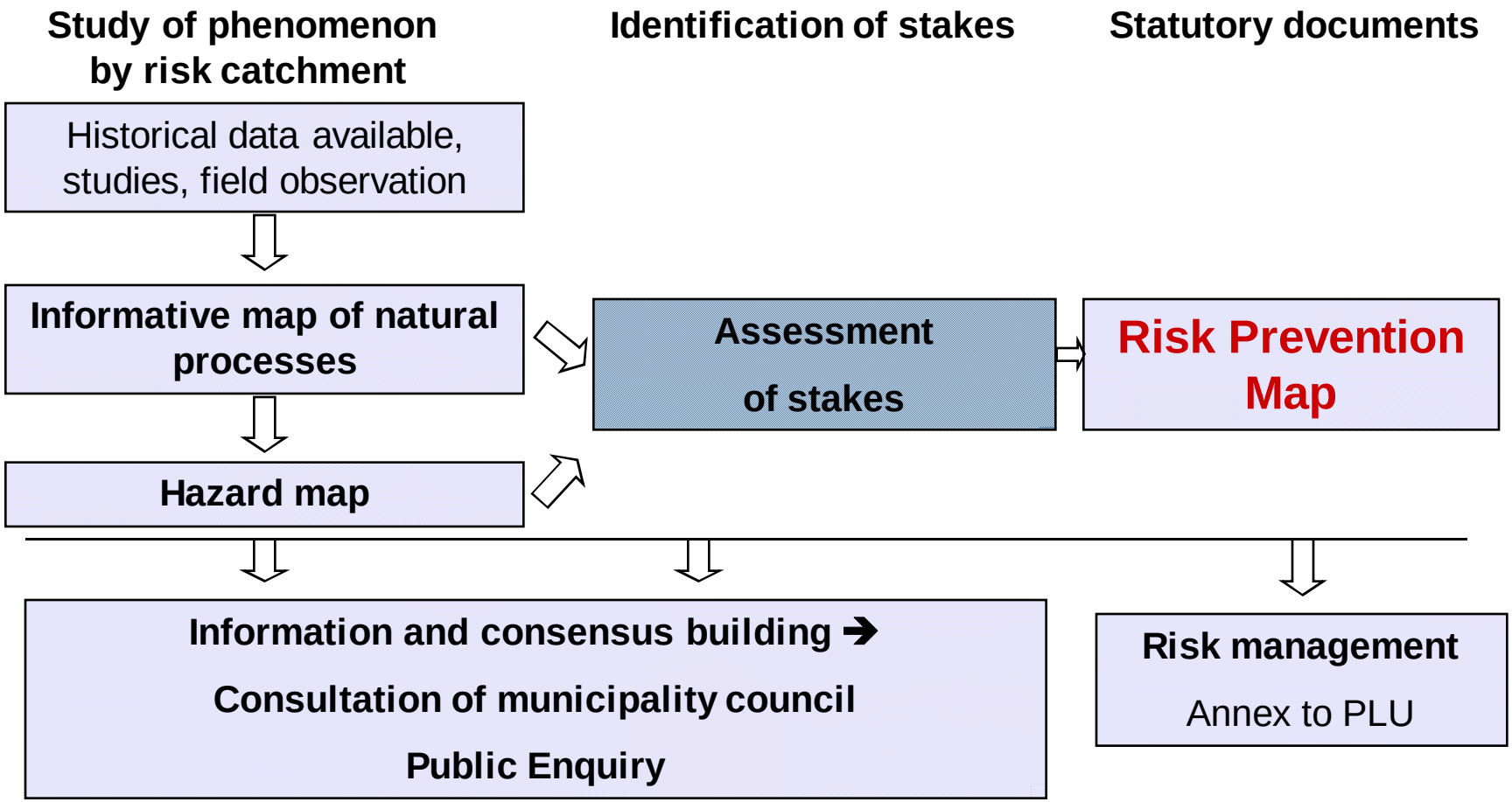
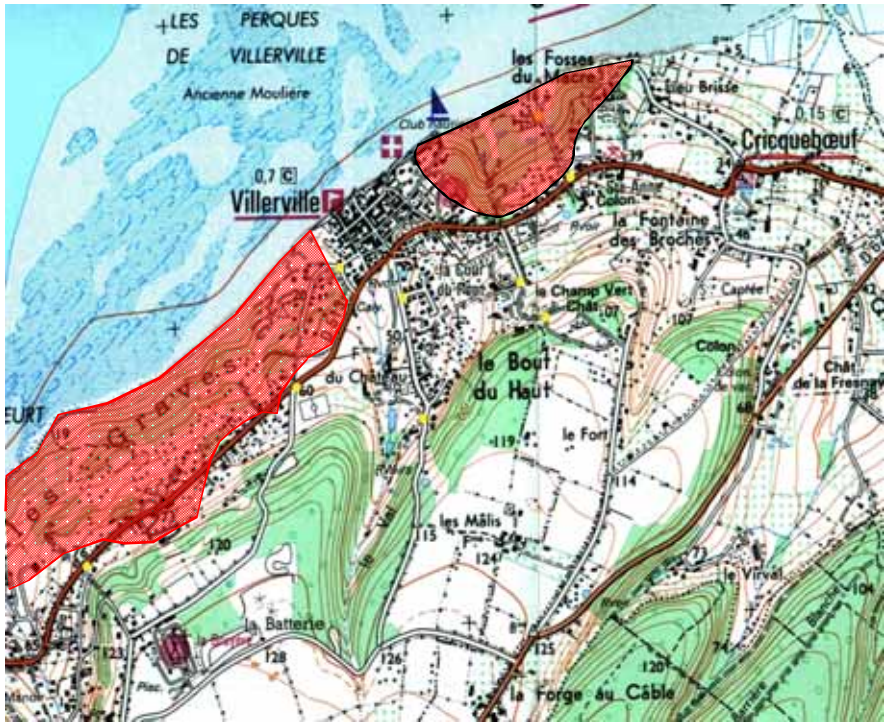
➔ The chain of actions to prepare a PPR



The PPR of Villerville - Cricqueboeuf

Hazard mapping: the **Villerville municipality** is limited by two very active areas, with an extension mainly at the East (Fosses du Macre).



<u>Questions</u>: Why is the Villerville town still (or always!) stable?

What is the future of the Villerville town ? Is the stability permanent or is there a possibility, in the future, that the town could be partially or totally destroyed by the extension of the active landslides.

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The PPR of Villerville - Cricqueboeuf

Hazard assessment

Predisposing factors:

- Lithology (marl, sand, chalk –aquifer layers-),
- Weak mechanical characteristics of marls,
- Tectonic (weak dip (< 1°) to the NE),
- Slope (DTM): steep slope to moderate steep slope,
- Geomorpholoy: scarps, open & active cracks, …
- Land cover: forest, bush, pond, …

➔ **Susceptibility of landslide**

Triggering factors (see previously):

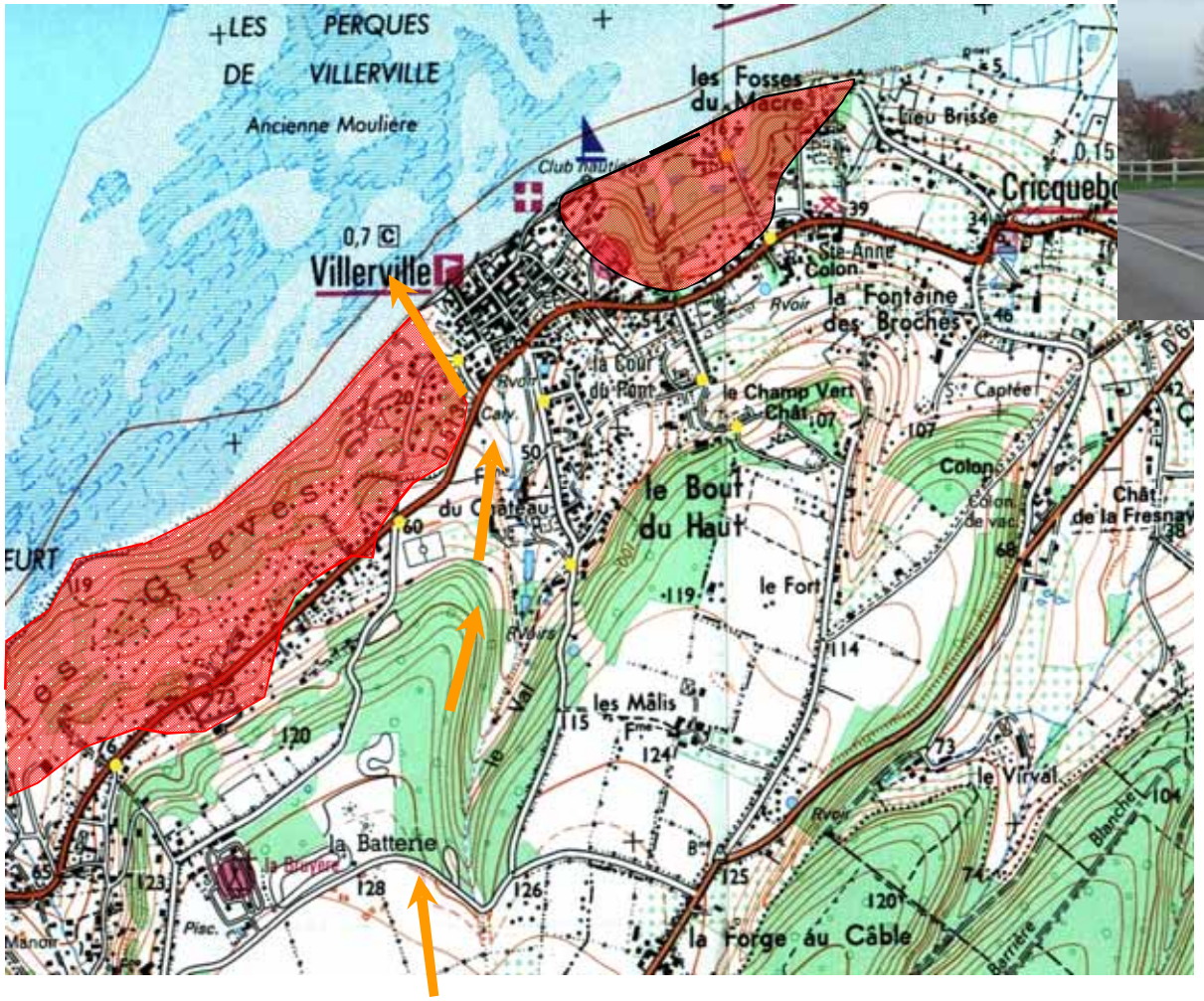
Main influence of:

- GWT variations,
- sea erosion at the base of the hillslope (toe unloading).

➔ **Acceleration triggered by GWT above a certain threshold.**

The PPR of Villerville - Cricqueboeuf

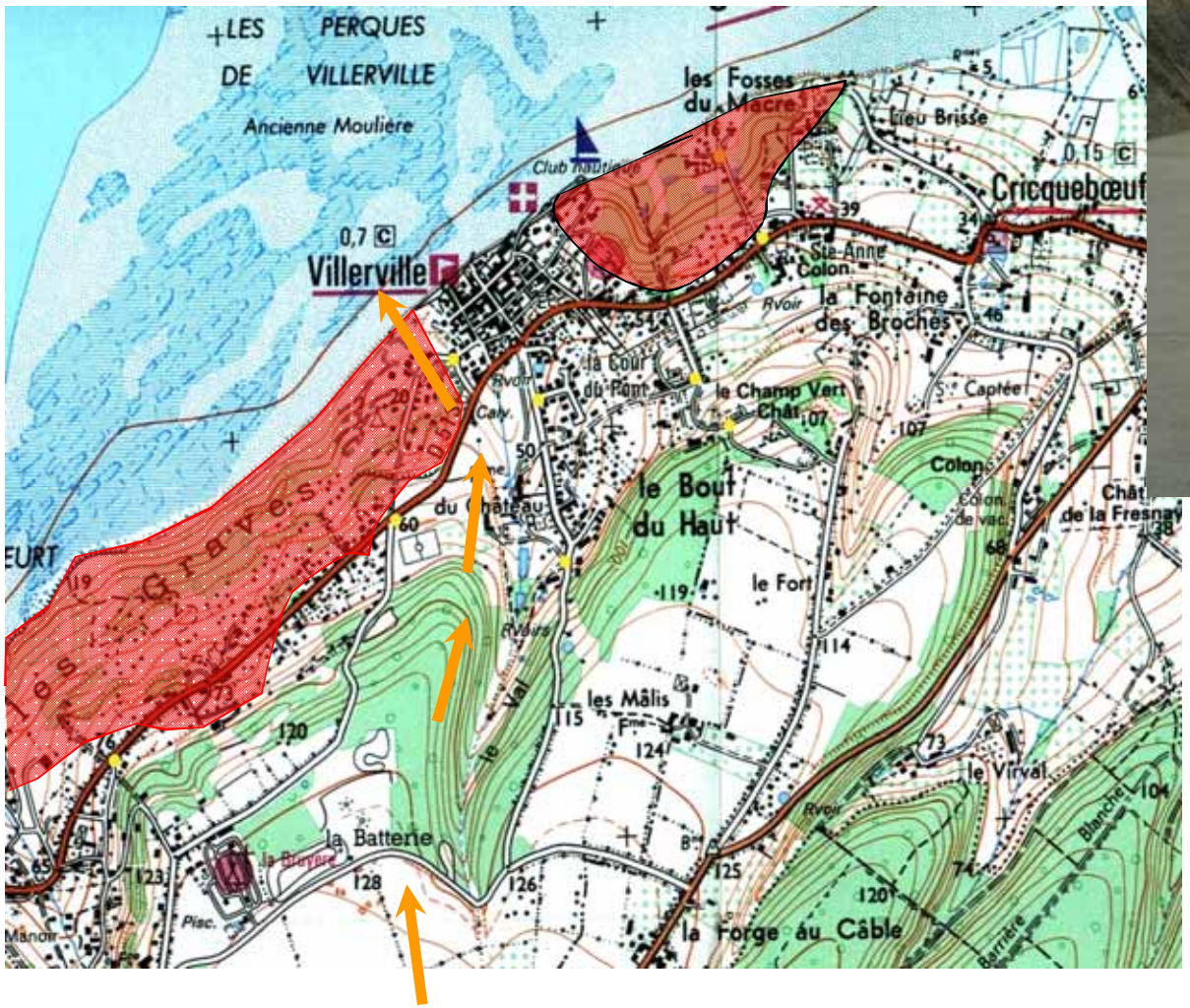
Hazard assessment: case of Villerville town



1. The town is located in the axis of a small valley at 20m a.s.l.

The PPR of Villerville - Cricqueboeuf

Hazard assessment: case of Villerville town

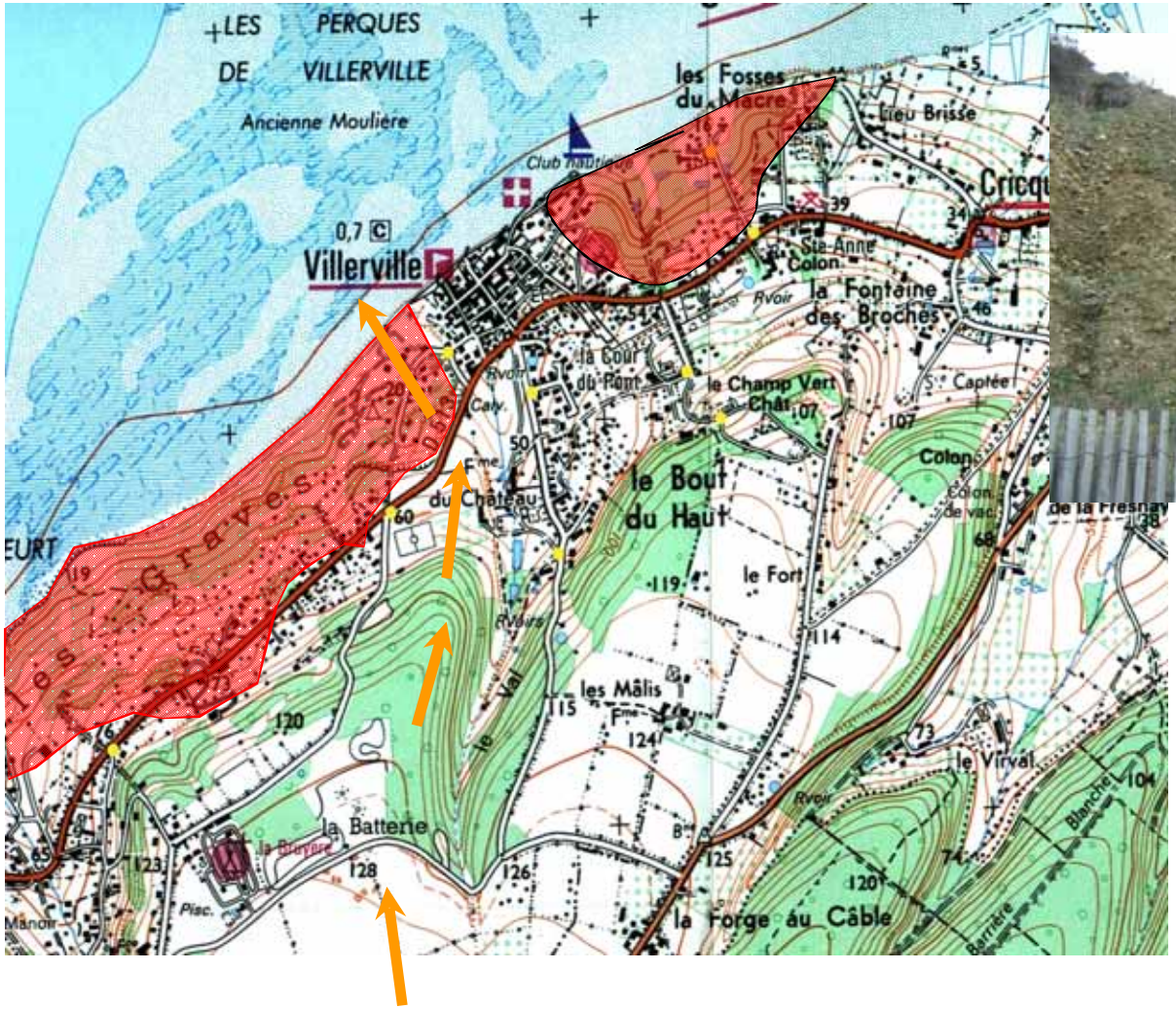


1. The town is located in the axis of a small valley at 20m a.s.l.

2. The coastal slope is protected by a seawall

The PPR of Villerville - Cricqueboeuf

Hazard assessment: case of Villerville town



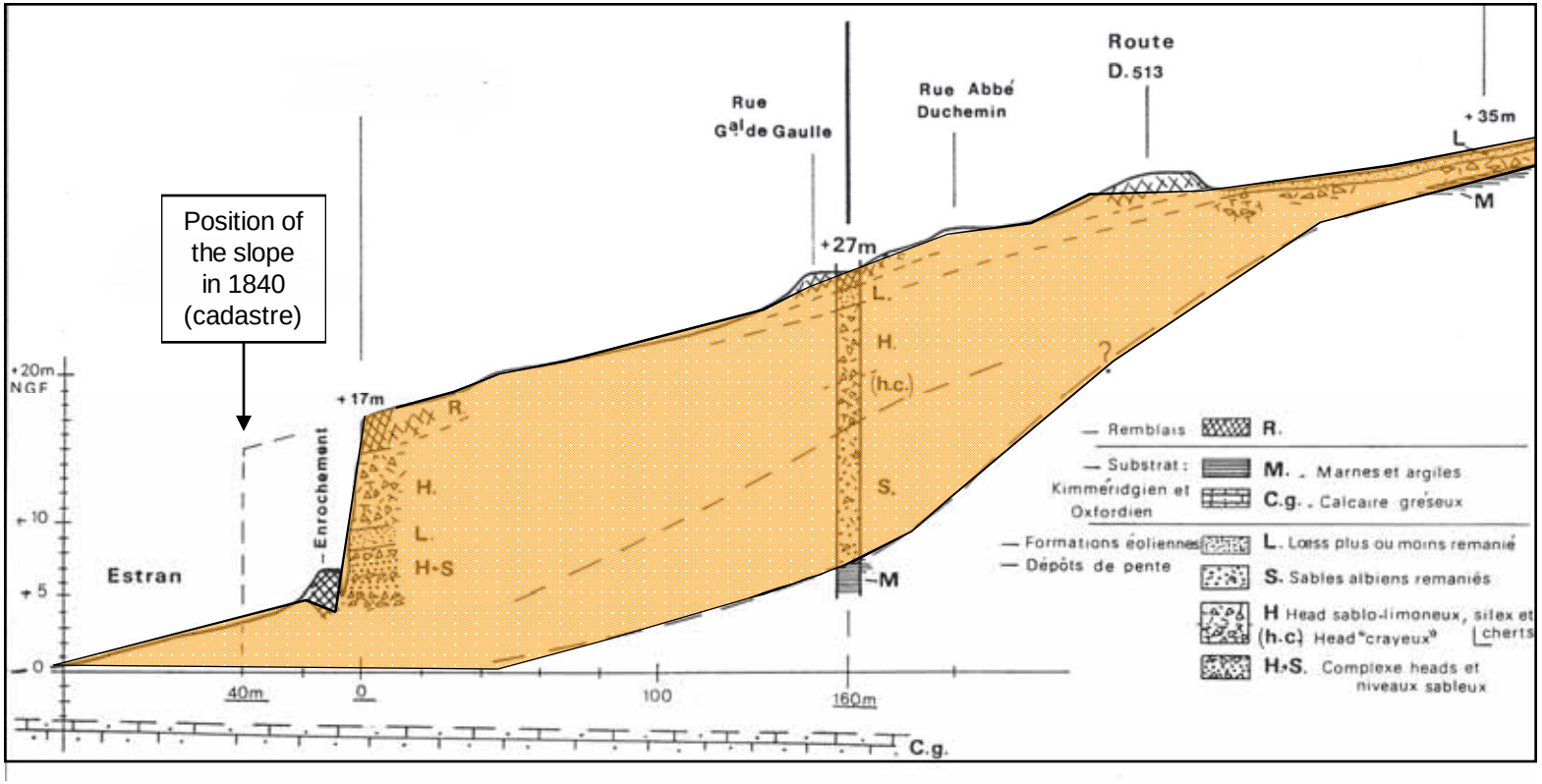
1. The town is located in the axis of the small valley at 20m a.s.l.

2. The coastal slope is protected by a seawall

3. The slope material are mainly eolian loam, sand and gravels (head)

The PPR of Villerville - Cricqueboeuf

Hazard assessment: case of Villerville town



➔ Paleo-valley fullfilled by colluvial-alluvial materials (flints, eolian loamy sands & gravels). These formations have been placed during the Upper Pleistocene period when the see level was low (max -100m).

➔ Materials are very permeable without watertable, ➔ Low hazard !!

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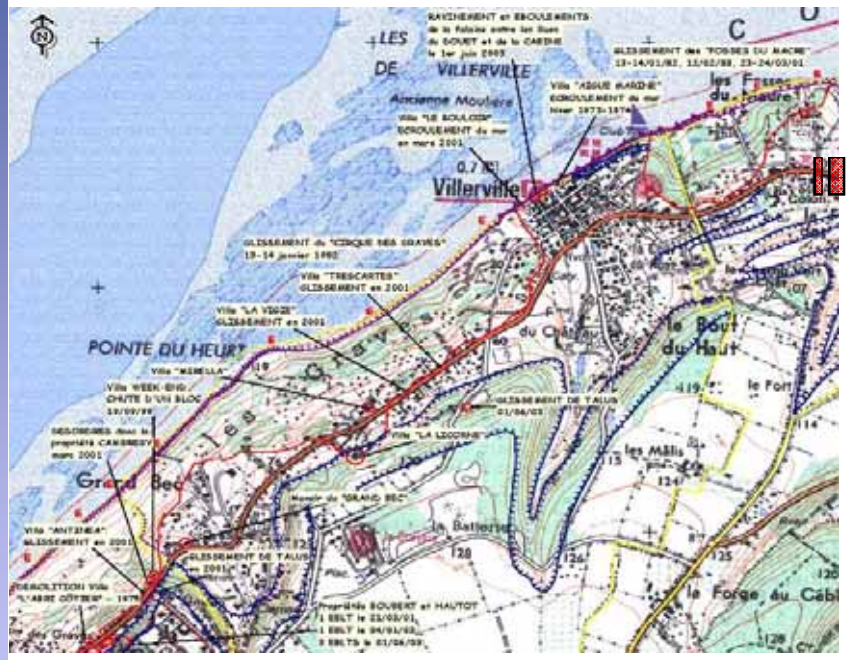
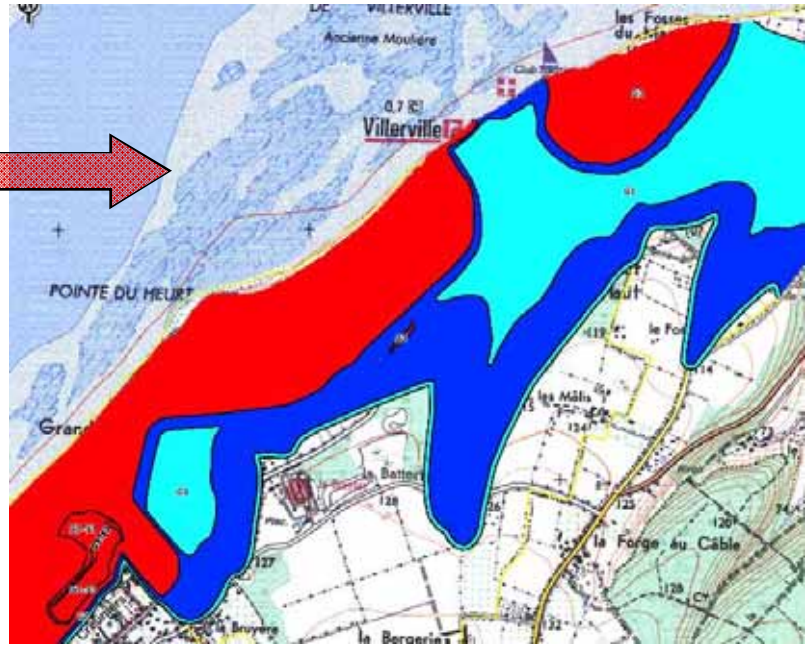
The PPR of Villerville - Cricqueboeuf

Hazard assessment and mapping

In progress, draft version



Landslide inventory map



Hazard zoning map

- G1: Low hazard
- G2: Moderate hazard
- G3: High hazard

The PPR of Villerville - Cricqueboeuf

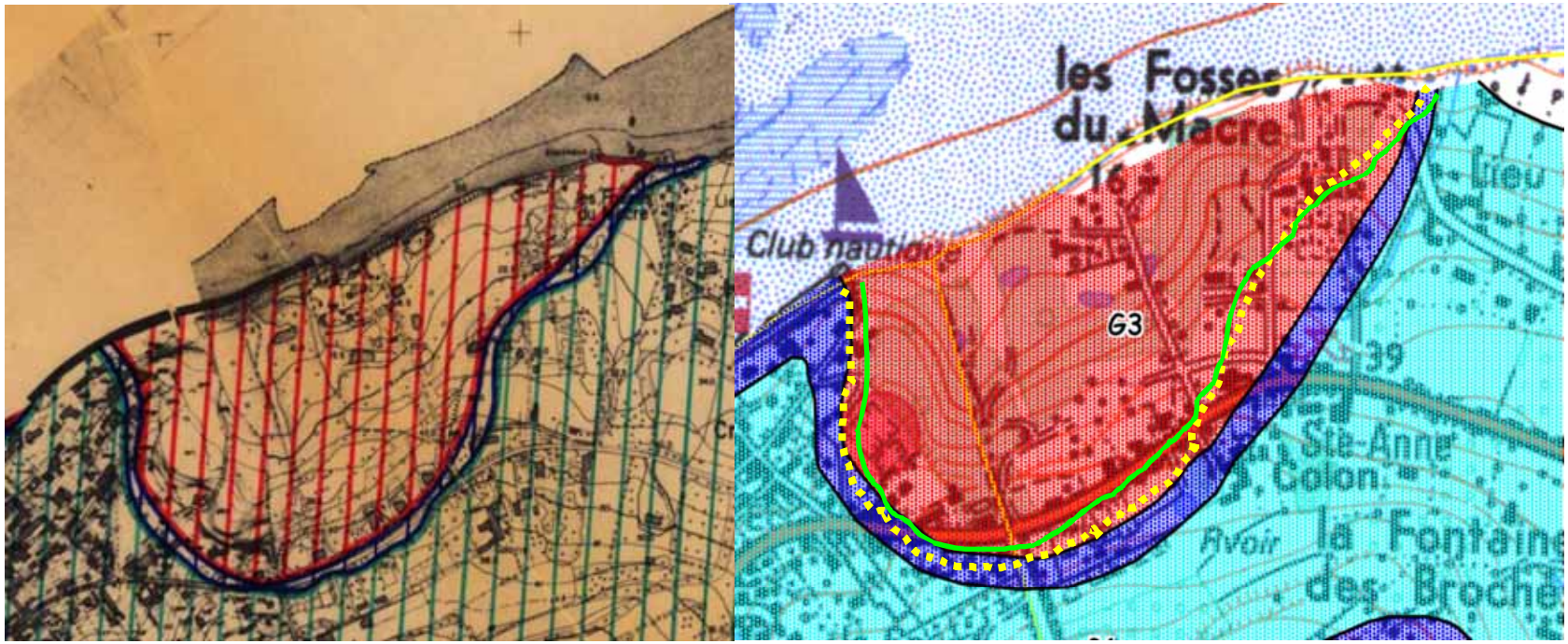
Hazard assessment and mapping

Hazard	Criteria
High **G3**	- Active landslide: open cracks, scarps, counter slopes with ponds, … - steep slope (> 30°), - geology: blocks of chalk, glauconic sands & marls, IV deposits, - buffer zone of security around active landsilde.
Moderate **G2**	- No activity. Smooth topography +- hummocky, - same geologic conditions of G3, - steep to gentle slope.
Low **G1**	- No activity. No indices. - same geologic conditions of G2 or colluvial/alluvial permeable materials, - gentle to low slope.
Null **G0**	- Flat topography (plateau)

The PPR of Villerville - Cricqueboeuf

Comparison of PER (1988) and revised PPR (2007) Hazard maps

In progress, draft version



Hazard zoning map PER 1988

Main scarp in 2007 (limit of active zone)

Limit G3 of the PER hazard map

Hazard zoning map PPR 2007

G1: Low hazard

G2: Medium hazard

G3: High hazard

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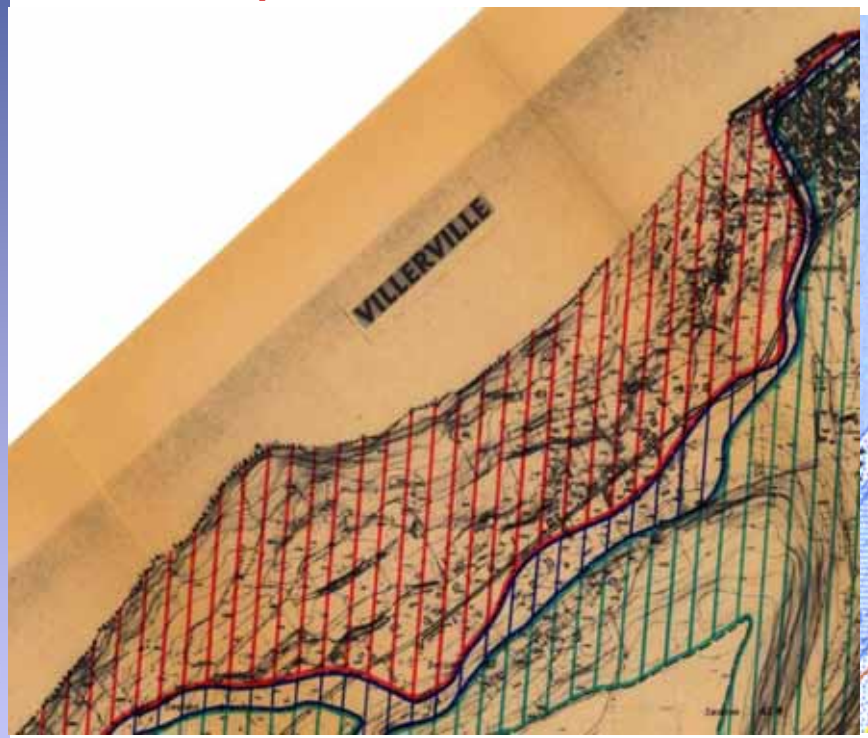
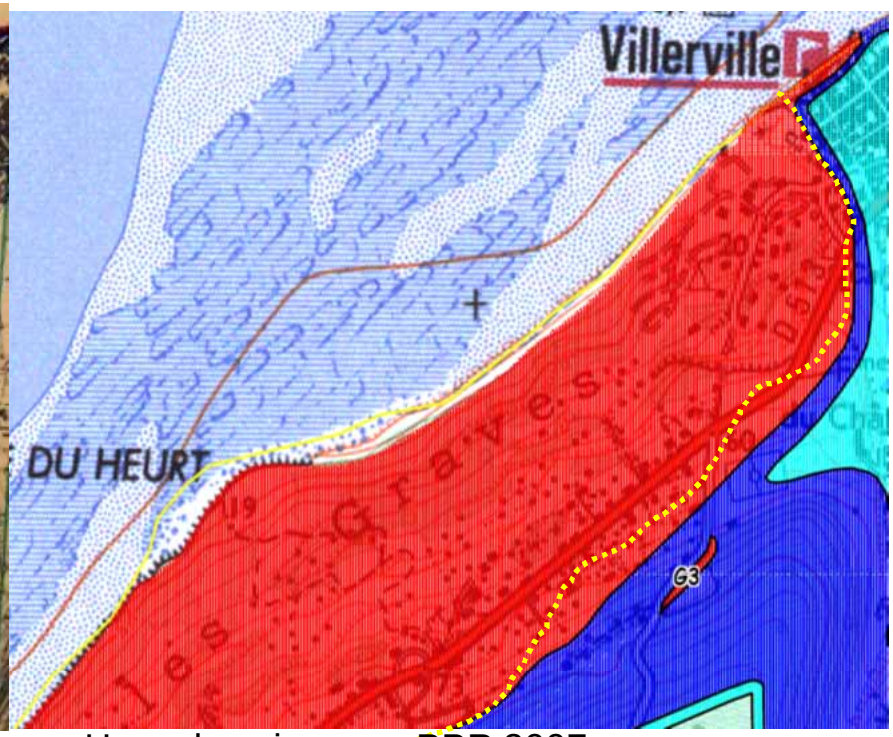
The PPR of Villerville - Cricqueboeuf

Comparison of PER (1988) and revised PPR (2007) Hazard maps

In progress, draft version



Hazard zoning map PER 1988



Hazard zoning map PPR 2007

Main scarp in 2007 (limit of active zone)

Limit G3 of the PER hazard map

G1: Low hazard

G2: Medium hazard

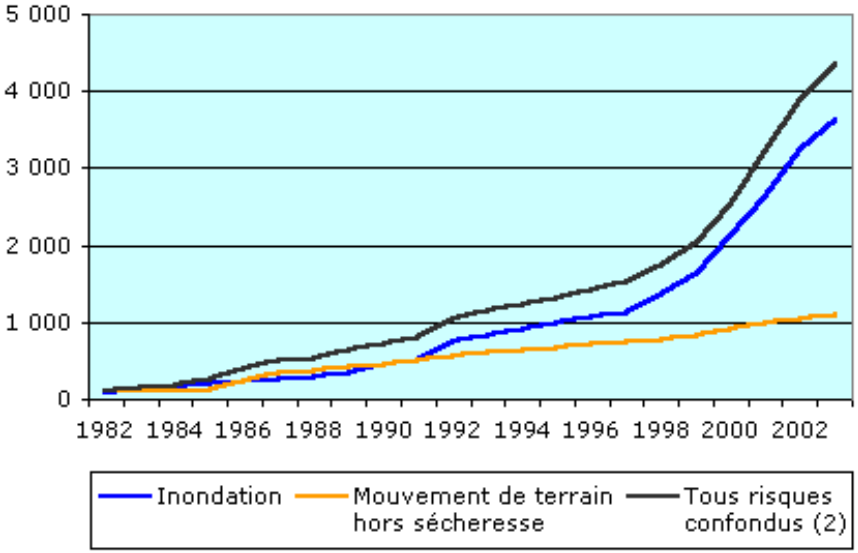
G3: High hazard

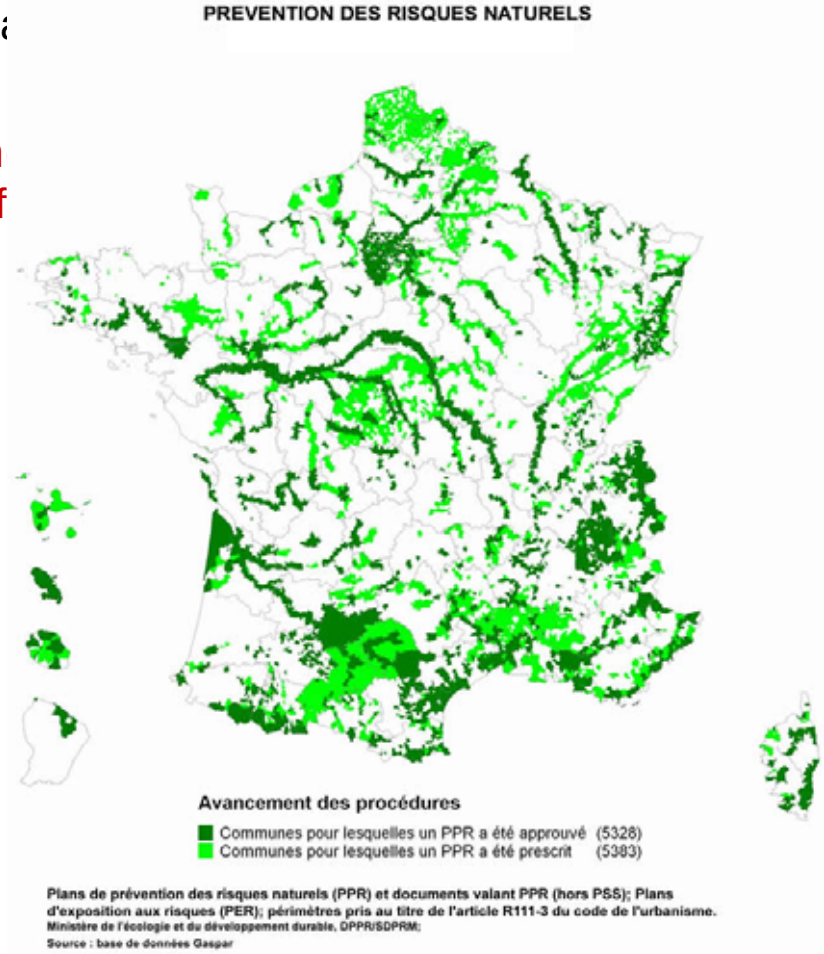
2.2. Efficiency and difficulties of PPR

In France, over 36000 local communities, more than 18000 are at risk.

In 2010, about 6000 PPR are available (including the previous PER, PSS and "R.111.3 - risks area and 2000 other PPR are in progress.

➔ the mapping procedure is a slow process an number of available PPR concerns 1/3 of communes at risk





Despite simplification of the procedure (from PER to PPR), the number of approved PPR is still weak and several problems exist. Also, it is essential to advance in researches to fill the gap between scientists and decision-makers.

So, Mountain-Risks may be able to give some answers to the Society.

What should we do to improve land-use planning?

The main reason to the difficulty to 'approve' a PPR is the little attention paid in local town/municipalities regarding the restrictive aspects of thd cartography, which can prohibit building or block building projects in high risk zones (red zones).

Cartography remains a delicate exercise and realism is of paramount importance:

- **over-estimation of the risk zone**: ➔ socio-economical consequences,

- **under-estimation of the risk zone**: ➔ responsibility.

How to determine and map the hazard? With a sufficient accuracy, without a long data collection, and a complex process of calculation.

How to assess the consequences? With appropriate method nor too simple (inventory of EE & major stakes of PPR procedure is not always appropriate) & nor to complex.

How to create a quantitative risk assessment?

Do we need to identify & describe each EE?

How do we do to transfer from regional scale to local scale ? Or the contrary!

The delay between the prescription and the agreement (by the state) of PPR is generally of 18 to 24 months.
But in many cases, the delay is increased, if the project of PPR is rejected by the municipality council, by the population during the 'Public inquiry' or others inquiries (project not well understood, not well prepared or not well presented!), or if major modification are necessary.

Sometimes, if no consensus is find among the 'parties', the Prefet could engage a 'contradictory study' by another organism (or expert) to solve the problem.
In other case, some people ('defence association' on the basis of scientific arguments) try to slow down the procedure by an 'juridical request', or in last case, by a request to a 'State Council'.
In this case, the delay could be very long or the PPR could never be approved.

How to communicate information?

How to educate the practitioners & population?

How to involve all stakeholders in the decision-making process?

2.3. Practical hazard criteria used by ONF - RTM

The criteria used by ONF – RTM are to propose a ranking of 'hazard' and 'stake' levels

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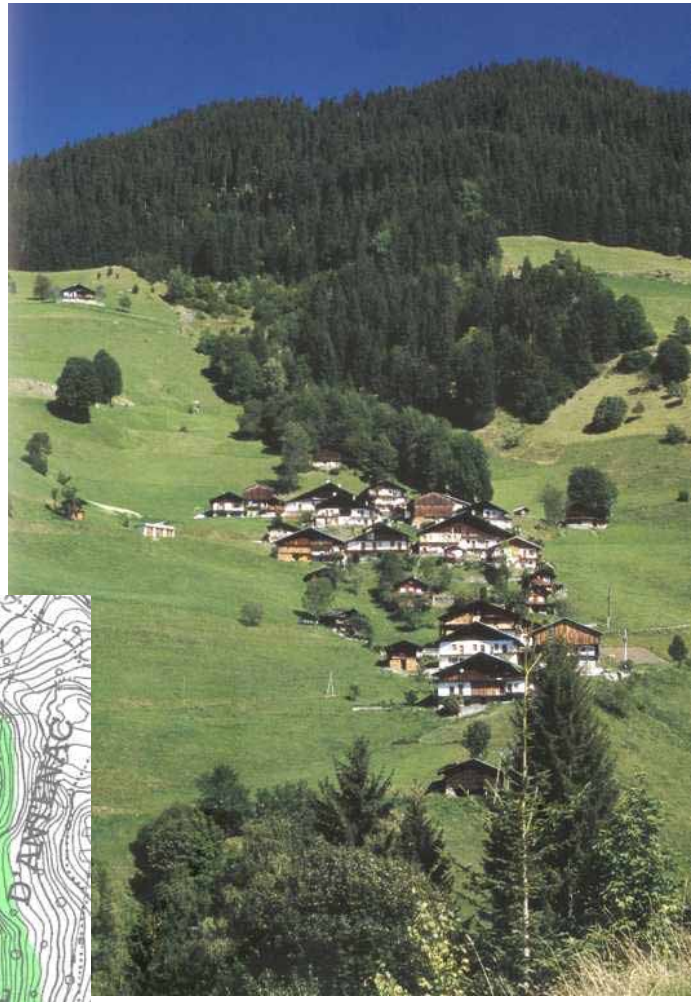
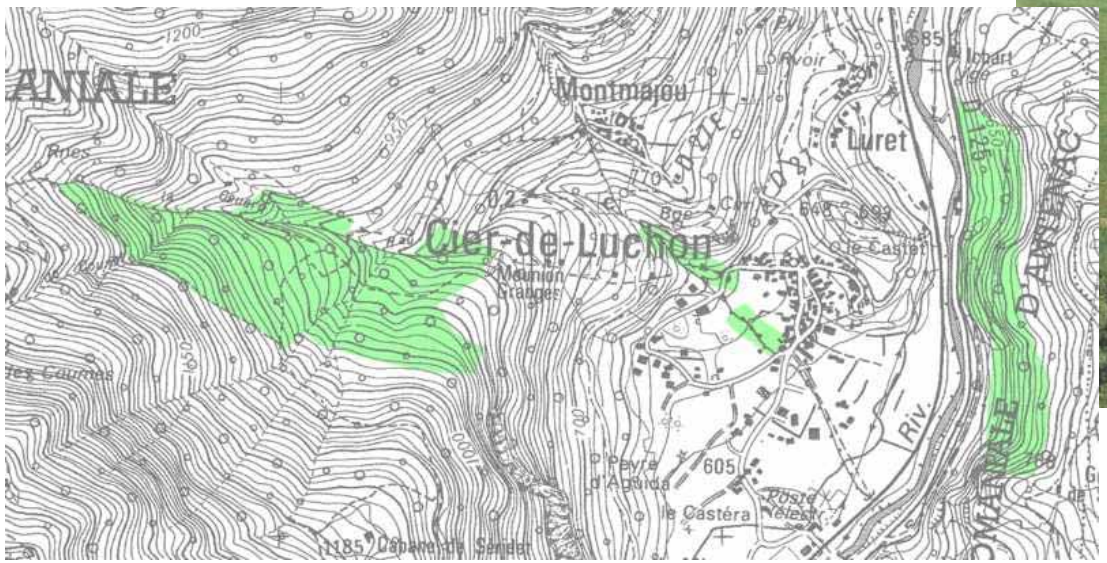
Example:

* Scale: 1/25.000

* Tool: ONF-RTM GIS Platform (ArcView)

* Data: use of existing databases





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Basic principles

*** Combine:**

- forest map ——— ❶ Forest, ❷ Other vegetation ❸ Bare soil

- hazard map

- stake map

Criteria for hazard characterization:

→ A map per process

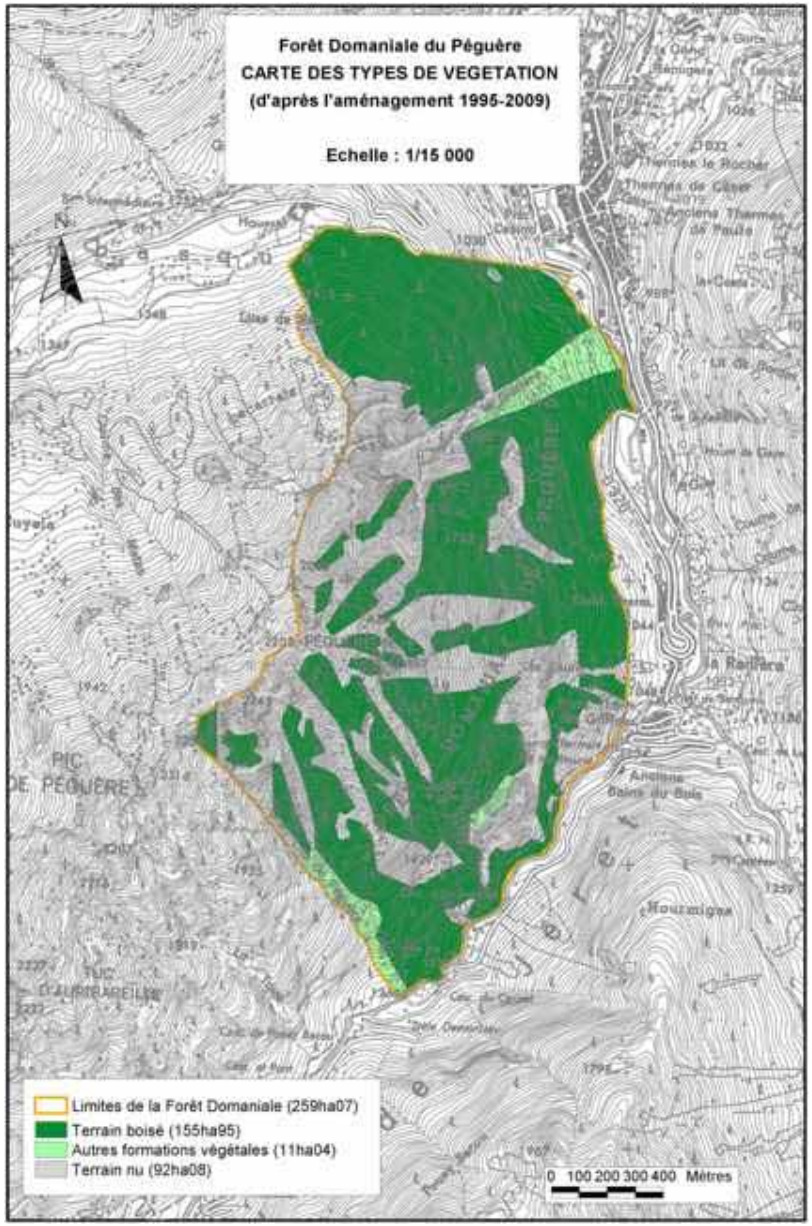
Snow avalanche / Landslide / Debris Flow / Rockfall / Gullying

Flooding and Forest Fires are not taken into account

→ Simple approach with single criteria

→ A relative index based on intensity not on spatial / temporal frequency

Note d'aléa				
Avalanches	Ravinement	Crue torrentielle	Glissement de terrain	Chute de blocs
1	1	2	2	2
3	2	3	3	3



➲ Overlapping of hazards

♦ Each hazard is analysed independently

➲ Quotation of risk level

		Niveau d'enjeu résultant		
		Faible	Moyen	Fort
Note d'aléa	1	Risque faible	Risque faible	Risque moyen
	2	Risque faible	Risque moyen	Risque fort
	3	Risque moyen	Risque fort	Risque fort

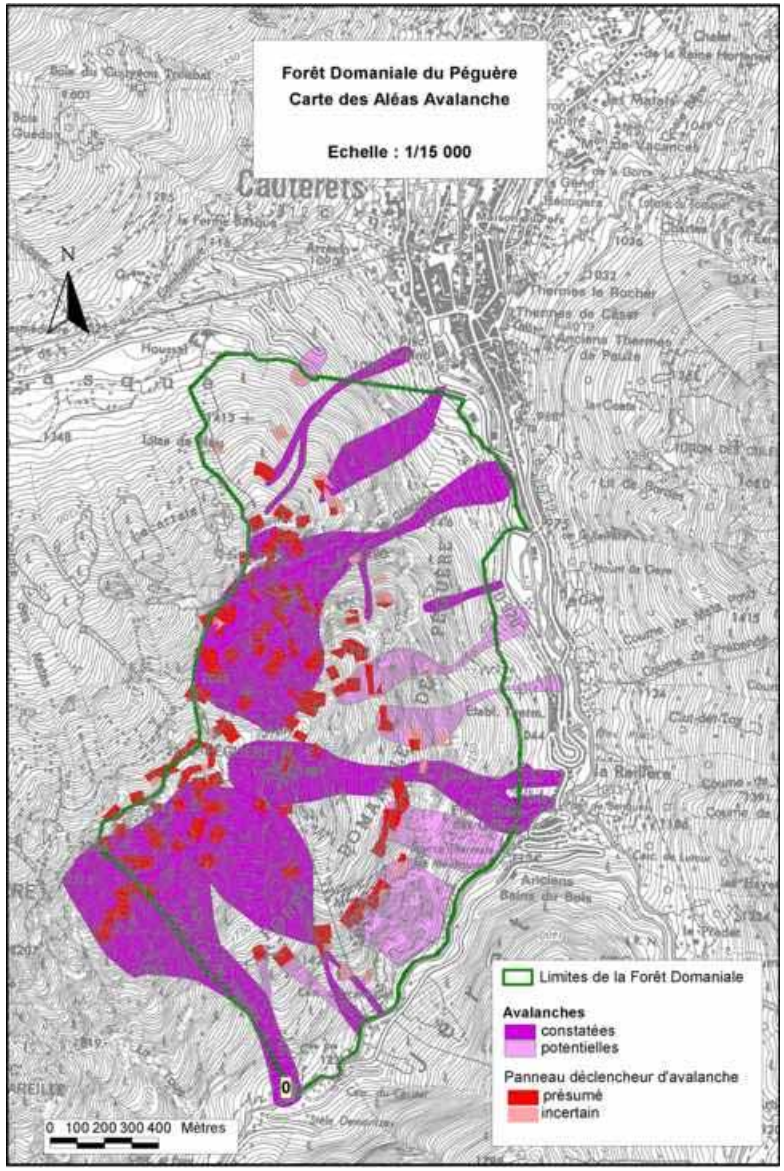
➲ Avalanche

♦ no distinction between the source zone and the accumulation zone….

♦ avalanche which has occurred: quotation 3 [the CLPA, Carte Localisation des Couloirs d'Avalanches) is used]

♦ potential avalanche: quotation 1

♦ If no historical data is available:
The map is prepared by 'expert method' and by photo-interpretation

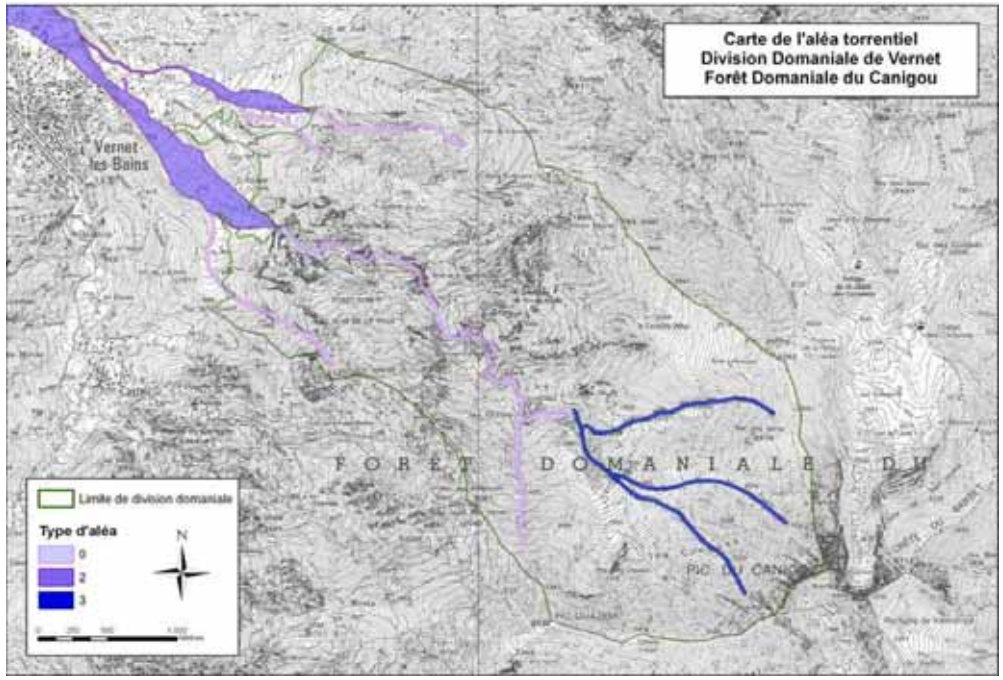


➲ Torrential flood

♦ The limits are the flooding areas; not the catchment:
- ➢ linear aspect
- ➢ mapping unit: < 1 drained hectare
- ➢ all the alluvial fan is potentially flooded

♦ Subdivision of the torrent in homogeneous segments according to their role in solid transport

- ➢ steep and non erosive segment: quotation 0
- ➢ regulation zone (deposition / scouring) : quotation 2
- ➢ steep and erosive segment: quotation 3
- ➢ minimal size of segement: 250 m



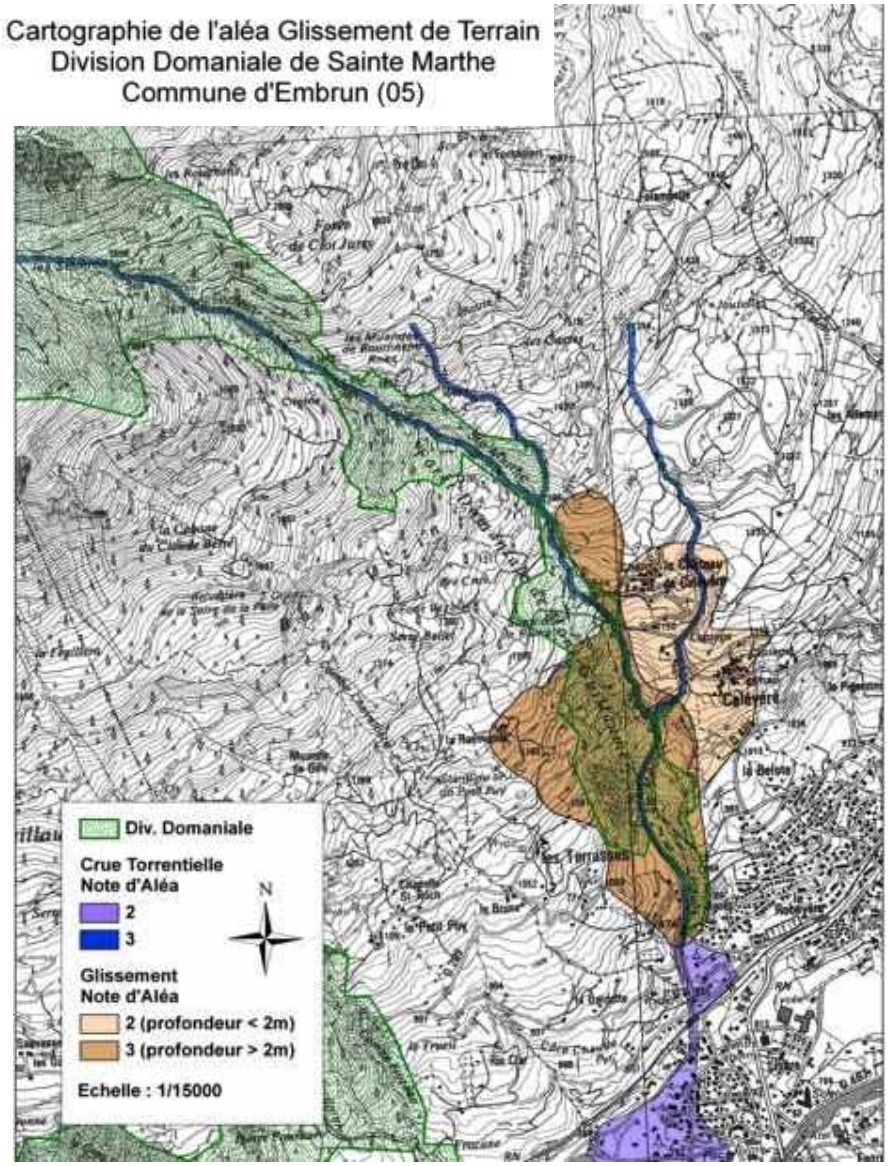
♦ assess the possibility of debris flow (yes / no)

➲ Landslide

♦ the zoning include active and potential, ablation and accumulation zones

♦ differentiation according to the estimated depth of landslide:

- < 2 m : quotation 2
- > 2 m : quotation 3



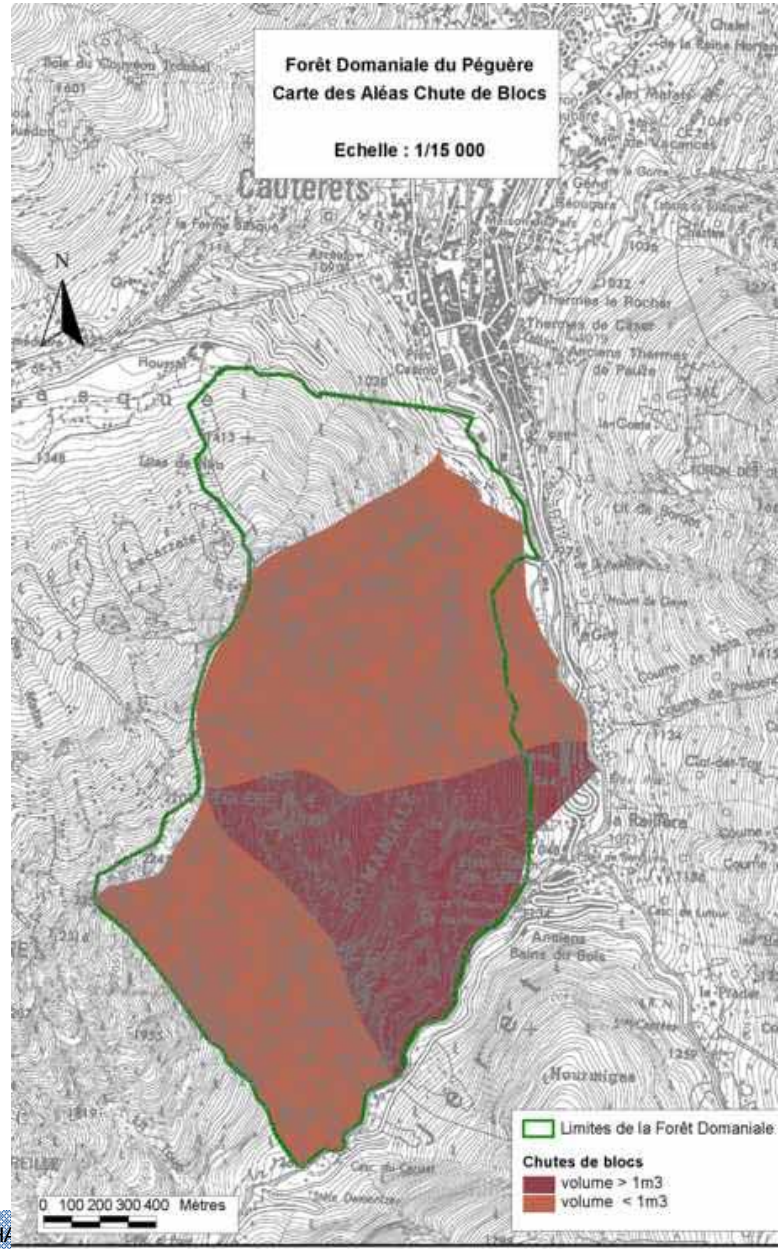
➲ Falls

♦ the zoning takes into account the source and accumulation zones

♦ differentiation according to the size of block for a standard event:

< 1 m^3 : quotation 2

> 1 m^3 : quotation 3



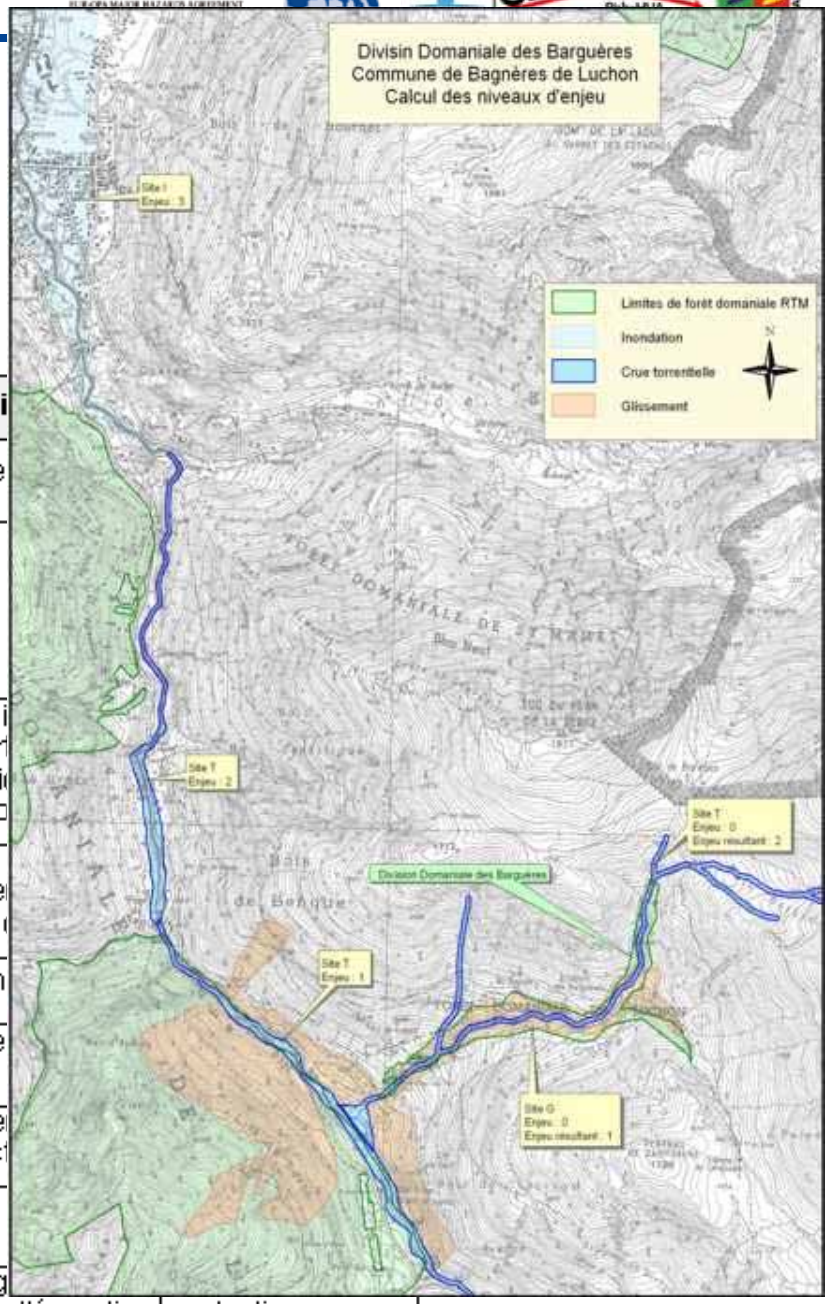
➔Delimitation and quotation of the stakes

➲ Homogeneous units of stakes

- ♦ the stakes are not located spatially
- ♦ quotation of local stake and of resulting stake

Type d'enjeu	Fort (3)	Moyen (2)	Fai
Habitat	Dense, plus de 10 logements	Dispersé, 2 à 10 logements	Bâtime
Voie de communication (route, rail)	Voies structurantes d'intérêt national	Voies d'intérêt départemental, ou accès unique d'un pôle important d'activités	Voies local
Réseaux		Ligne HT	Condui desser (électri téléph
Tourisme	Camping, Centre d'accueil, Colonie de vacances		Pistes Equipe touristi
Industries et commerces	Centre industriel	Commerces	Artisan
Agriculture			Bâtime Terres
Forêt			Peuple produc
Patrimonial		Bâtiment historique	
Autres enjeux publics	Ecole, hôpital, centre de secours	Autres bâtiments publics	Captag station d'épuration

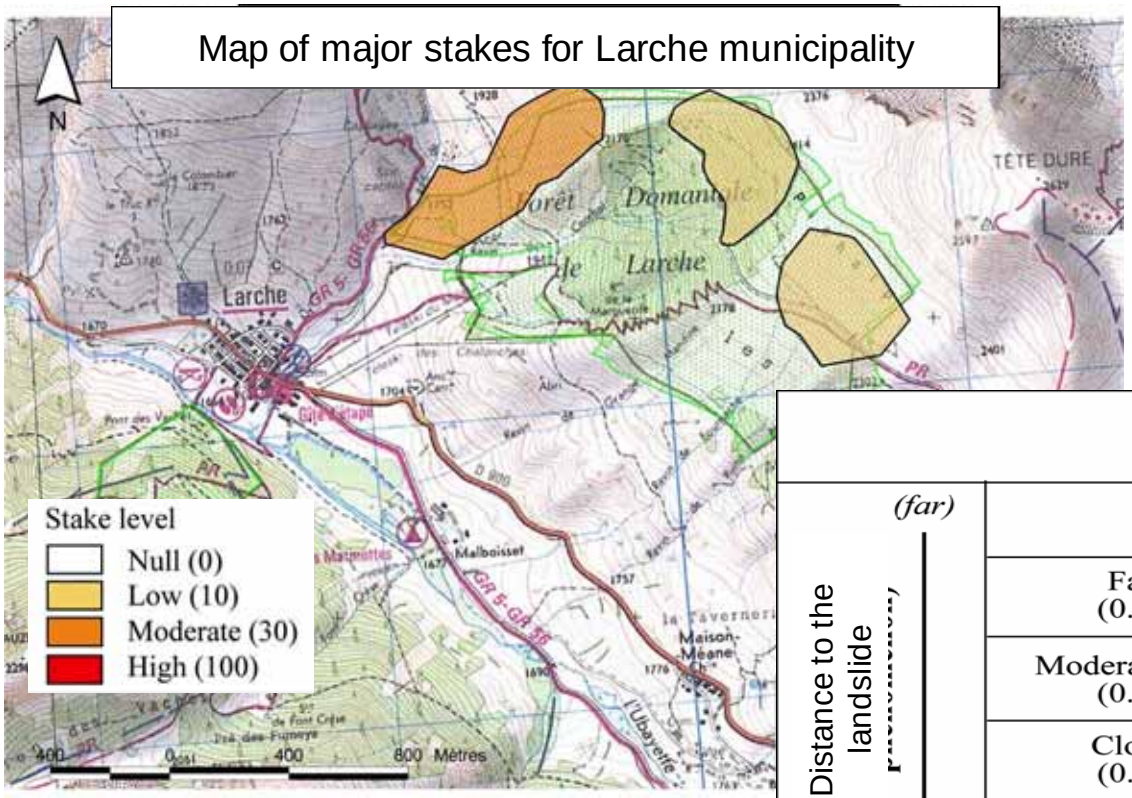
protection



➔ Risk zoning – Identification of the major stakes

→ Identification of major stakes (4 classes: null, low, moderate, high)

Map of major stakes for Larche municipality



Distance to the landslide (far → close)	Stake: Null (0)	Low (10)	Moderate (30)
Far (0.2)	0	2	6
Moderatly far (0.5)	0	5	15
Close (0.9)	0	9	27
Very close (1)	0	10	30

Final stake

Null | Low | Moderate | High

→ Matrix approach (RTM):
Matrix associating the type of stakes and the distance to the landslides

Conclusion: Access to Risk Information

Conclusion: Access to Risk Information

Conclusion: Access to Risk Information