Aosta Valley's Landslides

Decision Making Exercise

Royal Geographical Society with IBG

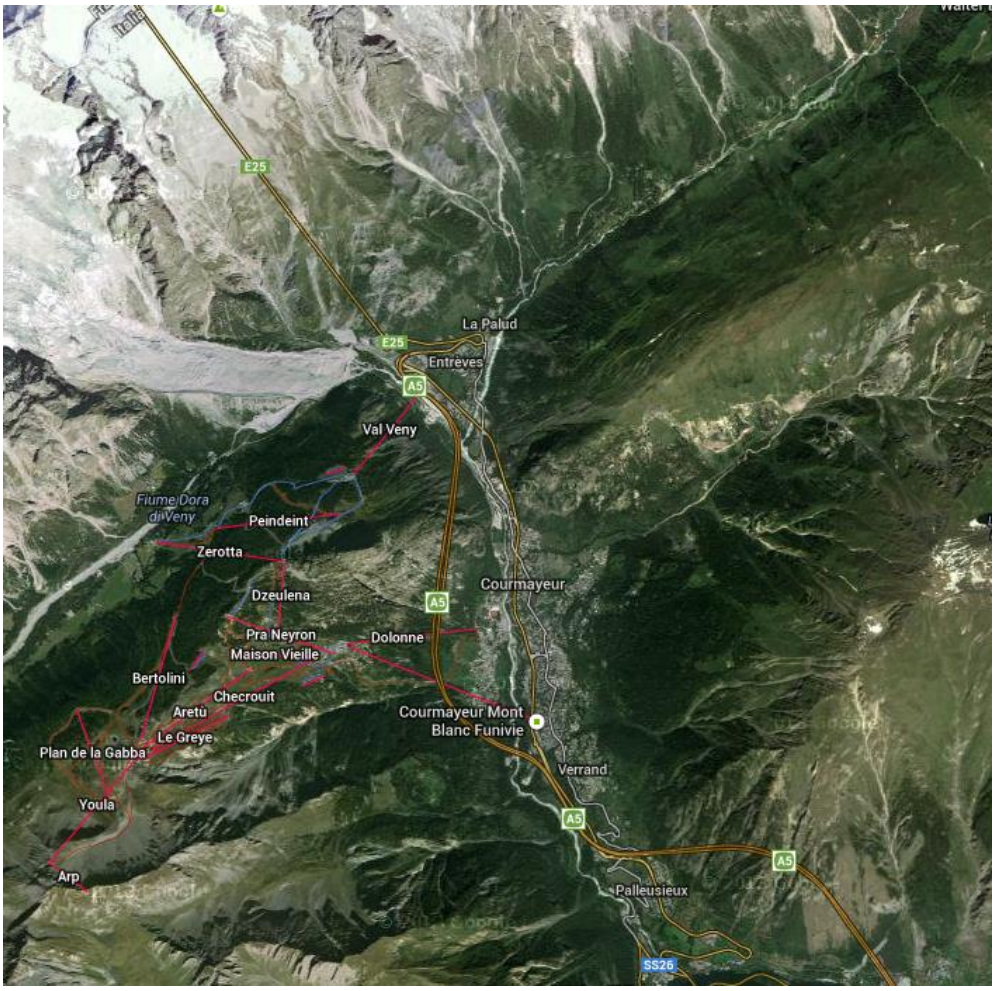
Advancing geography and geographical learning

This exercise will get you to think about landslides and how a real area in the Alps can best manage them. The Mont de la Saxe Valley near Courmayeur in the Aosta Valley region of Italy suffers from frequent landslides and it is your task to act as a member of the local authority and suggest ways of managing them.

You have a budget of €100,000 to spend on landslide protection or mitigation, or a combination of the two. In order to create a successful action plan for the region you will have to complete all the tasks in the order they are laid out in this booklet. This booklet also contains a number of resources. These will inform your decisions for the final task and allow you to justify your choices.

Good Luck!

Resource One: A satellite image on the Mont de la Saxe region of the Aosta Valley.

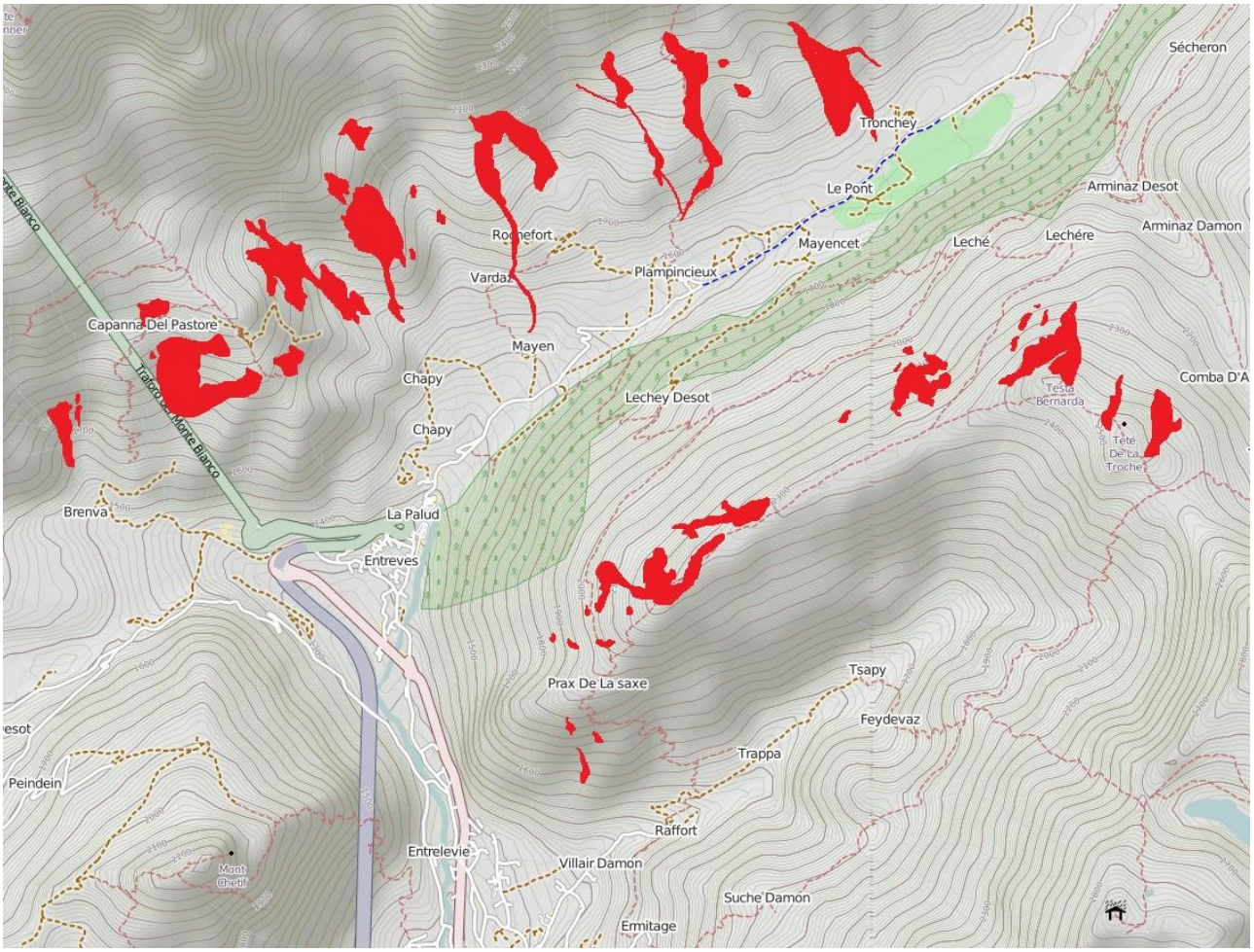


Source: Google Maps Satellite

The coloured lines in the west of the picture represent the ski runs and ski lifts to the west of Courmayeur. Almost the entire A5 motorway shown is in a tunnel running under the mountain sides. Without this tunnel, Courmayeur and the surrounding villages can become isolated in the six months of snowfall and ice cover between October and March each year.

Task One: Investigating past landslide activity

Study the map below which highlights in red past landslide activity in the Mont de la Saxe region of the Aosta Valley. This is the type of data that researchers like the Grand Alpine Tour team can collect.



Source: Holbing et al (2012) Taken from data sets collected from 2000 to 2009

Describe the pattern of landslide activity in the valley.

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How might this data help us to manage landslides?

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Resource Two: A newsfeed highlighting the danger of landslides in the Mont de la Saxe region

welove2ski

SKI RESORTS | WHERE TO SKI | HOW TO SKI | SNOW | GEAR | FAMILY SKIING

Could This Be The Worst Natural Disaster In The Alps?

By Peter Hardy | on April 24, 2014 | 3 Comments

Ski Holiday

Massive landslides on a Herculean scale are threatening to destroy a picturesque hamlet above the popular ski resort of Courmayeur and bury the approach road at the Italian end of the Mont Blanc Tunnel under nearly two million tons of granite.

Already in recent days, traffic through the tunnel has been halted for up to three hours at time because of giant boulders tumbling down the mountainside.

The tunnel could remain blocked for a considerable period until a new road is built. After the fire that killed 38 people in 1999, the tunnel was closed for three years. This resulted in traffic chaos across a substantial part of the Alps. As well as being a popular tourist route, the tunnel is one of the main freight arteries of the continent.

Italian engineers have been monitoring the slippage on the Mont de la Saxe 24 hours a day since 2009. But in the current warm spring weather, the cracks are widening at a rate of four metres a day and the first of what could be a two-pronged disaster appears to be imminent.

Photo: Meteoweb

Some 80 residents in the hamlet of La Palud have been evacuated and all mountain roads sealed off. As one of the scientists monitoring the cracks said yesterday: "It appears that now the slide is no longer a question of 'if', but when."

To give you an idea of the scale of the impending natural disaster, the first major rockfall is expected to be at least 300m wide by 45m deep – a similar mass of granite to the concrete and glass of the twin towers of the World Trade Centre that fell on Manhattan. Earthquake centres around the world are expected to record the seismic wave.

Apart from flattening La Palud and destroying the tunnel approach road, the landslide is likely to block a river swollen with snow melt, and this could cause flooding further down the Aosta Valley. But the real fear is that the slide will trigger a second rockfall higher up the mountain that could be more than 12 times bigger.

Source: welove2ski.com

Resource Three: Comments from people who live, work and visit Mont de la Saxe.

Resource Four: A fact file on the Mont de la Saxe region

Elevation:

1200m at the valley floor to 4810m at the peak of Mont Blanc.

Location:

Mont de la Saxe runs NEE from Courmayeur for 5 km, with a steep sided valley flanking all of its northern edge.

Population:

(Courmayeur and surrounding villages within the valley) 3350

Industry:

Other than ski tourism which brings most revenue into the town, the region also farms cereals and dairy herds.

Recreation:

Ski lodges and chalets dominate the area in and closest to Courmayeur. The base station for the Funivie Monte Bianco ski lift is in La Palud, north of Courmayeur and a second arm of the ski lift runs south to Courmayeur itself.

A seasonal golf course lies north east just beyond the village of Plampincieux on the valley floor.

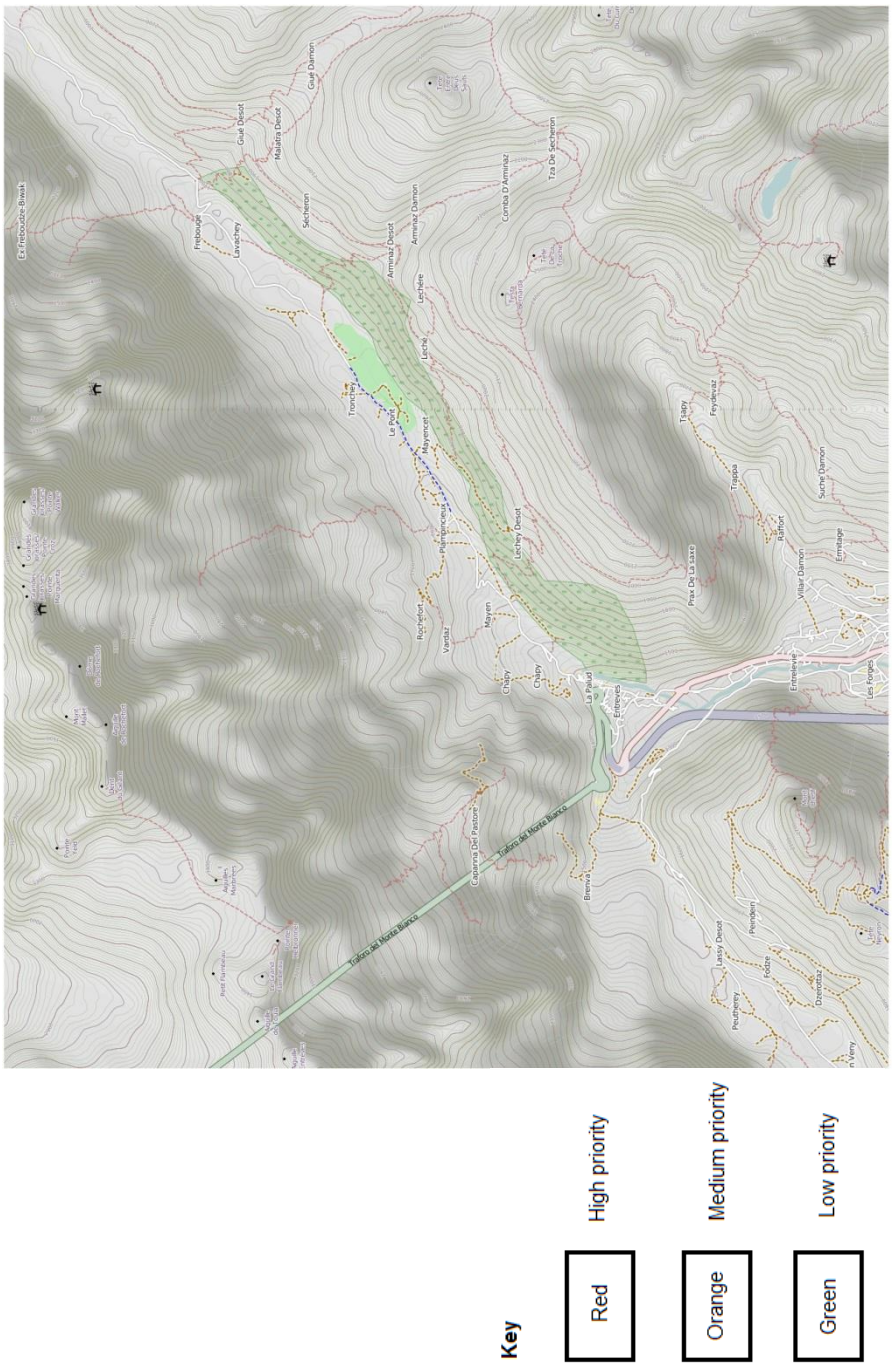
Transport:

The 11.6km long Mont Blanc tunnel runs from Entreves, just north of Courmayeur in Italy to Chamonix in Southern France.

Source: Creative Commons Flickr user Serlunar

Task Two: Prioritising the needs of the Mont de la Saxe region.

Using all the resources available to you shade the areas of the Mont de la Saxe region map below according to their priority for landslide protection. A key is suggested but you should also think about including annotations around the edge of the map to explain your choice.



Source: OpenStreetMap

Resource Five: Price list for different landslide management measures

Measure	Quantity	Price per unit (€)	MLC
Draining potential slip zones	$100m^2$	10,000	6
Underpinning in banks	$100m^2$	8,000	5
Digging holding ditches under potential slip zones	100m	1,000	4
Monitoring system put in place	$100m^2$	6,000	4
Metal containment netting placed under potential slip zones	100m	2,000	5
Extra training for all local emergency response teams	n/a	1000	5
Blasting slope with concrete ('shotcreting')	$100m^2$	2,500	3
Controlled explosions in a potential slip area	1	100,000	6
Evacuation	100 people	30,000	5
Education programme	100 people	500	4
Do nothing	n/a	0	0

Maximum Landslide Class (MLC) - This is the maximum level of landslide against which the measure will provide protection. Landslides are classed in a number of different ways, but the following scale gives an indication of the magnitude of different landslides according to the speed at which they travel. Higher class landslides are less frequent than lower class ones.

Class	Description
7	Extremely rapid; 5m/sec; buildings destroyed, many deaths
6	Very rapid; 3m/min; some lives lost, very difficult to escape
5	Rapid; 1.8m/hr; escape possible, some structures destroyed
4	Moderate; 13m/month; large structures remain, maintenance possible on smaller ones
3	Slow; 1.6m/yr; remedial work can be under taken during movement
2	Very slow; 15mm/yr; permanent structures undamaged by movement
1	Extremely slow; <15mm/yr; imperceptible without instruments

Source: Cruden and Varnes (1996)

Task Three: Decide on an Action Plan for Mont de la Saxe

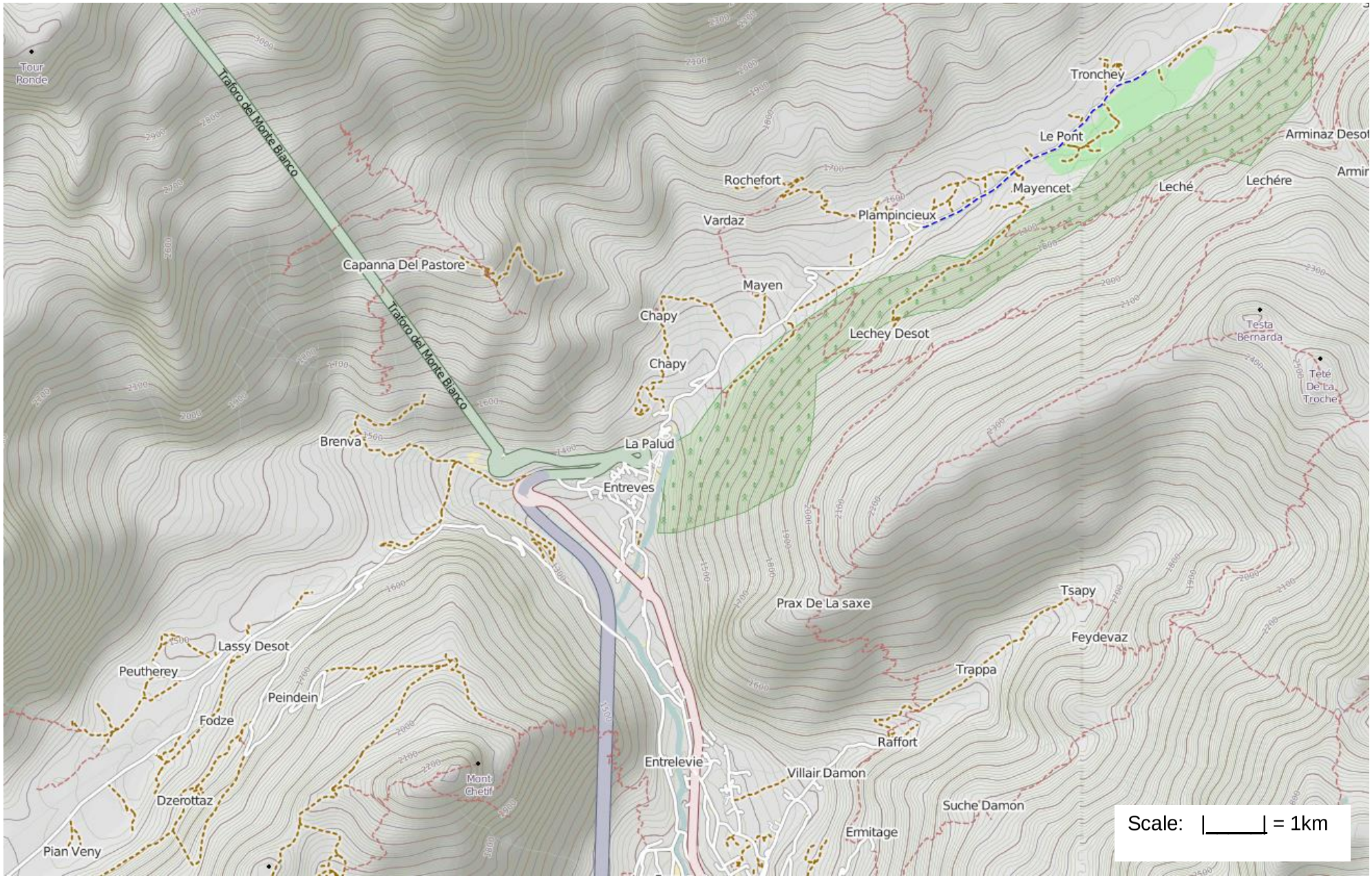
Using all the resources available to you decide how you will spend a budget of €100,000 for managing the landslides. The map on the next page should be used to record your ideas as well as the planning grid below. You will have to refer to the different resources within this pack and to your answers to the various tasks to make your choices.

Think carefully about

- which areas of the Mont de la Saxe Valley are under the greatest potential threat
- which areas require greatest protection
- the class of landslide you wish to protect against

You can choose more than one management measure in one place but remember that not all the measures will naturally work together.

Measure	Location	Quantity	Price per unit (€)	Total cost
			Total (€)	



Source: OpenStreetMap

Task Four: Justify your Action Plan for Mont de la Saxe

Why have you chosen the action plan you have outlined in Task Three? Refer to the resources in this pack, as well as your answers to the preceding tasks, to explain how they informed your decision.