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## Landslides in French tropical environments: lessons from new inventories to improve geomorphological and hazard knowledge

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A large diversity of poorly known and damaging landslides are located in French overseas tropical territories (Table 1, Figure 1). These mountainous territories present a large variety of heterogeneous, juxtaposed or overlapping, often highly weathered materials (i.e. volcanic, volcano-sedimentary or metamorphic) particularly susceptible to landslides. French overseas territories are often hit by intense weather conditions (cyclones, hurricanes or heavy tropical rains) or earthquakes, which makes them all the more vulnerable to landslides.

**Table1.** Major catastrophic events (last 40 years) for the French overseas territories (NE=not estimated).

Location	Major event		Damages		Estimated costs (€)
	Name	Year	Human	Materials	
<b>Guyane</b>	Cabassou	2000	10 deaths	Roadway covered	NE
<b>New-Caledonia</b>	Houailou	2014	8 deaths	Roadway covered	NE
<b>La Réunion</b>	Hyacinthe	1980	25 deaths	Multiple impacts on road and buildings	NE
<b>Guadeloupe</b>	Hugo	1989	-	Multiple impacts on road	5 Millions
<b>Martinique</b>	Morne-Callebasse	2011	10 deaths-75 evictions	20 buildings+collapsed road	17.1 Millions
<b>Mayotte</b>	Koungou	2018	5 deaths-150 evictions	Collapsed huts	NE

Each landslide inducing damage is listed in the French national landslide database (BD-MVT). However, it is incomplete because not all are damaging phenomena, especially on undeveloped slopes. Thus, in order to create statistically robust landslide database in these territories, the BD-MVT has been completed by visual remote sensing analyses (aerial photograph and stereoscopic analyses, orthophotographs and Google Earth® imageries investigations, etc.), and historical documents analyses. Each mapped phenomenon is integrated in standardized spatial databases with a series of attributes (i.e. type, materials involved, activity, period of occurrence, etc.). Morphometric attributes (e.g. length, width, reach angle, area, etc.) are derived from the landslide polygons and using local DTMs with a homogeneous resolution for all the studied territories. Every inventory has been verified and completed with field surveys (Table 2). They provide fundamental insights for the understanding concerning the physio-geographical conditions of landslide initiation and runout and help to better understand geomorphological characteristics of each environment.

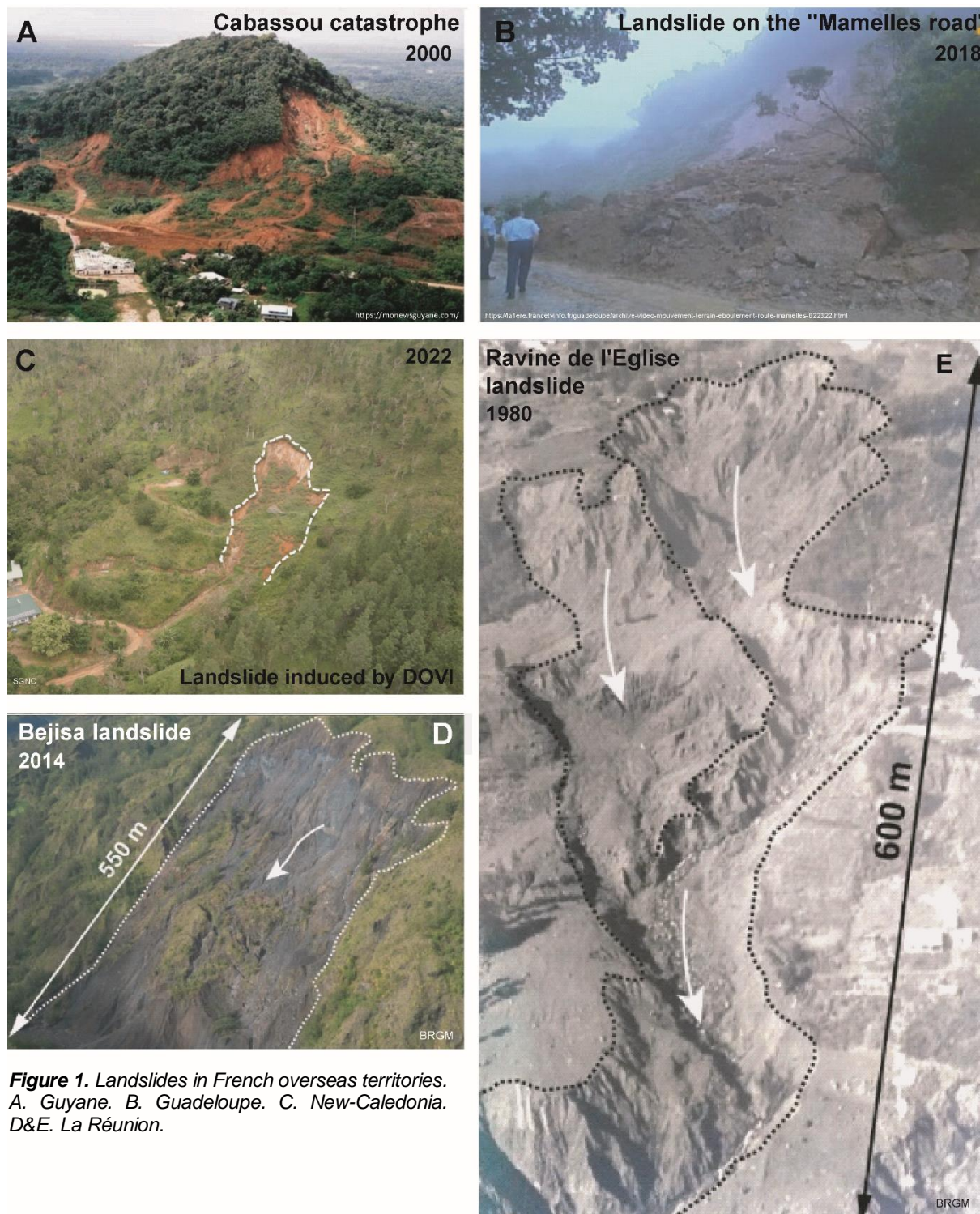
**Table2.** Overview of landslides in French tropical territories (evolving)

Location	Surface of territory (km <sup>2</sup> )	Investigated Area (km <sup>2</sup> )	Landslides (number=n)	Mean density (n.km <sup>2</sup> )
<b>Guyane</b>	83846	206	239	1.16
<b>New-Caledonia</b>	18875	7710	22416	3.15
<b>La Réunion</b>	2512	90	1 719	19.1
<b>Guadeloupe</b>	1628	210	1150	5.47
<b>Martinique</b>	1128	1128	1104	0.98
<b>Mayotte</b>	374	374	In course	In course

Through a series of statistical indices supplemented by field observations, this presentation aims to show the landslide specificities of each overseas territories and brings insights to understand the variety of processes involved (natural or anthropogenic). Such detailed inventories allow the integration of large-



to small-size landslides in a global geomorphological analysis. In particular, moderate to small landslides triggered by cyclonic rainstorms play a significant role in the dismantling processes of mountains edifices (volcanic or others). The first results obtained are promising, and suggest that the comprehensive analysis of overseas landslide inventories, beyond the information they bring for susceptibility and hazard analyses, can provide valuable information for understanding the role of landslides in the landscape evolution of tropical territories.



**Figure 1.** Landslides in French overseas territories. A. Guyane. B. Guadeloupe. C. New-Caledonia. D&E. La Réunion.