Consultancy Service for the Development of an Inundation, Flooding and Landslide National Risk Profile, Strategic Framework and Action Plans for Disaster Risk Management for the Republic of Mauritius

Eng.Filippi Elisa, Hydraulic Engineer
Dr.Marsala Vincenzo, Geological Engineer - SGI Studio Galli Ingegneria

Capacity and validation workshop
Swami Vivekananda International Convention Centre, Pailles, Mauritius, August 22-24, 2012

FLOOD AND LADSLIDE RISK ASSESSMENT

Table of contents:

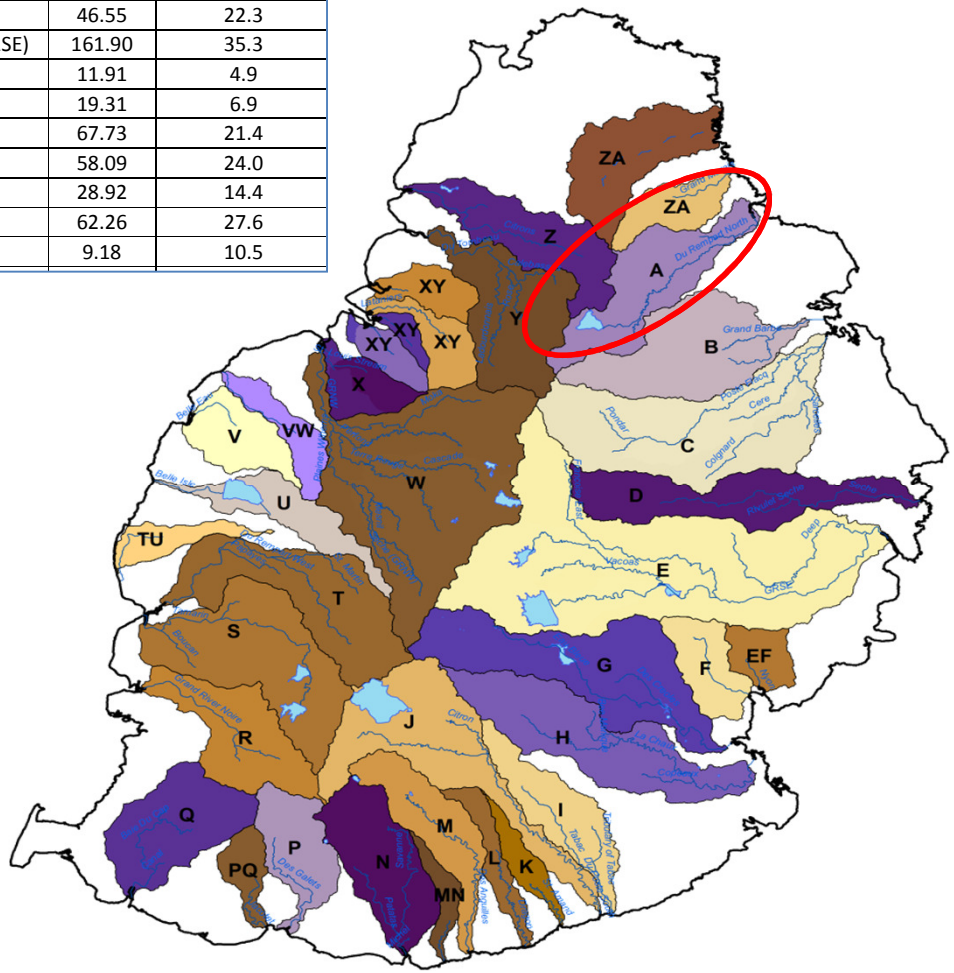
Hydrological analysis : GIS information

Catchment grid delineation (delineates subbasin for every stream segment)

Catchment basin	Main river name	Area (km2)	Main river length (km)
A	Du Rempart North	42.15	16.2
B	Francoise North	51.84	25.3
C	Du Poste Flacq	83.84	20.1
D	Seche	46.55	22.3
E	Grand River South East (GRSE)	161.90	35.3
EF	Nyon	11.91	4.9
F	Champagne	19.31	6.9
G	Des Creoles	67.73	21.4
H	La Chaux	58.09	24.0
I	Tabac	28.92	14.4
J	Du Poste South	62.26	27.6
K	St. Amand	9.18	10.5

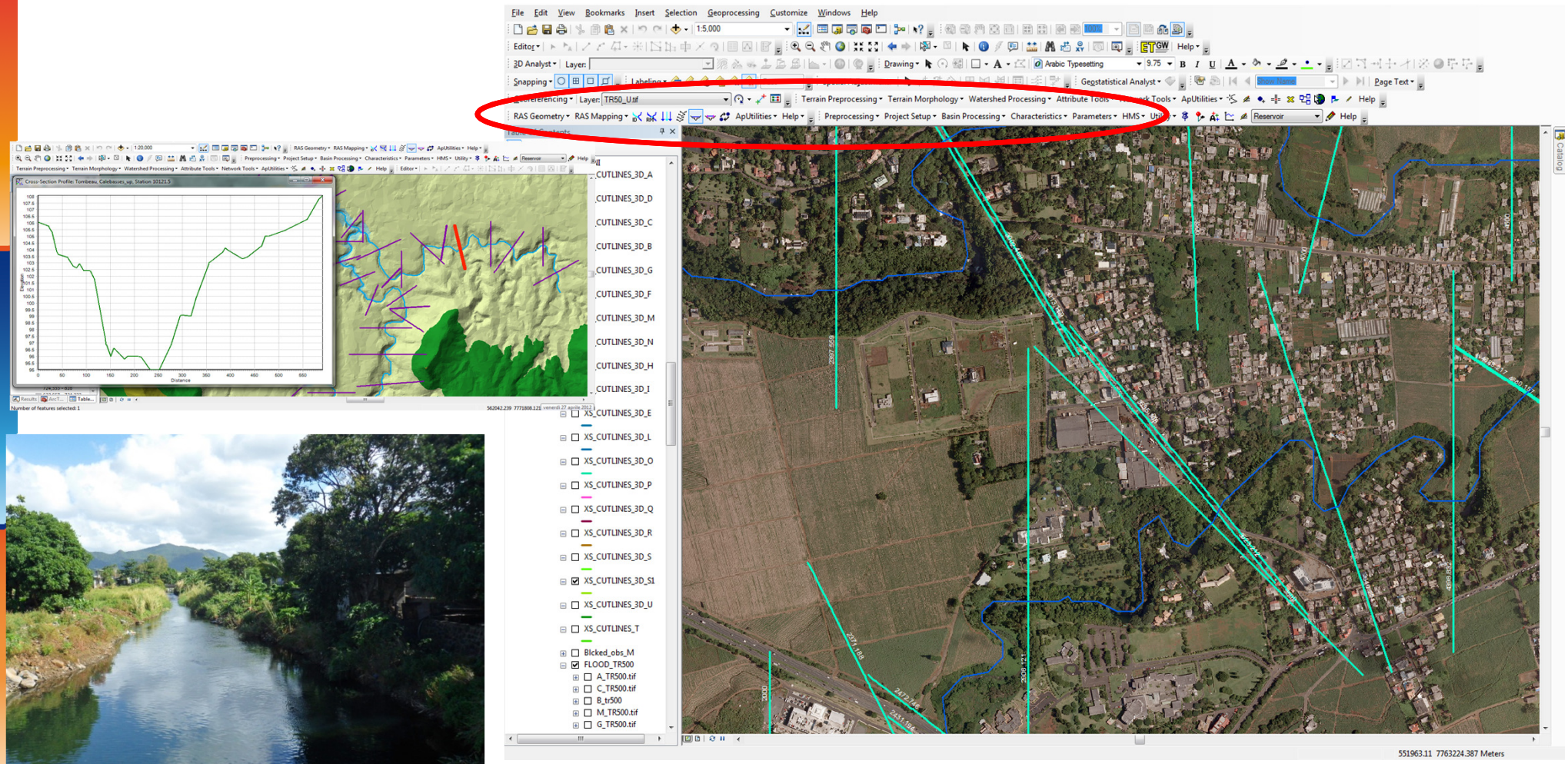
Peak flow estimation

	Current Scenario		Climate Change Scenario	
Return period [yr]	Q [m^3/s]	q [$m^3/s/km^2$]	Return period [yr]	Q [m^3/s]
A - Du Rempart North				
500	304	7.2	359	8.5
100	188	4.5	221	5.3
50	133	3.2	157	3.7
25	87	2.1	103	2.4
B - Francoise North				
500	182	3.5	215	4.1
100	80	1.5	95	1.8
50	54	1.0	64	1.2
25	33	0.6	39	0.8



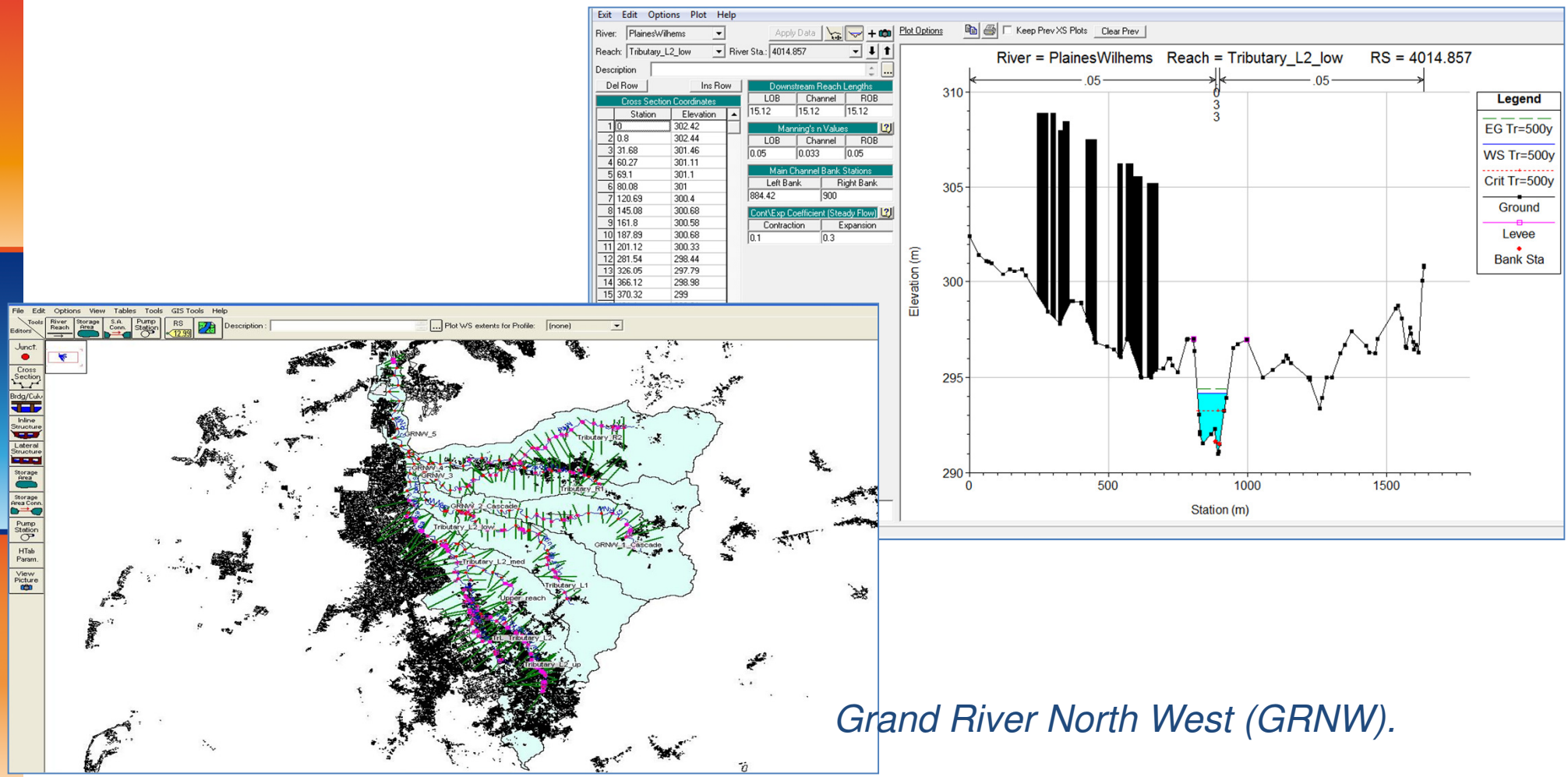
Hydraulic analysis

HEC-GeoRAS: set of ArcGIS tools designed to process geospatial data for use with the HEC-RAS hydraulic model



Hydraulic analysis

HEC-RAS: 1D Hydraulic model to perform water surface profile (RP 25, 50, 100, 500 years) calculations for steady gradually varied flow in natural or constructed channels

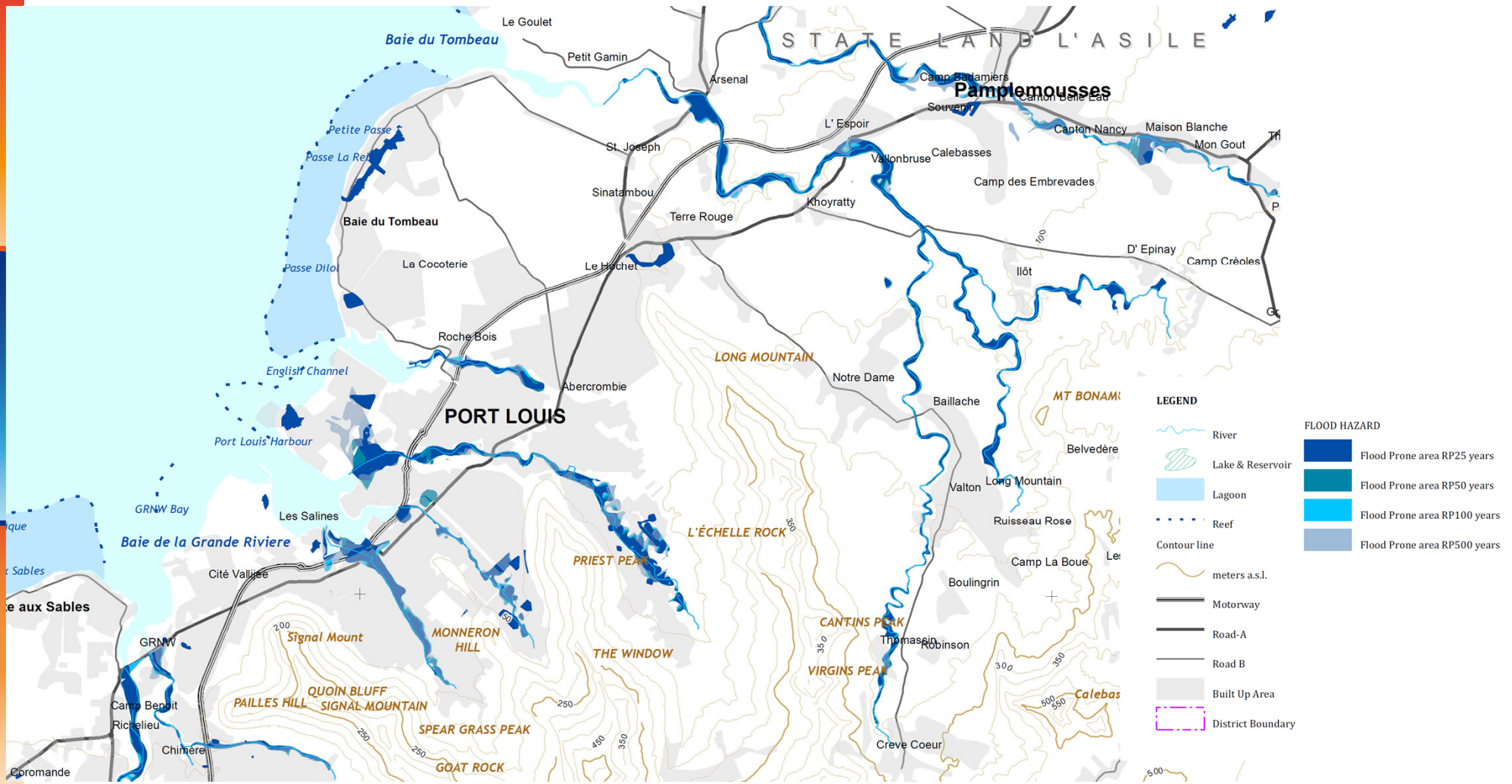


Grand River North West (GRNW).

Flood hazard mapping

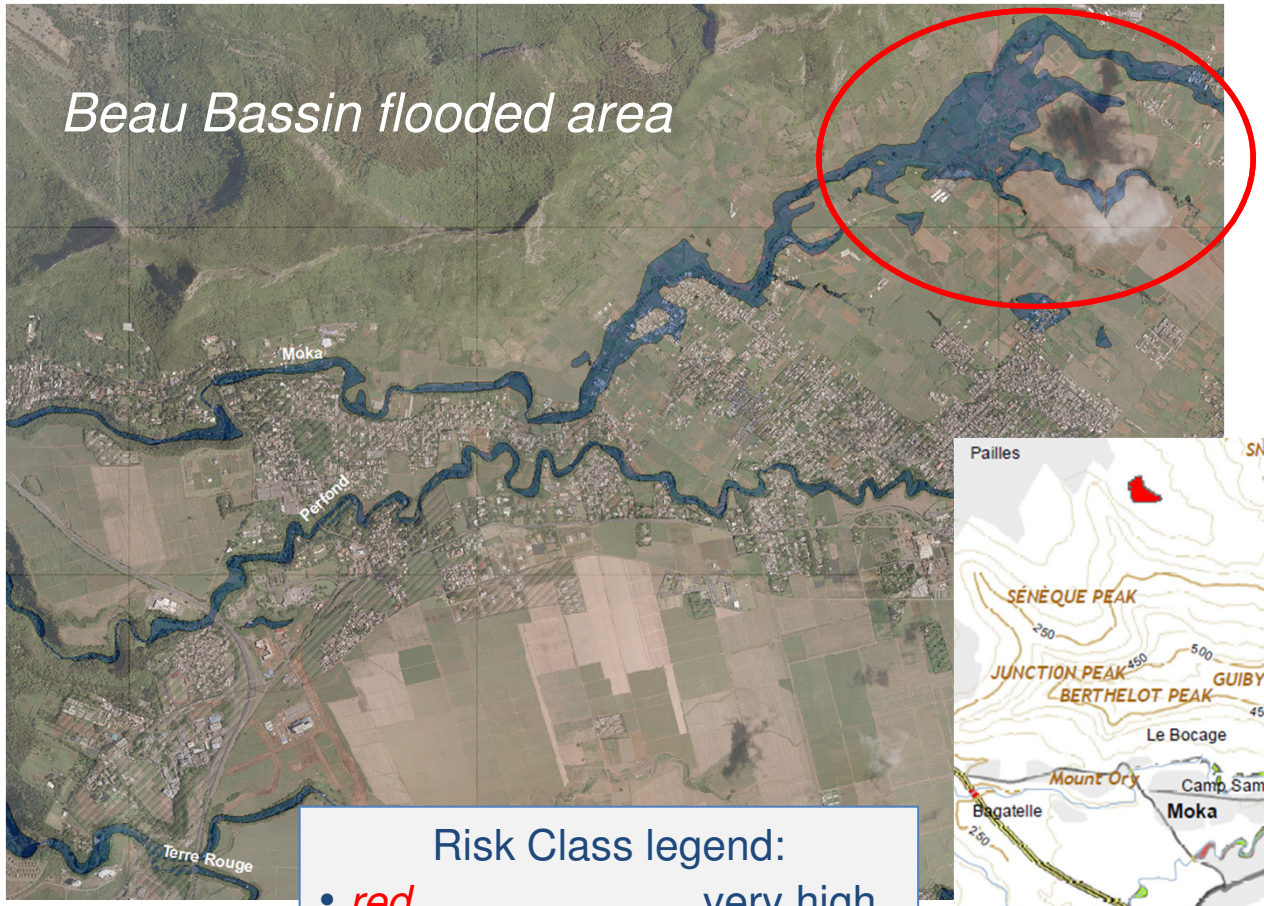
ArcGIS–HecGeorasPost processing

FLOOD HAZARD LEVEL	
Return Period of flood Event	**Scenario**
25 years	Floods with a high probability
50 years	Floods with a medium probability
100 years	Floods with a low probability
500 years	Extreme event

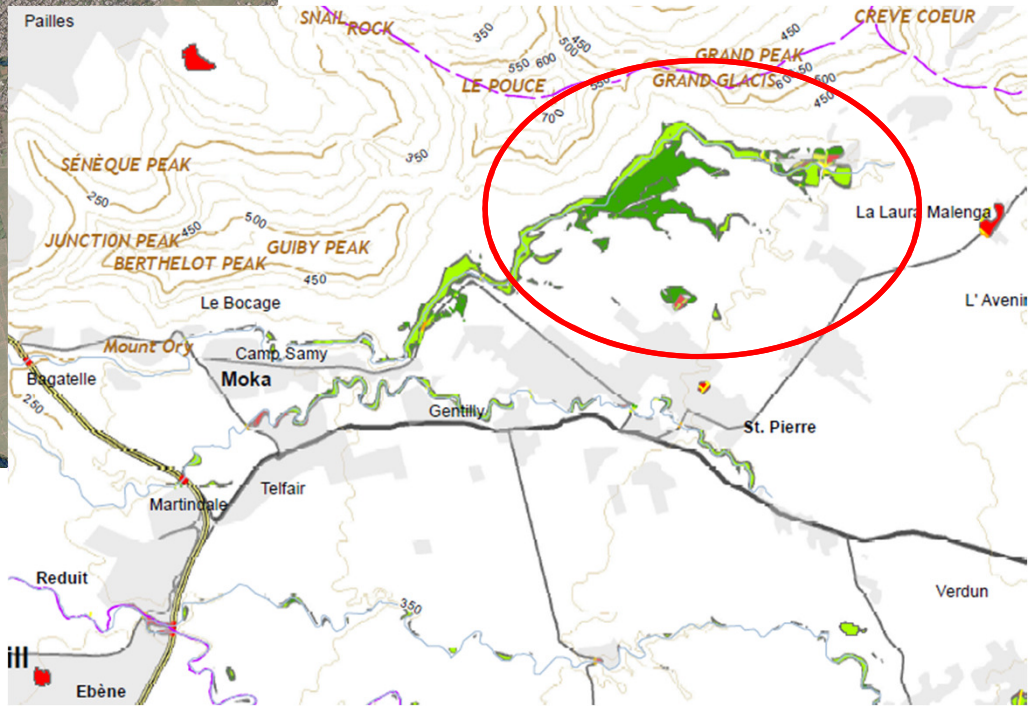


Flood risk analysis

Risk analysis for different land use categories



land use and its demanded level of protection



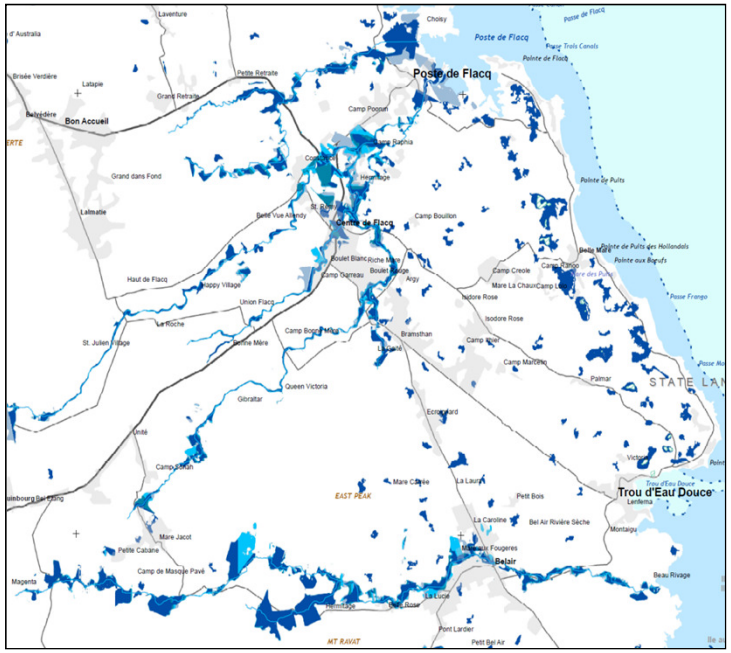
Risk Class legend:

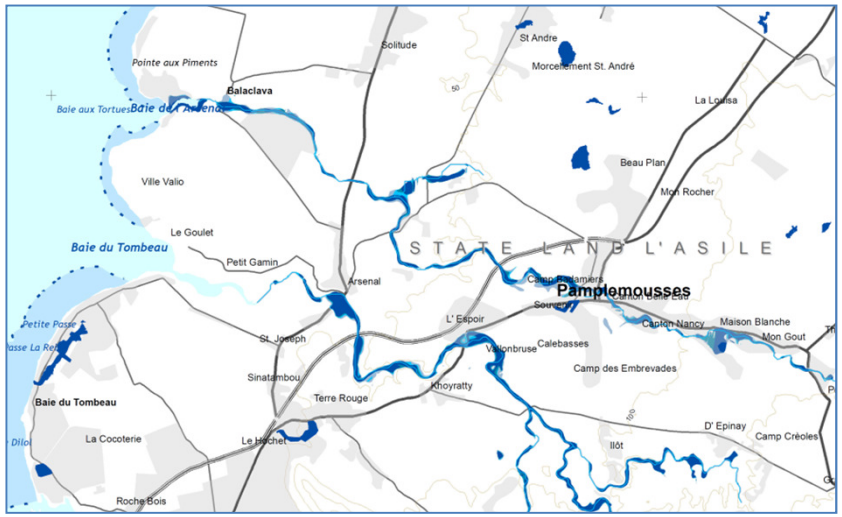
- *red* very high,
- *orange* high,
- *yellow* medium
- green low
- *light green* very low.

Flood risk: results

There are various zones that are critical respect to flooding risk. The most critical areas are those with high concentration of human settlements, which makes them vulnerable:

- **Poste de Flacq** et rivière **Séche**;
- **Port Louis** area;
- Rivière **Citrons** (Pamplemousse, etc.);
- Areas from Rempart West to GRNW;
- Riviéres Tabac, La Chaux, Des Creoles.





Lowlands area: low place where the elevation around are higher than them self, and generally is absent the drainage system, therefore in case of heavy rain they are flooded: Grand Bay; etc).

Damage estimation

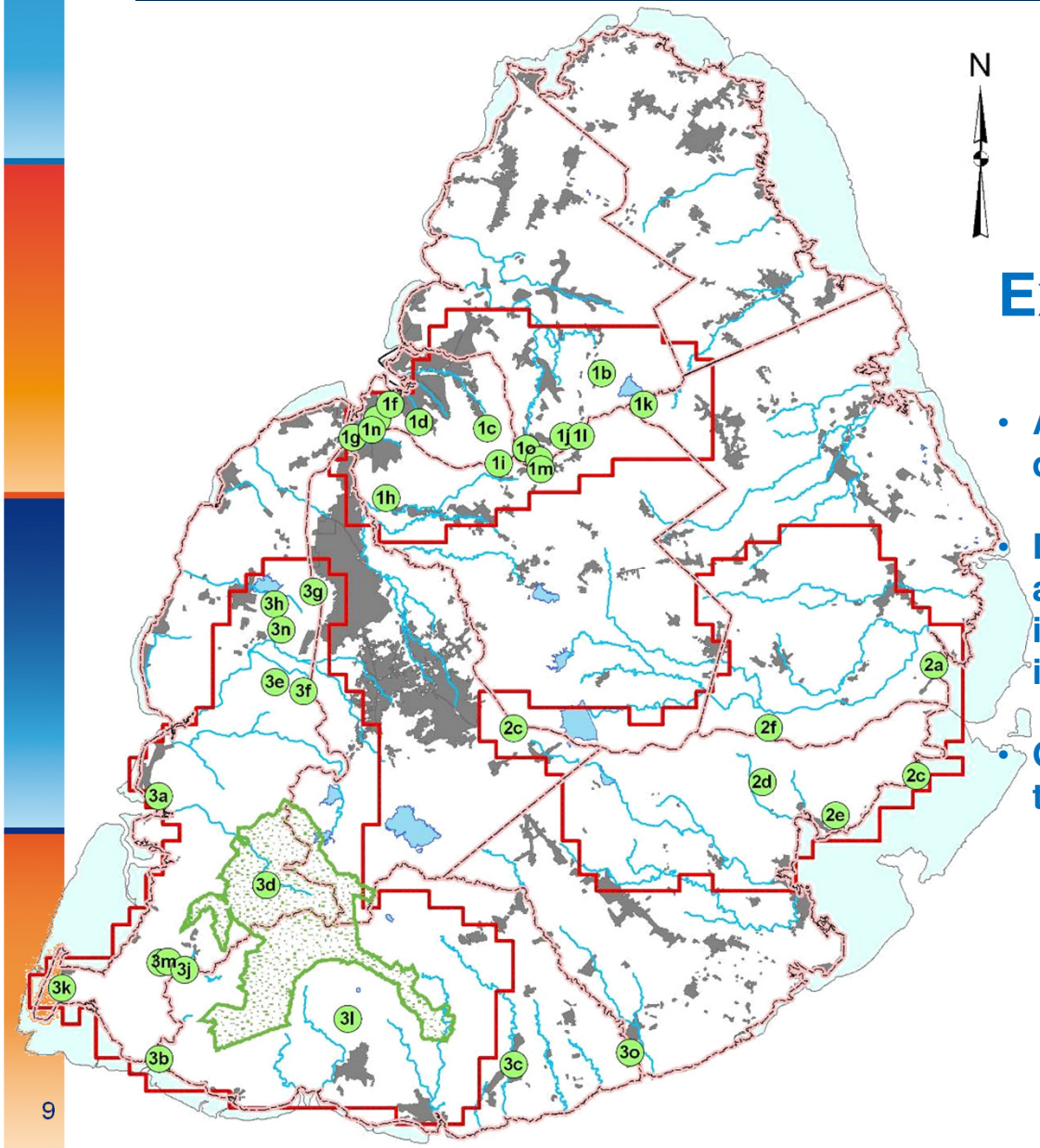
VALUES OF EXPOSED ELEMENTS IN **ROM**

	Value of exposed elements for flood (millions MUR)			
Zone	**Tr 25 year**	**Tr 50 year**	**Tr 100 year**	**Tr 500 year**
MAURITIUS	57,098	57,097	69,732	78,007
RODRIGUES	902	955	985	1,000

VALUES OF POTENTIAL DAMAGE IN **ROM**

	Potential damage to buildings and infrastructures for flood (millions MUR)	
Zone	**Annual (statistical average)**	**Tr 100 year**
MAURITIUS	1,175	117,500
RODRIGUES	51	5,100

Existing landslide and surveying



Existing landslide

- Analysis of landslide prone areas from available documents
- Defining of three main mountainous/hilly zones, according to the potential contribution to slope instabilities for Mauritius, and analysis of whole island of Rodrigues
- Overview of the areas with critical landforms to drive the survey

Existing landslide and surveying

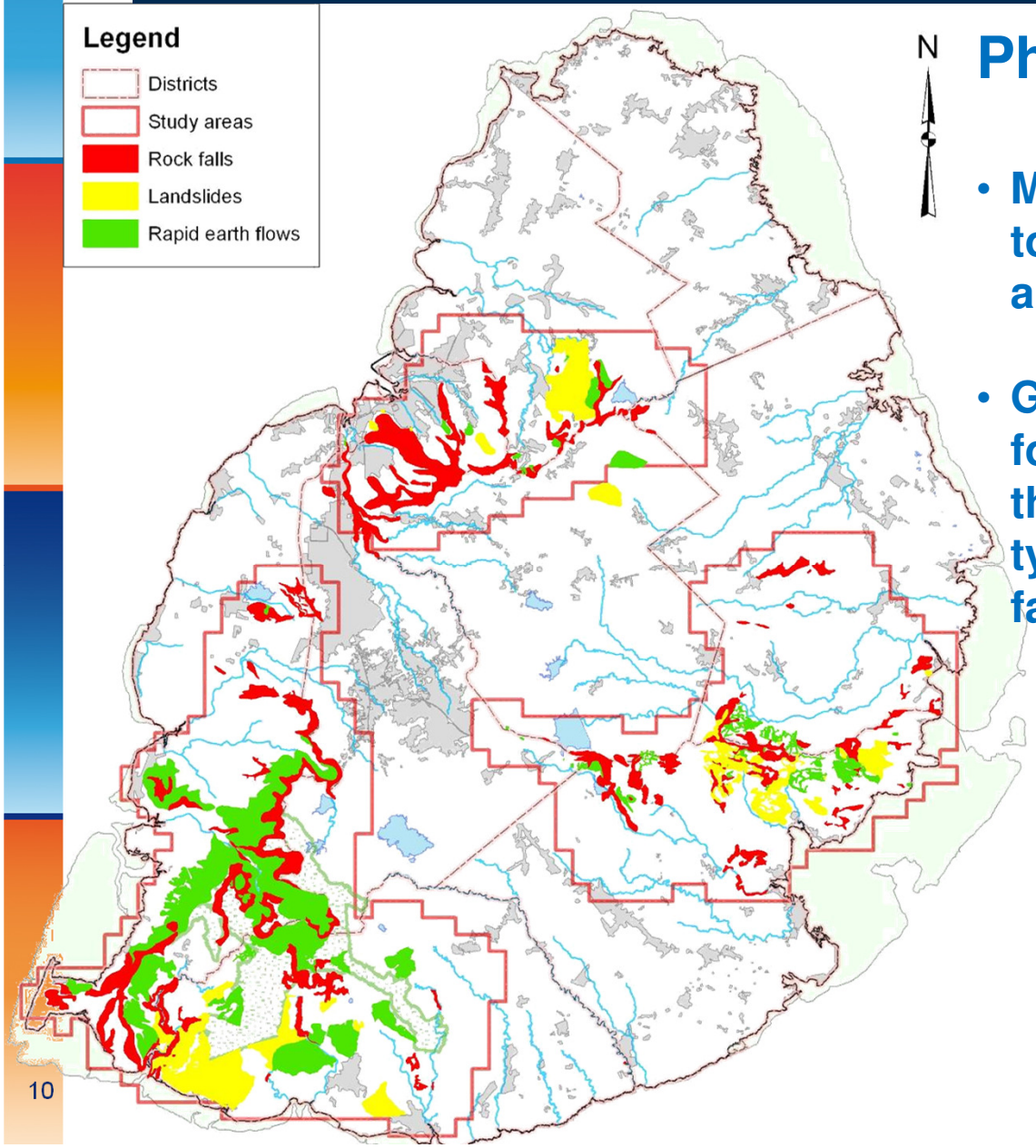
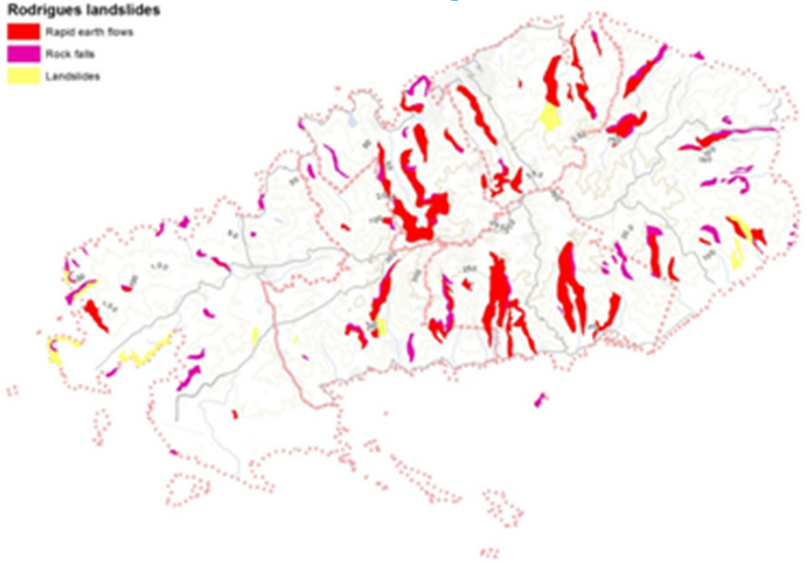
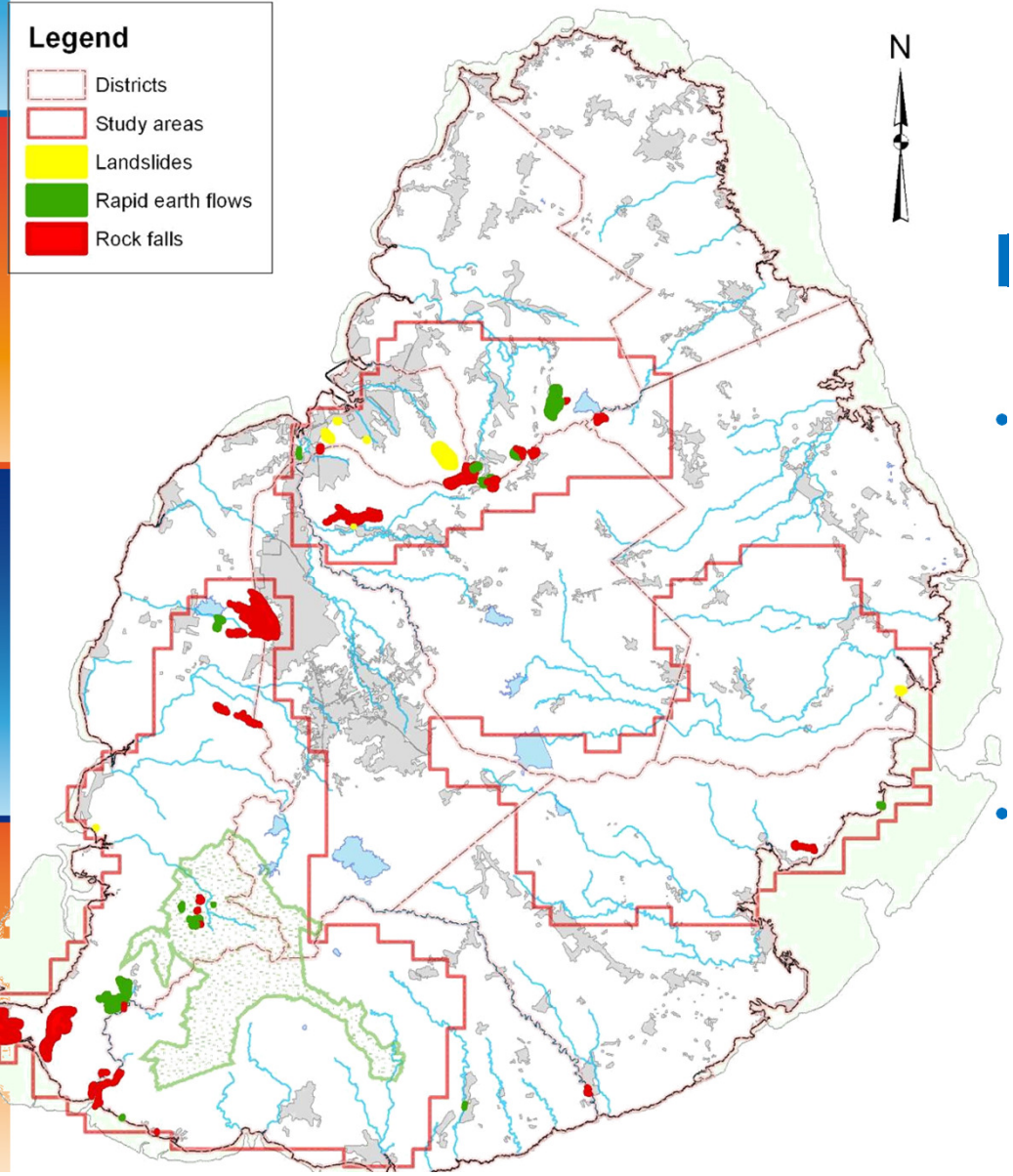


Photo-geologic results

- Mapping of homogeneous areas related to the main orographic, geomorphologic and land parameters
- GIS mapping of principal factors allowed for the definition of homogeneous zones that are, or can be, affected by different type of slope instabilities such as rock falls, landslides and rapid earth flows.



Existing landslide and surveying



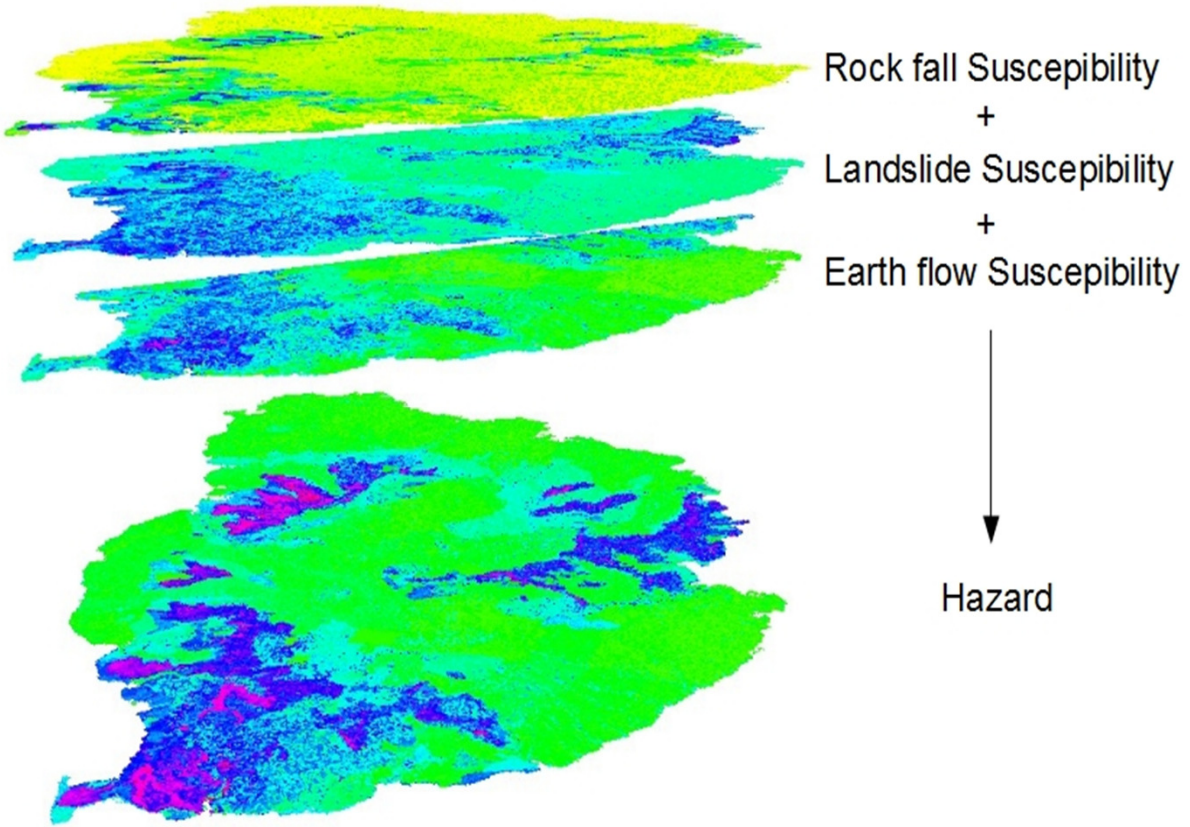
In field survey

- In field survey on the landslide prone areas included in the available documents and considering the photo-geologic results

- Elaboration of geomorphological simplified profiled

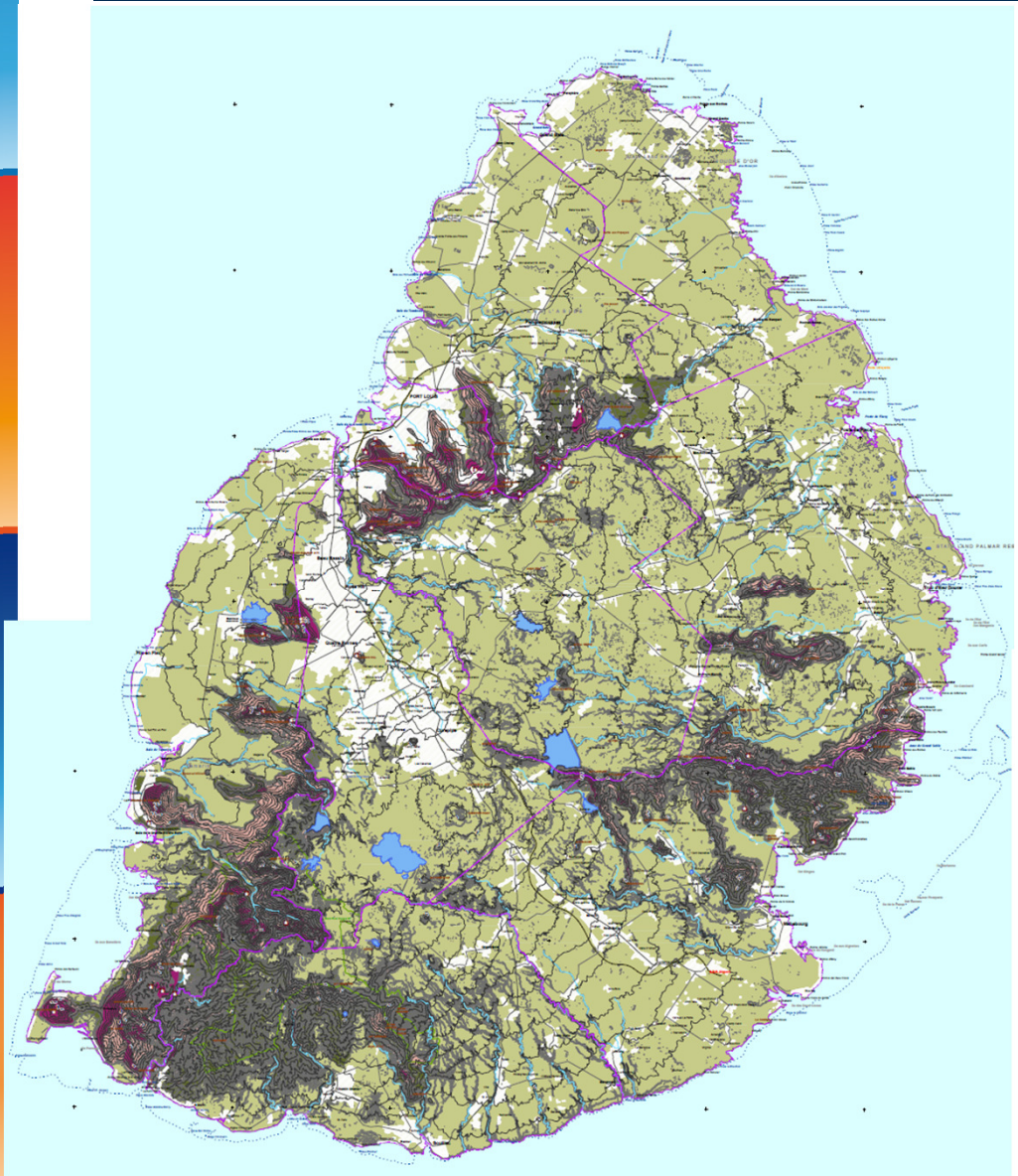
Susceptibility model

Elaboration of the Susceptibility model of the different three susceptibility (rock fall, classic landslide, earth flow)

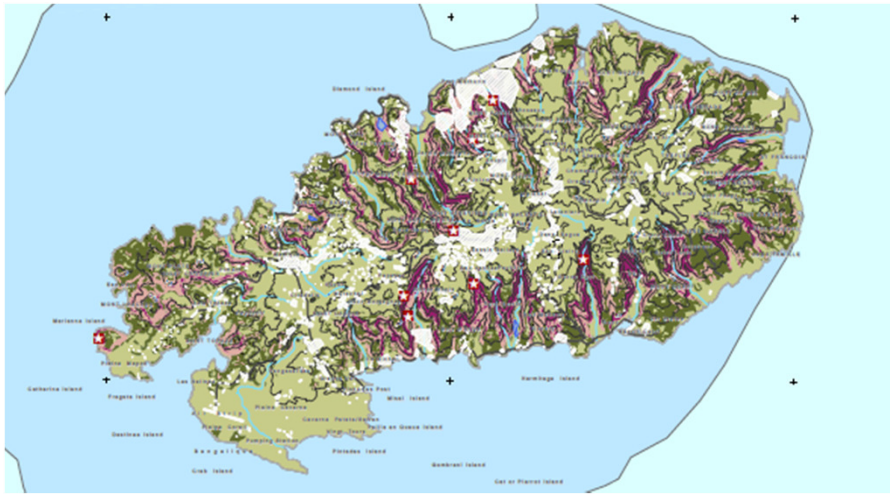


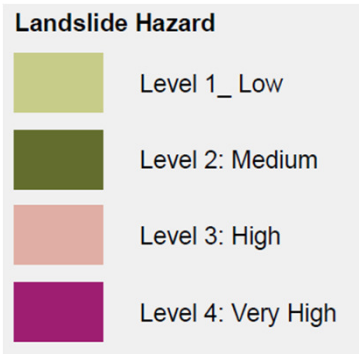
Landslide hazard as result of the overlaying of the susceptibility map

Landslide hazard mapping



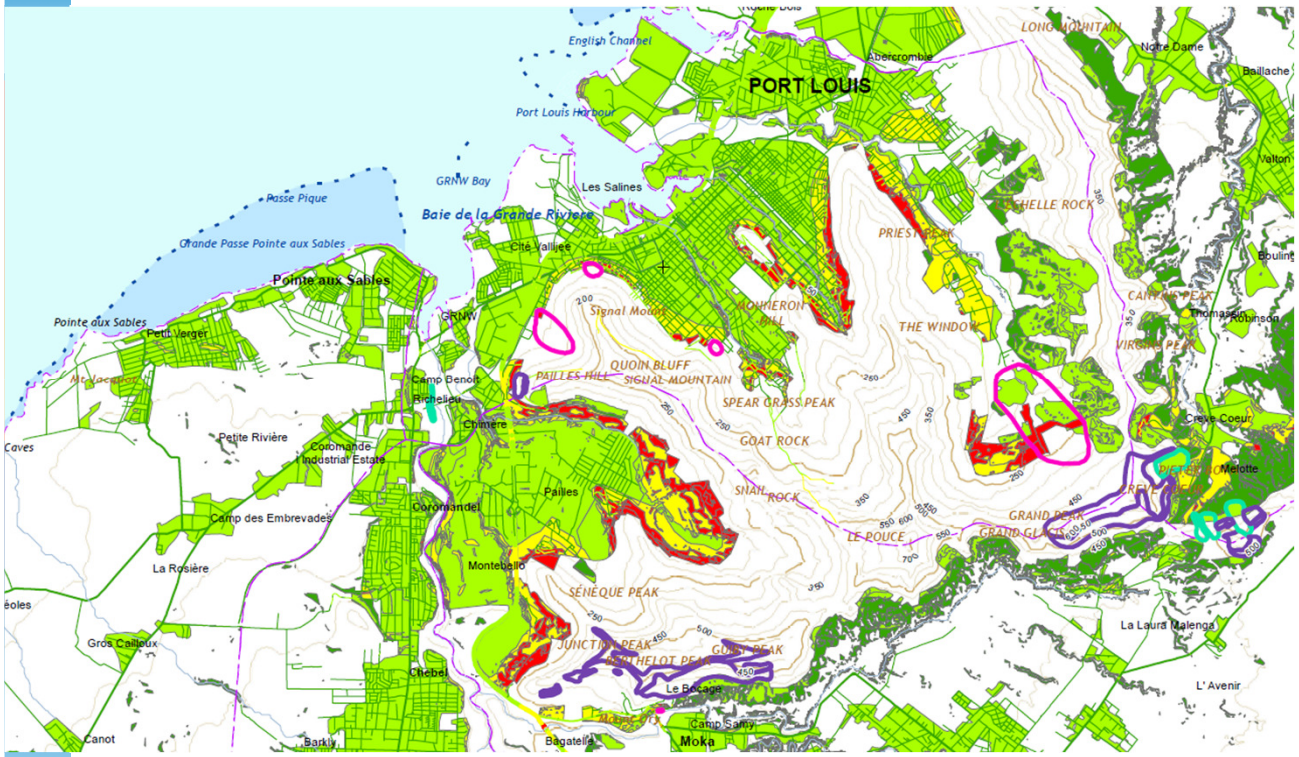
HAZARD MAPS



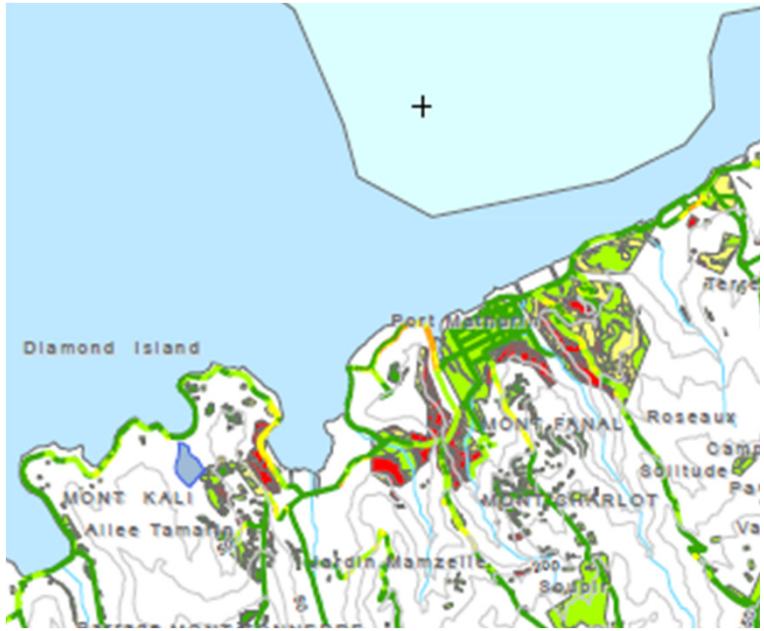


Landslide risk mapping

Mauritius : Port Louis



Rodrigues: Port Maturin



	Hazard level			
Feature	Level 4	Level 3	Level 2	Level 1
Natural features	none	none	none	none
Agricultural fields	low	low	very low	none
Built up area	very high	very high	medium	low
Expansion area	very high	very high	medium	low
Motorway	very high	very high	medium	low
Main road	high	medium	low	very low
Secondary road	medium	low	very low	very low

Risk Classes

Risk Classes

Damage estimation

VALUES OF EXPOSED ELEMENTS IN **ROM**

	Value of the exposed element (landslide risk) (milions MUR)		
	Built up area	Expansion area	Road
MAURITIUS	217,000	19,300	5,900
RODRIGUES	10,600		1,200

Thank you for your attention