and goods exposed to natural hazards can be of great value in the process of gaining common European standards in Civil Protection operations and mechanisms. Therefore, we worked in a way that allowed the RISK project outcomes to have an important role to play in future discussions and development related to Risk Management at an EU level, (considering that recently, at EU level, the civil protection legislation has been revised with a very strong focus on preparedness and prevention policy and action and that, now, the development of risk management capabilities is the new "frontier").

### **3.6 Lessons learnt and possible improvements**

The main lessons that can be learnt are:

- working together in international teams requires more time than expected, so when a project is planned an extra-time consideration for the coordination is necessary;
- cultural and background differences must be viewed as a precious patrimony and not as an obstacle to working together;
- peer involvement is a key element to improve the relationships inside a partnership and to have more possibilities of achieving common objectives;
- the benefits of in-person meetings can be greater than their increased travel costs and result in overall benefits to the project. This despite the popularity of communication tools such as skype that are lowering the barriers and costs of distance collaboration.

• **4. ACTIVITIES**

**4.1 Comparison between initially planned and actually implemented activities, including monitoring, evaluation and dissemination**

The project has followed the initial activity plan, despite the need for human resource extra time. Only the time frame needed to be modified (see 'Initial and actual time schedule') together with the addition of two project meetings (eight instead of six with the variation of some meeting locations).

Therefore, there are not many differences between the initially planned and actually implemented activities.

**TASK A: Project Management**

The activities connected with this Task were planned to lead to the following objectives:

- Ensure the smooth and efficient running of the project;
- Ensure that the project runs to the proposed timetable and specified deadlines are met and outputs produced and disseminated;
- Maintain active lines of communication between partners and activity areas;
- Maintain the budget to the standards set by the Commission and auditing at the end of each year;
- Report back to the EU Commission on the progress and outcomes of the project;
- Effective technical co-ordination of the Project;
- Establishment and running of Quality procedures;
- Efficient communication with EU Commission;
- Overall Administration of the Project.

The activities of this Task have been strictly linked with the eight project meetings:

1. 11<sup>th</sup> of February 2013, Maison de l'Aquitaine - Paris (France);
2. 22<sup>nd</sup> of April 2013, Department of Science and Technologies – University of Sannio - Benevento (Italy);
3. 3<sup>rd</sup> of July 2013, Conference room of the Municipality of Ajdovščina (Slovenia);
4. 3<sup>rd</sup> of December 2013, GBIII (Campus Süd) of the TU Dortmund (Germany);
5. 18<sup>th</sup> of February 2014, Maison de l'Aquitaine - Paris (France);
6. 22<sup>nd</sup> – 23<sup>rd</sup> of June 2014, Natural History Museum of Crete - Heraklion (Greece);
7. 16<sup>th</sup> of September 2014, Lingotto Congress Center - Turin (Italy);
8. 11<sup>th</sup> of December 2014, Department of Science and Technology – University of Sannio - Benevento (Italy).

Considering that, originally, the organisation of the project meeting was: project months 1 - Italy, 6 - France, 12 - Slovenia, 15 – Greece, 18 - Germany, 24 - Italy, we significantly changed this plan. Considering the results of the project, we believe that extra meetings were profitable in the use of time and money, giving us the possibility of refine our work and exchange an invaluable amount of information.

**TASK B: Creation of a Risk Management Tool**

The activities connected with this Task were planned to lead to the following objectives:

Creating a geospatial scenario-based risk-analysis software tool, which estimates return-on-investment and uncertainty for portfolios of natural-hazard risk-reduction measures and mitigated locations. The model is inspired by financial-portfolio theory, a method for evaluating alternative,

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local and regional-scale investment possibilities on the basis of their estimated distributions of risk and return. The model is general enough to be applied to any hazard, though it may be difficult to acquire accurate estimates for some of the information required to run the model. The tool integrates natural-hazards, earth-science and economic information in an online Geographic Information System (Web-GIS) to estimate expected value and uncertainty of return-on-investment, expected loss, and expected value and uncertainty of community wealth retained. For a natural-hazard event, a user can run the tool to evaluate the risks and returns of investing in different portfolios of locations and loss-mitigation strategies, and then compare and rank them according to the user's risk preferences. The tool is designed for decision-making at a local and regional level, but data at any scale can be entered into the model. For example, it would be appropriate to use parcel-level data for making loss-mitigation investment decisions that involve actions taken at the parcel level. It is also easy to rerun the model with updated or alternative datasets as more current or accurate data becomes available.

The main results connected with the Task have been achieved, but considering that a new work-group from the University of Sannio joined the project in November 2013, we have developed an additional feature of the software tool for evaluating Structural Damage Scenarios for seismic events and the related Mean Damage Ratio. To achieve this additional objective, the Project Board decided to considerably lengthen the timespan of the Task B, up until the end of November 2014. Furthermore, in order to fulfil the request of the two Public Bodies that participate in RISK, we realised two versions of the software tool: a) the originally planned online application; b) a light version, in form of MS Excel Application, utilisable as an add-on for existing GIS platform (e.g. Slovenian National GIS). The Guides are available for both the applications too.

### **TASK C: Vulnerability Assessment**

The objective of this Task concerns the key components of the technical work to be carried out in the five project areas. This work aimed to produce the vulnerability assessments and the related vulnerability maps, which are the main outputs of this Task of the project.

In this case, we simplified the organisation of the deliverables, stating the realisation of a Report for each of the seven Actions (C1-C7). Furthermore, we decided to choose, for each of these seven Reports, the more suitable areas (among the five project areas) in which to implement data collections, studies, elaborations, etc...

### **TASK D: Action Plans**

On the basis of the detailed vulnerability and risk assessments (see Task C), during this Task, specific action plans have been outlined. These plans have the purpose of providing national and, mainly, local stakeholders with robust strategies to address the project areas, and to incorporate the related funds in their future public investment programming.

As for the previous Task, we simplified the organisation of the deliverables, stating the realisation of a Report for each of the five Actions (D1-D5). Similarly, we decided to choose, for each of these five Reports, the more suitable areas (among the five project areas) in which to implement data collections, studies, elaborations, etc...

### **TASK E: Action Plans**

This Task aimed to disseminate information on the project activities, raising awareness and promoting the RISK results among the various actors involved and among other interested parties



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at a European level (additional regions, user groups, etc.), through workshops and electronic Newsletters as well as through the realisation of a discussion forum.

Furthermore, it intended to:

- establish channels for the flow of information and orchestration of mechanisms among project partners and among the network;
- create channels for the exchange of information with the network;
- make a majority of the news and information regarding the project available to target groups and to the general public;
- disseminate the outcomes of the project;
- draw up a formal collaboration agreement among partners.

We slightly changed the original plan:

**Workshops** - in the beginning, the following six workshops were scheduled: Italy (1<sup>st</sup> month), France (6<sup>th</sup> month), Slovenia (12<sup>th</sup> month), Greece (15<sup>th</sup> month), Germany (18<sup>th</sup> month), Italy (24<sup>th</sup> month). The last workshop in Italy was intended as the final event in which the complete project was presented.

Instead, the final scheduling of the RISK workshop has been:

1. 4<sup>th</sup> of July 2013, Conference room of the Municipality of Ajdovščina (Slovenia) – Project Workshop;
2. 3<sup>rd</sup> of December 2013, Meeting Room 113 - GBIII (Campus Süd) of the TU Dortmund (Germany) – Project Workshop;
3. 18<sup>th</sup> of February 2014, 6.00 PM, MAISON DE L'AQUITAINE, Paris (France) – Project Workshop;
4. 24<sup>th</sup> of June 2014, Natural History Museum of Crete - Heraklion (Greece) – “Natural Disaster Risk Mitigation” (OPEN MEETING);
5. 16<sup>th</sup> of September 2014, - Roma room of the Lingotto Congress Center - Turin (Italy), IAEG XII Congress - RISK Session;
6. 11<sup>th</sup> of December 2014, Università del Sannio, Auditorium - Ex Convento Sant'Agostino, Benevento (Italy) – “Incertezze e complessità della gestione dei rischi geologici” (OPEN MEETING with round table).

**Participation at conferences and meetings** (in EU countries) relevant to the themes dealt with by *RISK*. Originally, it was estimated the participation in two relevant events.

In fact, other than in the aforesaid IAEG International Congress, we submitted a paper for the 5<sup>th</sup> International Disaster and Risk Conference IDRC 2014 - 'Integrative Risk Management - The role of science, technology & practice' - 24-28 August 2014 in Davos, (Switzerland). This paper, illustrating the main project outcomes, was accepted and the project leader, Prof. F. Guadagno, was invited to present it at the Conference. Unfortunately, Prof. Guadagno was unable to attend the Conference and a person of the Board illustrated the paper instead.

**Paper brochure** - We decided to prepare the project brochure closer to the end of the project so we could include the main outcomes and use them during the final events (Turin and Benevento).

**Workshops Proceedings on CDs** - We decided to prepare a memory card (USB) including the main project Reports closer to the end of the project and distribute them during the final events (Turin and Benevento).

## **4.2 Qualitative evaluation of the activities**

All the activities planned according to the RISK approved project have been realised and some additional works have been done and added to the initial schedules.

This result has been achieved thanks to all the partners that have shared common perspectives and responsibilities, respecting their commitments and the deadlines (original or re-planned).

For each Task, all the specific planned actions have been constantly overviewed by the Coordinating Beneficiary and Steering group and monitored utilising the reports developed. In some cases, following this first evaluation process, actions were assessed, revised and improved, where necessary.

Also, at the beginning of 2014, an internal evaluation report on the intermediate results was realised by the 'Province of Avellino' partner. Considering the limited number of definitive results available at that stage, this report was not very significant. So, we decided to realise a second version of this intermediate evaluation report at the end of the Task C.

Furthermore, at the end of the project, the internal evaluation report on the final results was produced by the 'Province of Avellino' again. Other than a critical analysis of the main deliverables, a questionnaire was sent to all the project partners requesting them to highlight strengths, weaknesses and provide specific recommendations on the following topics:

1. Quality of planning
2. Quality of project management (coordination, collaborators involvement, process etc.)
3. Quality of outputs (relevance)
4. Impact on stakeholders
5. Sustainability
6. Future opportunities
7. European added value

The feedback from these questionnaires has been consolidated in the above-mentioned summary report.

In this internal feedback activity, the project members were given the opportunity to grade and comment on the project management, the dissemination and the reports, what the level was (from good to bad). The evaluation displayed that RISK has been a successful project. Generally, all of the responses about the project management, comprising planning, implementation and modifications, have been classified over average. For example, some answers received comments like "well scheduled project with a clear timeline" and "flexible time schedule to accomplish changes when and where needed". To the request of what could have been done better, some interesting replies were "more connection with Public Administrations" and "more dissemination events". To the crucial question of whether RISK met its prospect and expectation, the majority of answers given were positive. Many people said: "I left the project with a patrimony of significant new knowledge and interesting contacts". Generally, all partners answered "over average" when asked if the project resources have been reasonably utilised. Again, remarks on how things could have been done better include: "it would have been interesting if more EU Countries could have been involved ". Comments about what was good comprise "good team work"; "more than once, the project plan was changed, but in this way all the project partners were able to fulfil their commitments"; "project coordination and a non-stressed atmosphere addressed to maximise the cooperation". Mainly, all partners answered "over average" when asked if the results could be easily verified. Two of the most interesting remarks about the experience of the project are "the importance to meet frequently" and "the positive attitude in the project without any prejudice".

## **5. PRESENTATION OF THE TECHNICAL RESULTS AND DELIVERABLES**

### **5.1 Description of individual deliverables and their purpose**

The partnership of the RISK project paid attention to accomplishing an intense work regime regarding the processes that may or may not work and drawing operational conclusions on the implementation of the activities.

Regarding the obtained results, we can say that, according to the information gathered, through the Internal Evaluation report on the final results and the opinion of the external entities (e.g. Professors of the involved Universities who did not actively participate in the project), there is unanimity as a positive appreciation of the action and project success. Beyond the fulfilment of the project objectives, it has equally been considered quite positive the cooperation established among the different institutions, creating connections that did not exist before (mainly, between research and public administration) and, consequently, opening a path to future joint activities, with advantages to the involved entities and to the users of the conceived work.

The transfer of the RISK products was foreseen from the beginning. We intend to continue divulging the project results. So, in order to upgrade the results dissemination, the policy of the action management is to diffuse the project and disseminate the achieved results, by means of different intervention tools, namely:

- Publication of propagation materials to the public in general;
- Project web portal that will live in the next years;
- Participation in conferences, fairs, workshops and other public future events.

The list and the purpose of the main project deliverables is the following:

<b>Action of reference</b>	<b>Title</b>	<b>Short description / Purpose</b>
A.3	Evaluation report on the intermediate results	1) Evaluating the quality of project development; 2) Pointing out the project strength and weakness.
A.3	Evaluation report on the final results	1) Assessing the results achieved in relation to the RISK goal, objective and expected results as expressed in the approved project; 2) Generating relevant findings, lessons and recommendations to guide and inform the planning of a possible future utilisation of its results.
A.3	Interim Report	Fulfilling the requests of the EC
A.3	Final Report	Fulfilling the requests of the EC
B.1	Risk Management Software Tool	Supporting the process of planning and allocation of (usually limited) resources into investment to protect communities against catastrophic losses from natural-hazard events. In particular, the online application (named RMST) is useful to operate the analysis and the subsequent assessment, from an economic point of view, of the "Return of Investment" (ROI) connected with the risk mitigation associated with a particular natural hazard.  RMST is available at <a href="http://www.risk-project.net">www.risk-project.net</a>
C.1	Report containing a complete scientific assessments of future climate change and probabilistic risk	Giving an estimate of the effect of future natural disasters. In the study, a number of different global climate models are also listed as well as the related downscaling procedures. The analysis is available for the following study areas:

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	assessment of natural disasters	<p>a) Slovenia: potential effects of climate changes on floods occurring in the Vipava river basin and on the evolution of the Slano Blato landslide. In this direction, a number of historical events in Ajdovščina area have been collected and described in the form of Metadata Sheets;</p> <p>b) Greece: potential effects of climate changes on sea level rising, on droughts and on temperature changes in the Rethimno area (Crete);</p> <p>c) Germany: hypothetical climate change scenarios for the Wupper area, with the emphasis on river flooding.</p> <p>Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a></p>
C.2	Report containing an in-depth analysis of the geological, topographical, hydrological, and environmental nature	<p>Conducting the analysis of the geological, topographical, hydrological, and environmental nature of some project areas, with the collection of a large amount of data and the subsequent arrangement in a GIS system. Since the analysis involved different areas across Europe, data availability, appropriateness and comparability represented a crucial issue. Thus, RISK – where possible – relies on European-wide already available datasets. These datasets have been transferred into an appropriate geodatabase utilised to build various GIS layers. The advantage of using European-wide datasets is the possibility of an easy construction of other case studies outside the RISK project. Metadata are extensively utilised to describe the input datasets, the applied methods, as well as the output datasets.</p> <p>Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a></p>
C.3	Report containing the detailed vulnerability of the infrastructure assets	<p>Comprising the detailed vulnerability assessment of the infrastructure assets for the Sannio-Irpinia area, the Ajdovščina area, and a more general vulnerability assessment of the infrastructure assets for three secondary areas (Greece, France and Germany). The quantitative assessment of the vulnerability addresses 3 different aspects:</p> <ol style="list-style-type: none"> <li>1. The direct structural vulnerability of elements: it describes the induced damage for a given intensity of a phenomenon;</li> <li>2. The functional vulnerability of the networks: it describes the operating capability of a network depending on the damages of its components;</li> <li>3. The systemic functional vulnerability of the services: it describes the consequence (in terms of operating capability) on a given element, network, service because of the structural damages of other elements, networks, or service.</li> </ol> <p>Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a></p>

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C.4	Report containing the detailed growth of the urban agglomerations at the 2030 scenario based on the current demographic and urbanization trends, on the master plans and development plans	<p>Analysis of the current demographic and urbanisation trends in order to predict the growth of the urban agglomerations up to the 2030 scenario. We utilised the available statistical data together with past growth patterns and updated understanding of real-estate pressures, main infrastructure developments, housing needs and other trends to predict, with a reasonable amount of certainty, the territorial coverage of the five project areas at the 2030 scenario. The likely acceleration of urbanisation due to climate change and a probable situation including deteriorating productive and living conditions in the rural areas, in particular where rain-fed agriculture prevails, have been also taken into account. The review includes the analysis of the territorial master plans and territorial development plans that have been prepared in all the project locations, with the caveat that some of the projected urban growth might not occur as planned, and might in fact occur elsewhere and in other forms that those predicted. The results encompass the detailed growth assessment of the urban agglomerations present in the Sannio-Irpinia area and in the Ajdovščina area, while only a general growth assessment of the urban agglomerations is presented for the three secondary areas (Greece, France and Germany).</p> <p>Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a></p>
C.5	Multi-layered vulnerability and GIS risks maps	<p>The vulnerability and risks maps result from the interpretation of the overlapping between the projected impacts of climate change and risks of natural disasters drawn from the previous studies, with the assessment of the current and future territorial coverage and assets. The vulnerability maps indicate the relevance of each of the major hazards (landslides, flooding; availability of water resources; risks of earthquakes and tsunamis, etc.) for the current territorial coverage and for the future territorial coverage. Moreover, a cross risk assessment (iteration of all the combinations of the different phenomena) is obtainable to simulate the synergistic impacts of the climate changes and natural disaster risks. In addition, to classify the existing areas according to their degree of vulnerability, present and future, the study also identifies hot-spots, i.e. critical pieces of urban infrastructure, municipal systems, or locations, considered particularly vulnerable due to their exposure or to the functional complexity and their role in the economy of the five areas.</p> <p>Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a></p>

<p style="text-align: center;">C.6</p>	<p>Report containing the detailed evaluation of the socio-economic costs of the impacts of climate change and natural disaster risks</p>	<p>The vulnerability and risk maps and their assessments have been accompanied by an evaluation of the socio-economic costs of the impacts of climate change and natural disaster. This included economic assumptions as to the value of built environment, infrastructure, economic assets and activities. While the evaluation of existing assets can be carried out quite accurately, assumptions are needed for the consistency and value of the assets that are expected to take place up to the 2030 scenario.</p> <p>Climate change is an alteration in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer.</p> <p>Regardless of the context where it should be applied, whether coastal areas, hydrogeological risk areas, deglaciation risk areas, and also the scale of investigation (national, regional or local), the methodological approach that allows you to estimate an economic quantification of impacts of climate change follows some basic common lines. It must:</p> <ol style="list-style-type: none"> <li>a) outline one or more reference scenarios (benchmark) for the reference parameters. The scenario is used to assess the risk or the various adaptation strategies;</li> <li>b) define one or more future scenarios of climate change with and without adaptation policies, and their economic implications for reference variables;</li> <li>c) compare the results between the benchmark and the scenarios with climate change, in order to quantify the economic impacts of climate change and / or adaptation strategies on reference variables.</li> </ol> <p>Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a></p>
<p style="text-align: center;">C.7</p>	<p>Report containing the detailed assessment of the roles and activities of national and local institutions that are currently responsible for the territorial planning, provision of infrastructure and services, and for disaster preparedness</p>	<p>The risk assessment and its evolution in connection with climate change and natural disasters includes an evaluation of the roles and activities of national and local institutions that are currently responsible for the territorial planning, provision of infrastructure and services, and for disaster preparedness in the five project areas.</p> <p>In particular, this evaluation provides a clear picture of:</p> <ul style="list-style-type: none"> <li>• current risk mapping, if any;</li> <li>• level of public information and awareness of the risks;</li> <li>• existence of emergency response plans;</li> <li>• organisational and logistic capability of responsible institutions to install early warning systems and to carry out emergency prevention and emergency rescue and evacuation operations in case of natural disasters. Their performance during all recent catastrophic events (e.g. landslides, flooding) should be analysed to determine the level of response effectiveness and of coordination among relevant agencies.</li> </ul> <p>Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a></p>

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D.1 / D.2	Territorial planning recommendations aiming at minimising the vulnerabilities and risks identified  Recommendations concerning the physical investments that will be required to protect or upgrade the infrastructure assets and systems	Specific recommendations in terms of land-use and territorial planning that would facilitate the adaptation of the project areas to the changing climate and increase their resilience to natural disasters.  Specific recommendations concerning the protection or upgrade of the existing infrastructure, built environment, and territorial systems to increase their adaptation to climate change and their resilience to natural disaster risks.  Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a>
D.3	Recommendations concerning the institutional preparedness and emergency plans in view of the climate change impacts and disaster risks	Based on the assessment carried out in the Action C.7, this Report recommend measures to improve the preparedness of the local and national institutions in charge of territorial planning, provision of infrastructure and services, watershed management and for disaster preparedness in terms of their ability to incorporate adaptation to climate change and resilience to natural disaster risks.  Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a>
D.4	Economic evaluation of the recommended remedial adaptation actions against the costs of the impacts of climate change and natural disasters	a) Ranking the remedial actions recommended in the areas of territorial planning, infrastructure, and institutional preparedness in terms of their importance and of their urgency; b) Conducting an economic valuation of the remedial actions, estimating the costs of their implementation and comparing them with the value of the projected losses due to the impact of climate change and natural disasters.  Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a>
D.5	Platform for data and information management, Web-GIS and decision-making tool	This Report explains some of the case-studies developed in connection with RMST (see Action B.1), illustrating details regarding both data sources and pre-elaboration done to prepare the case. The basic theory utilised to develop RMST is shown too.  Study available at <a href="http://www.risk-project.eu">www.risk-project.eu</a>

**5.2 Value-added - in particular European value-added and transferability – of the deliverable**

RISK demonstrates that the collaboration between all of society's actors, including public, private and research bodies is an essential aspect of a fruitful cooperation. For example, some of the risks and dependencies include critical infrastructures that are often owned by private companies. The project has clearly stated the necessity for cross-border and cross-sector civil protection platforms (e.g. the RMST online application) to meet and create effective networks at local and regional levels. This will improve information sharing, awareness and increased knowledge on how to manage risks and disasters in the EU area.

The right prerequisites for cooperation need to be established in all the EU regions. The prerequisites identified in this project are not unique to the five project countries and could be applicable in other areas in Europe. So, the University of Sannio will continue working on the results of this project both at research and dissemination level.

The deliverables listed above represent a sort of report with recommendations for official good practice concerning risk management. This report is intended as a very practical document that can be applied to all Member States regardless of the particularities that may characterise their emergency structures or mechanisms. Indeed, the specific research included in the deliverable was carried out mainly in five different Member States with different realities in terms of emergency systems and structures but the conclusions drawn can be said to be common to all countries. Furthermore, the literature review was carried out on the basis of existing relevant literature on the subject worldwide. Therefore, it is hoped that the various reports can serve as a reference documentation not only for the Member States of the European Union but also in an international context. This is confirmed by the fact that the project outcomes were presented and appreciated at the IAEG International Congress held in Turin which was attended by a worldwide audience.

### **5.3 Dissemination**

The results of the project were:

- presented in September 2014 during an International Congress (IAEG) to a vast and very selected audience with the attendance of geologists, decision-makers, environmental engineers, researchers and other relevant professionals;
- presented in December 2014 during a final event with the attendance of the aforesaid kind of professionals and, most notably, with the active participation of various political representatives (e.g. Commissioner for Civil Protection of the Campania Region, President of the Province of Avellino, Mayor of Benevento, etc...);
- presented at local level in all the five involved Countries by means of open workshops/meetings. All the project events received a significant press, radio, web and TV coverage.
- Publicised by a paper brochure also including four of the five project Newsletters and a memory card in which the most important project deliverables are stored;
- Divulged by various websites. First of all, the project website ([www.risk-project.eu](http://www.risk-project.eu)) and the project web application ([www.risk-project.net](http://www.risk-project.net)). Furthermore, the project is reviewed in the websites of the partners and of other public bodies;
- Planned to be presented to the Director of the Italian Civil Protection Department.



## **6. EVALUATION OF THE TECHNICAL RESULTS AND DELIVERABLES**

### **6.1 General lessons learnt**

This project represents only the starting point toward improving strategies concerning the mainstreaming of risk management within the framework of Civil Protection. Undoubtedly, this subject requires further investigation, research and dialogue.

The EU Civil Protection Financial Instrument represents an important opportunity to consider risk management issues in the context of civil protection and it is hoped that the European Commission will continue to co-finance worthwhile projects that address this issue. In this context, it seems to be essential that any such projects involve one or more Civil Protection Departments/Units as well as organisations involved in risk management and natural hazards to ensure that the issue is globally addressed.

Another important lesson learnt is that studies, data collection, elaboration of risk maps, etc are an essential pre-requisite for a real and effective risk management action, but they must be complemented with practical tools and guidance that enable end-users to implement this action. Tools have to be envisioned to help the end-user to manage not only the specific cases (e.g. how to plan a mitigation action) but also as a communication instrument addressed to the community. It was also learnt during the project that although there are some interesting examples of trans-national cooperation in EU countries, cross-sector cooperation remains relatively undeveloped (e.g. between research and public administration or between geologists and engineers). This is one of the biggest challenges to the development of a civil protection perspective based on a cross-border / cross-sector synergy. In order to stimulate this development and broaden perspectives a lot of further work should be done.

Finally, the general lesson learnt is that the overall results reached concern the increased awareness about the need of including "economic" tools and procedures in the planning of local and national civil protection policies.

The lack of specific tools and procedures for decision-makers is coupled by the difficulty to find information and data for the elaboration of scenarios both at private and public level.

The effort made in the RISK project has been addressed to delineate a core group of these tools and procedures that can then be refined, expanded and extended to other areas and to other objectives.

### **6.2 Strengths**

The RISK project represents one of the first approaches at European level on the issue related to risk management connected with Civil Protection. Thanks to the project, isolated European experiences (e.g. at national or local level) have been identified and connected, underlining the necessity for the development of network structures fostering the continuous flow of information and the establishment of collaboration among relevant stakeholders. RISK has also exploited the results of International projects (e.g. USGS, FEMA), not necessarily addressed to Civil Protection, to expand its initial vision.

Another important strength of RISK was the significant amount of input from end-users (e.g. Municipalities, single professionals). This process provided a comprehensive basis for the analysis, and also makes the final results more useful at a practical level.

An additional strength was the effective collaboration among the partners that represented a key factor to complete the project without substantial difficulties.

Finally, all the studies, analyses and evaluations carried out during the project have pointed in a convergent direction, with few contradictions or exceptions. This crucial factor provided the project deliverables with a strong level of confidence and sharing.

### **6.3 Possible challenges and/or improvements to be tackled through further action**

The project foresaw the following objectives to be accomplished in medium-term:

- Dissemination of the developed tools and procedures;
- Increasing the local capacity in risk management (e.g. including themes like cost-benefit analysis, vulnerability assessment supported by GIS, etc).

Furthermore, the local communities need to be more informed, so that they can feel safer.

In this context, it is necessary to understand the role that each actor plays (e.g. research institutions, public bodies, NGOs, private companies) and to redirect their performance, avoiding conflicts and encouraging cooperation in order to exploit the opportunities connected with the ICT. We understand that the civil protection organisations can and must be the mediators between the local communities and the local authorities, having as a basis the study of the people's needs and the methodology to solve problems.

### **6.4 Recommendations to stakeholders, partners, authorities in charge, National and EU institutions**

The main project deliverables include a remarkable series of recommendations directed at key stakeholders including European civil protection units; other organisations dealing in risk management; European, national and local policy makers.

These recommendations broadly cover the following areas:

- Policy and Practice
- Training and Information
- Information Technology
- Communication systems
- Awareness raising and dissemination

## **7. FOLLOW-UP**

Some European Civil Protection Agencies (mainly at regional and local level) have little experience in risk management. The outcome of the RISK project and the recommendations produced will therefore form a solid, practical basis to the near-future improved activities in this field.

The RISK project can lead on a European level to an enhanced best practice in risk management connected with natural hazards within Civil Protection Agencies. The project supports the starting up of a new and improved trans-national cooperation in Europe and further discussions on identified bottlenecks and useful future work.

At a European level, the procedures identified in RISK can be applied by Member States in order to improve the effectiveness of their national activities.

The risk management strategy in most EU Member States is primarily focused on national policy. The results of RISK are a first step to improve the general level of trans-national cooperation at regional level and enhance the cost-effectiveness of efforts.

Judging from the satisfaction of the participating authorities and from the audience in Turin (IAEG Congress), the results of RISK seem to be successful.

### **7.1 Comparison between initial and current follow up**

The initial follow up was substantially related to the possibility to extend the project results to other European countries not involved in the RISK partnership.

The project partnership stated that the project outcomes are utilisable, without particular impediments, within the whole EU, but this process is not possible as a specific action within RISK. The second issue was more related to the extension of RMST - basically addressed to categories of professionals normally not used to dealing with issues related to Civil Protection. The follow up was based on the opportunity to involve not just experts but real decision-makers (e.g. from Municipalities, Provinces, etc...) in the utilisation of the project results. These issues are still actual, even if during the project cycle, many activities encountered the appreciation of different categories of experts. RMST proved to be very attractive even for a public of non-experts.

### **7.2 Additional follow up approaches**

RMST, an online tool accessible from the website, can be continuously updated (also after the project ends), allowing both the beneficiaries and the wider public updated information of new case studies and risk scenarios.

The recommendations and the RMST environment can have a wide diffusion all around Europe so they can be seen as tools and instruments addressed to the relevant professionals and decision makers in order to approach, in a novel way, topics like prevention and mitigation.

The mapping mashup, not included originally, in the project proposal has proved to be very useful to favour a deeper awareness of the risk.

The possible follow up is represented by the further dissemination of RMST, being possible to address this online application to university students, technicians operating in the public administrations, etc...

Another relevant impact of the opportunity to extend the project issue is represented by the possibility to cover other sectors of the risk management connected with natural hazards. The RMST case studies have been limited to earthquake, landslides and floods.

However, the community of experts that experimented RMST raised the need to cover other aspects, like coastal erosion and climatic hazards.