FEEDBACK ON RISKPLAN TOOL WORKSHOP
STANS 29-31 March 2009

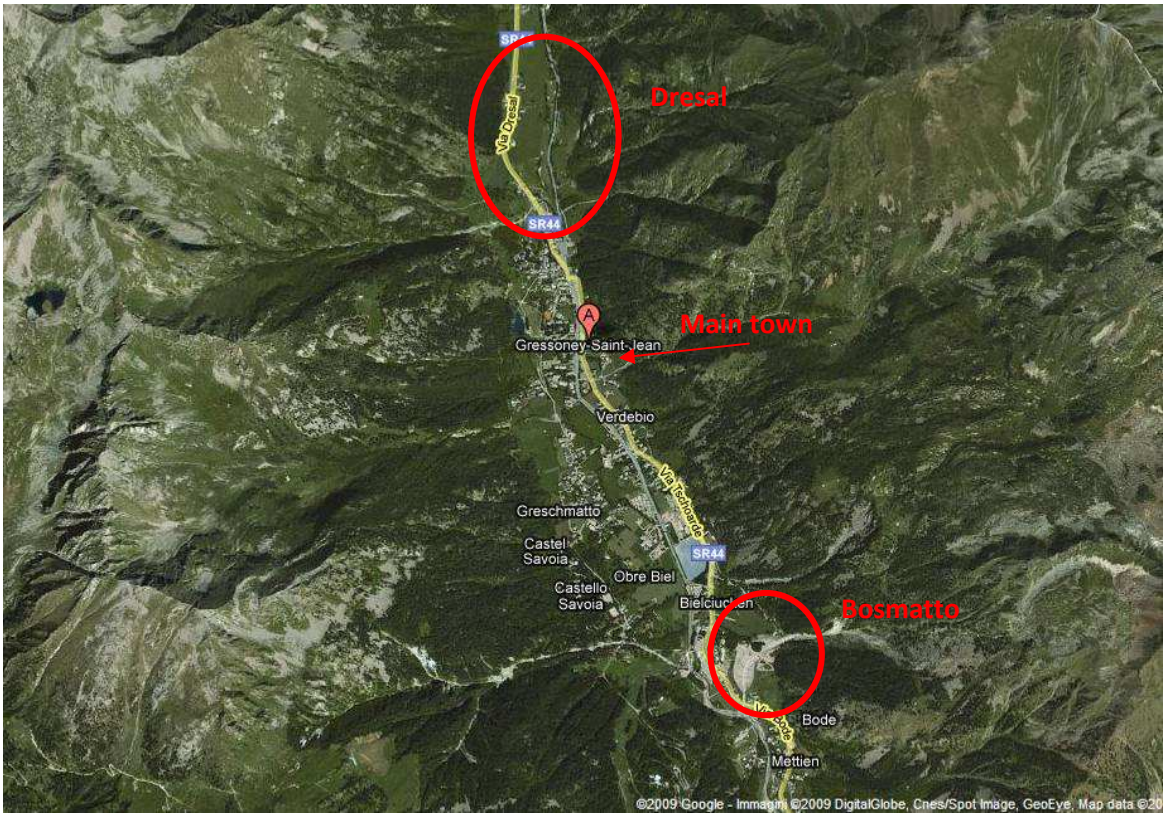
Eng. P. Ropele, *Chief of Service for Idraulic Works (RAVA)*
Eng. F. Collé, *Service for Idraulic Works (RAVA)*
Eng. N. Bétemps, *Service for Idraulic Works (RAVA)*
Eng. I. Voyat, *Safe Mountain Foundation*
Eng. M. Curtaz, *Safe Mountain Foundation*

The workshop in Stans was useful to understand how Riskplan works and to directly try it on an example to assess which are the strong and the weak points of the tool.

RAVA case study

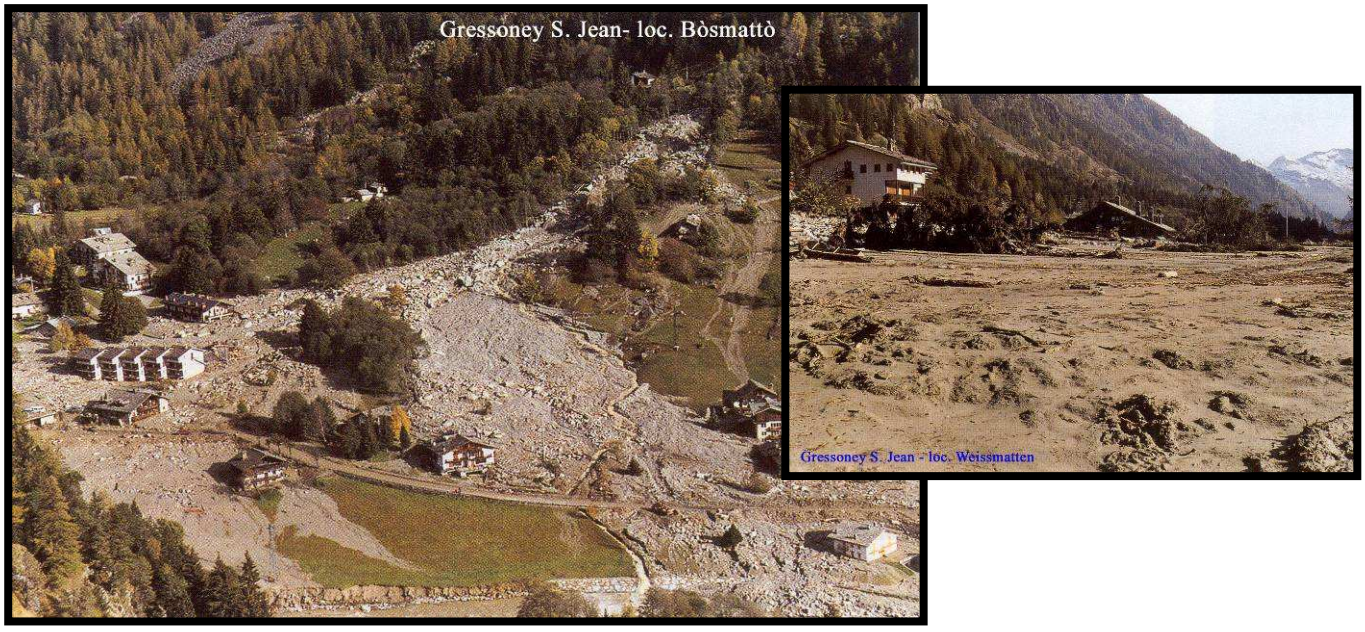
RAVA considered the case of Gressoney Valley which is a secondary valley crossed by the Lys torrent on the eastern side of Aosta Valley, at the border with Piemonte region. During the 2000 flood this valley was seriously damaged by landslides, debris flows and the flood of the Lys torrent. After that event a lot of works were done to prevent such disasters and to better protect population, buildings and lands.

During the workshop two different natural hazards were analysed with the Riskplan tool: Bosmatto landslide and Lys flood in Dresal plain and in the main town, Gressoney Saint-Jean.

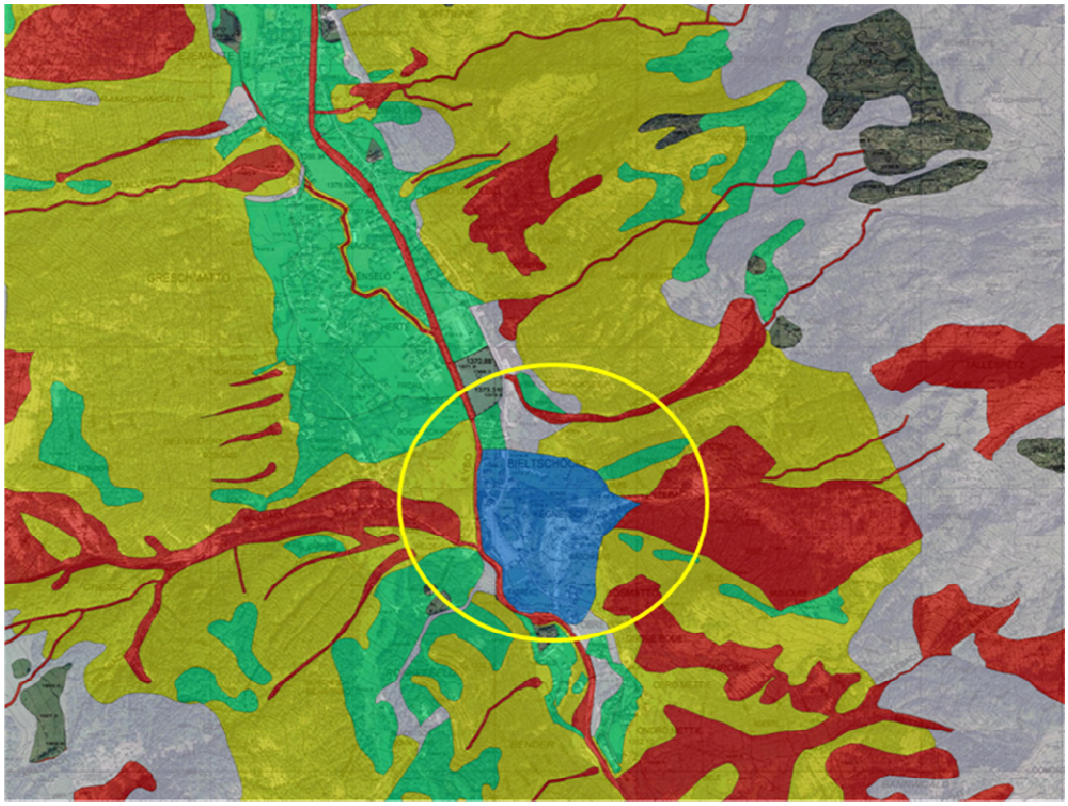


Bosmatto landslide:

A big landslide associated to debris flow that in 2000 destroyed some buildings on the alluvial fan.

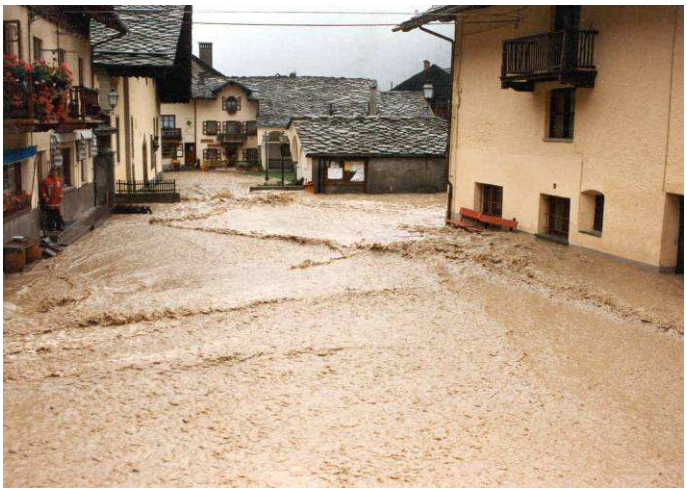


After the year 2000 a system of levees and a basin were built to direct and collect the debris material in the case of a new event. The hazard map of this area is shown below; the blue zone corresponds to the area of potential high risk, without measures (see picture).



- **Lys flood**:

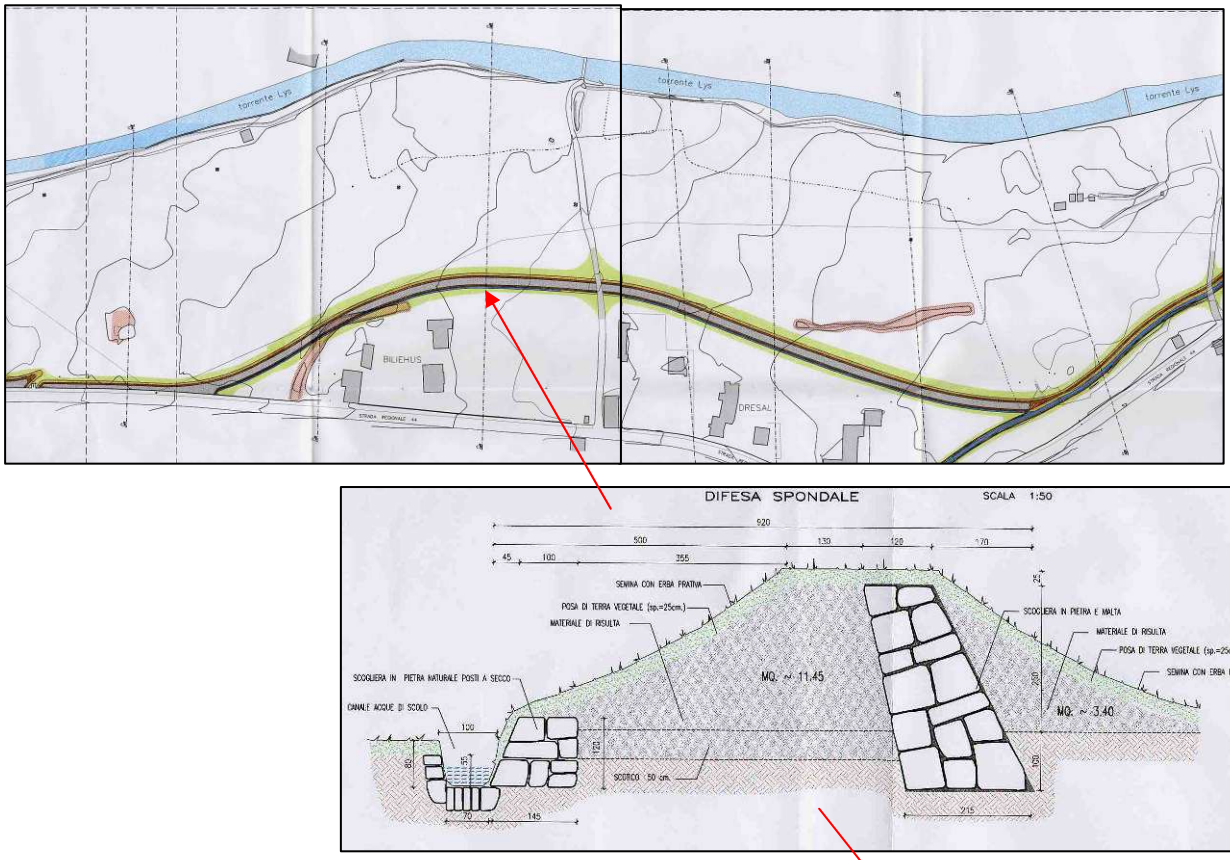
In 1993 the water of the Lys torrent flood the main town of Gressoney Saint-Jean; in 2000 the main town wasn't damaged but the water spread over the Dresal plain.



Flood in main town in 1993.

Autumn 2000: flood in Dresal plain.

After 2000 some levees were built to protect the buildings which are inside the area.



Dresal plain in 2000 (left) and in 2008 (right).

INPUT DATA:

The most important input data are summarized below.

The region of Gressoney municipality was divided in **3 object areas**: main town, Dresal plain and Bosmatto.

The **exposure** was divided in high season (30%) during which much more people are in the valley (summer and winter holidays) and low season (70%) during which only the inhabitants are in the municipal district.

Name	Probability	Description
Normal course	70 %	Low Season
High season	30 %	High season

Scenarios:
Lys flood flow discharge:

Scenarios		
Name	**Frequency**	**Description**
HQ 20	20 Jahre	Flow discharge 80 m^3/s
HQ 100	100 Jahre	Flow discharge 150 m^3/s
HQ 200	200 Jahre	Flow discharge 220 m^3/s

Bosmatto landslide:

Scenarios		
Name	**Frequency**	**Description**
high hazard level	100 Jahre	Area of deposition (red area)

The situation before (like **before year 2000**) **and after the measures** was considered for each one of the two hazards.

Measures:
The cost were derived from the knowledge of technicians from RAVA technical services.

Dam in Dresal plain:

Investment costs	1 200 000 EUR
Annual maintenance costs	20 000 EUR
Annual operating costs	0 EUR
Lifetime of the measure	50 Jahre
Rate of interest	2 %
Annual costs	56 000 EUR

Dam for debris flow in Bosmatto area:

Investment costs	5 000 000 EUR
Annual maintenance costs	20 000 EUR
Annual operating costs	0 EUR
Lifetime of the measure	50 Jahre
Rate of interest	2 %
Annual costs	170 000 EUR

The dams in Dresal plain allow to prevent the flood in the Dresal village for a 200 year discharge but they don't have big effects on the protection of the Main town: here the existing levees are designed for a torrent discharge of 100 years.

The evaluation of material damage and of fatalities was based on the experience and knowledge of the people working for RAVA technical services. Besides it was estimated that during the high season (30% exposure) the number of fatalities could change instead of material damages. In fact there are more people (tourists) in the area in the high season period. Instead the number of the damaged materials (overall buildings) remains the same (at least it can increase only a bit to consider the higher number of cars, for example; it wasn't done during this analysis).

RESULTS:

Looking at the annual costs resulting for the two different measures, the dams for the debris flow in Bosmatto is the more effective solution; in fact it can reduce much more the annual costs (from 717.500 € to 20.500 €).

Before measures:

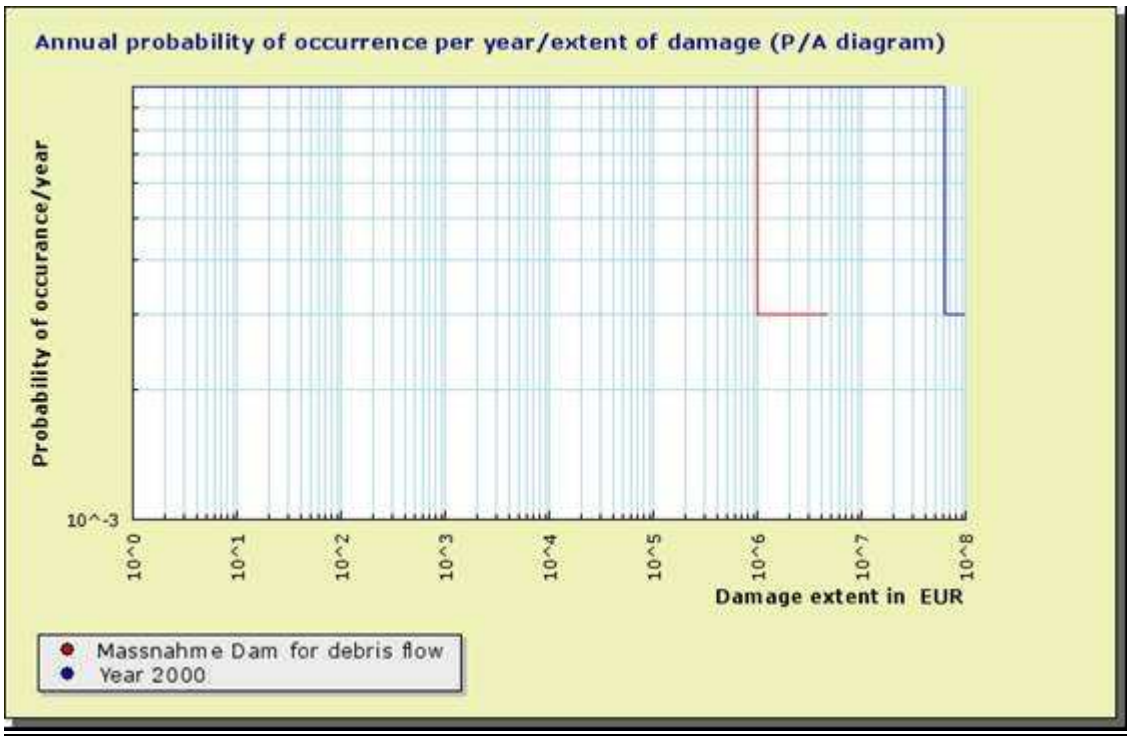
Sum of annual risks in regions/object areas - all processes			
Region/object area	**Persons:**	**Material assets:**	**Total:**
Region Gressoney-Saint-Jean	438 375 EUR	405 300 EUR	843 675 EUR
Object area Dresal	39 375 EUR	15 775 EUR	55 150 EUR
Object area Maintown	31 500 EUR	39 525 EUR	71 025 EUR
Object area Bosmatto	367 500 EUR	350 000 EUR	717 500 EUR

With measures:

Sum of annual risks in regions/object areas - all processes			
Region/object area	Persons:	Material assets:	Total:
Region Gressoney-Saint-Jean	81 375 EUR	65 300 EUR	146 675 EUR
Object area Dresal	39 375 EUR	15 775 EUR	55 150 EUR
Object area Maintown	31 500 EUR	39 525 EUR	71 025 EUR
Object area Bosmatto	10 500 EUR	10 000 EUR	20 500 EUR

Sum of annual risks in regions/object areas - all processes			
Region/object area	Persons:	Material assets:	Total:
Region Gressoney-Saint-Jean	404 250 EUR	392 325 EUR	796 575 EUR
Object area Dresal	5 250 EUR	2 800 EUR	8 050 EUR
Object area Maintown	31 500 EUR	39 525 EUR	71 025 EUR
Object area Bosmatto	367 500 EUR	350 000 EUR	717 500 EUR

Also looking at the graphs of the annual probability per year versus the extent of damage we can see that the measure more efficient, which is able to reduce in a significant way the cost of damages, it's the dam for debris flow in Bosmatto. Instead the levees in the Dresal plain can slightly reduce the costs of events with occurrence not extreme. That's because the levees were built to prevent a HQ200 in Dresal plain but they have no big effects on Main town, where the actual dams are designed for a HQ100.



CONCLUSIONS:

After working on a case study in the period just before and during the workshop the people from RAVA who attended the workshop (Ropele, Collé, Bétemps: RAVA technical services; Voyat, Curtaz: Fondazione Montagna sicura) met for a discussion (16 July) about Riskplan tool and drew the following conclusions.

(-) The software needs a lot of data, especially economical data, which are often difficult to find in advance. Many times the costs are known only after an extreme event happens. Maybe in other countries, like Switzerland, which have a different insurance system, this can be easier. This is even more true for the cost of fatalities which is not known in Italy and which counts a lot in the results of the analysis.

(-) The software allows to compare the results for different hazards separately; if two of them interact you must define a third hazard with proper scenarios, measures etc. The tool works separately for each measure. Also to analyse the sum of different measures you must construct a new case because the software doesn't do the calculations by itself. In a certain way this oblige the user to think about and to analyse in detail the new situation, but sometimes, for example when considering an entire valley and independent hazards which impend on different areas, it would be useful to can sum them without creating a new package of measures and avoiding the need to fill in the Input Matrix of every cell of the Cockpit.

(+) It's a good tool in programmatic decisions to decide which system of measures should be applied before and which one can be delayed: for example at a basin scale (or at valley scale) it can help to assess which investment should be done first, e.g. protections to face up debris flows rather than avalanches. In this way it's a good tool to be used in local administration and also in the territory planning.

(+) It's a useful tool for comparison and visualization if you have to analyse a lot of hazards, a lot of different scenarios and a lot of different measures. It gives a panorama of the different conditions and the relative annual costs, which is the quantity which can be compared. The consideration of the frequency and the exposure makes the comparison more adequate.

(+) It obliges to think about and to include all the different costs of a measure like annual maintenance and operating costs which are sometimes forgotten but are important.

(+) It's helpful in the "risk dialogue" to help the discussion, not only among technicians and experts in risk management, but also to communicate (and also to persuade) the decision makers about the best decisions to face up to natural hazards. In fact it gives important data (economical data, in particular annual cost) and visualises them in a good way to be understood also by a non-expert audience.

(+) The software can be used in a lot of different ways. Also more theoretical subject can be analysed, like provisions. For example during the workshop a group compared the situation before the construction of protection measures and the situation after, when the measures "allow" an increase in the urbanisation of the new protected zone.

(-) The actual version of Riskplan doesn't allow to copy data from an Input Matrix to another one. It should be easier to can copy them and permit to change the values which are different in a second moment (e.g. to consider package of measures).

(-) The tool could be used to assess the effect of climate change: for example the frequency of catastrophic events can be increased, but as for the other type of analysis, all new data must be entered and the calculations have to be done once again.

(-) The association with a GIS software can improve the tool in a significant way and make it more userfriendly. Once the territory to analyze, the values of the material and the people living on it are defined (GIS map and database associated), the calculations could be easier: designing the perimeter of the object area for every hazard could give automatically the values to fill in the Input Matrix.