

Center for studies and expertise on risks, environment, mobility and spatial planning



Relev Project



Hurricanes and urban evolution in Saint-Martin between 1954 and 2017: How our societies change?

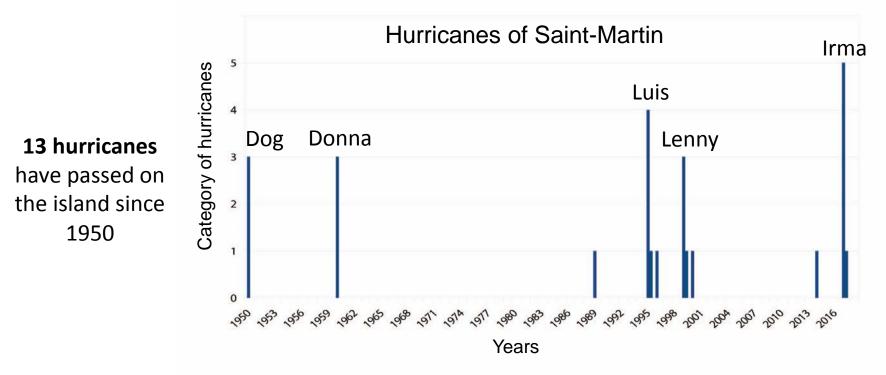
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Hurricanes before Irma in Saint-Martin

According to the National Hurricane Center et Meteorological Service Netherlands Antilles and Aruba



In this study, we wanted to focus on the adaptation of Saint-Martin to hurricanes from the 1950s to the present by looking at the urban planning of the island.

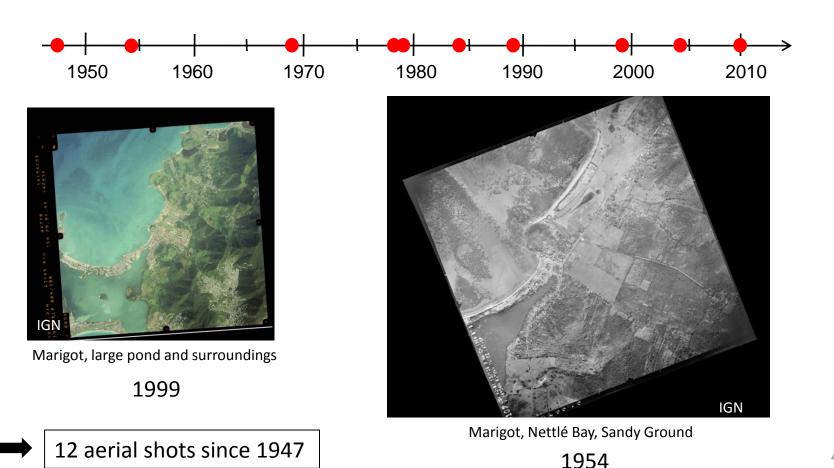
Cartography of construction and reconstruction

 Creation of maps of construction evolution (normal development of the island) including potential reconstructions (following hurricanes or other natural disasters) on Saint-Martin from 1954 to 2017.

To understand how hurricanes influenced the "normal" development of the island.

Aerial photography

 Regular and highquality of aerial shots available on the IGN website
 Aerial shots



Aerial photography

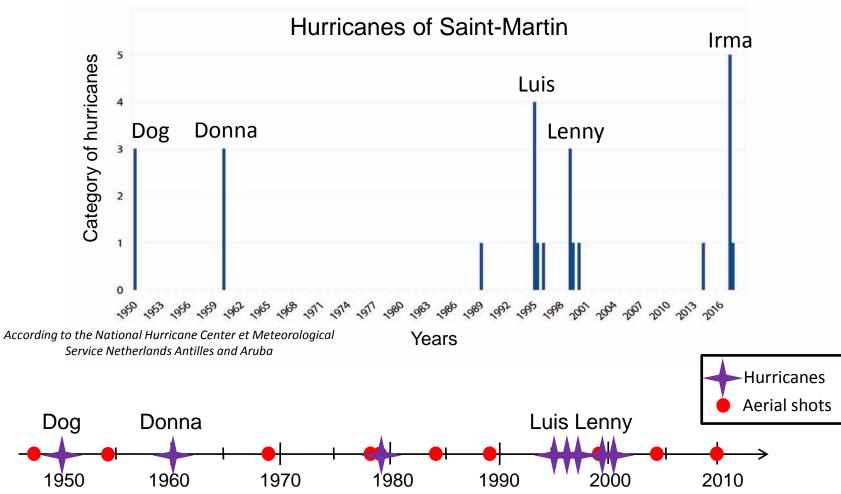
 Regular and highquality of aerial shots available on the IGN website
 Aerial shots

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Total coverage and high quality

Aerial photography and hurricanes

• Regular hurricanes



Cartography of construction and reconstruction

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Copernicus data

Copernicus project Risk & Recovery Mapping activated in february 2018

All buildings in 2017 are listed and mapped

This map is used as a working basis

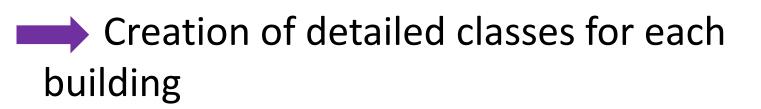
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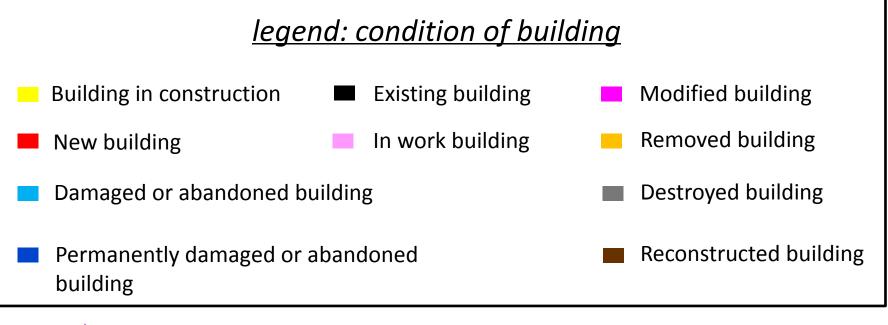
Cartography of construction and reconstruction

What is the history of the buildings on Saint-Martin today?

- When were they built?
- Have they undergone any changes in their history? :
 - Following an enlargement?
 - Following hurricane damage?
 - As a result of abandonment?
- Have they been rebuilt? Removed?...

Cartography of construction and reconstruction

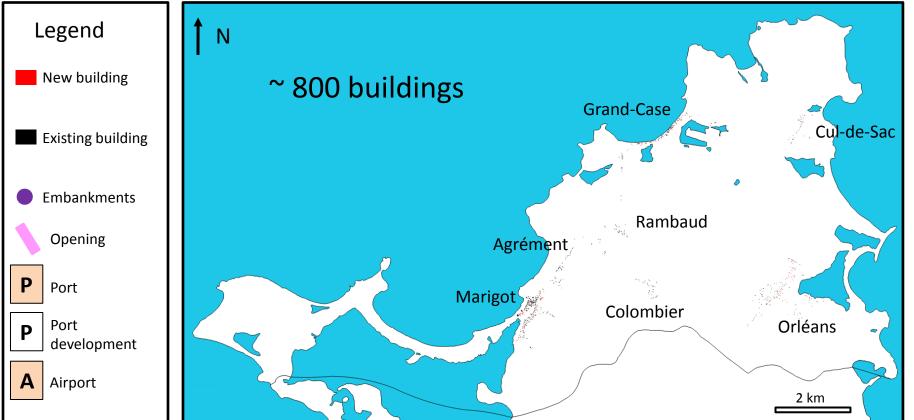




Depending on its state at a given time, a building will have a particular color

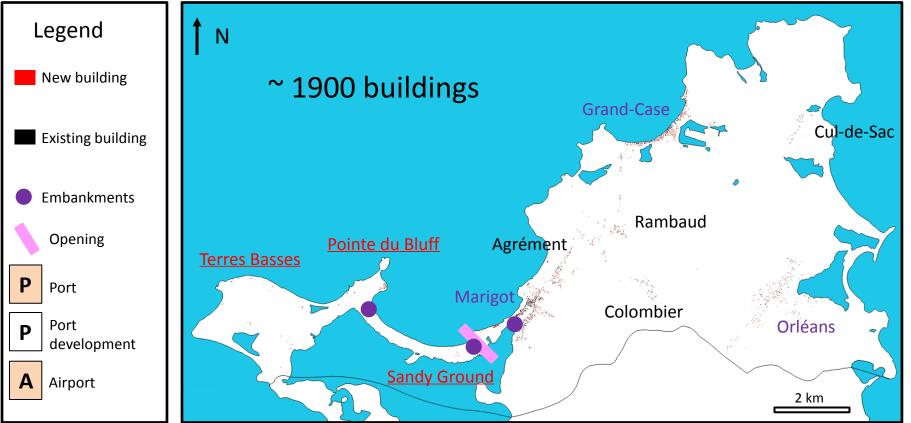
Saint-Martin 1954

New neighbourhood Significant expansion of neighbourhood



Saint-Martin 1969

New neighbourhood Significant expansion of neighbourhood

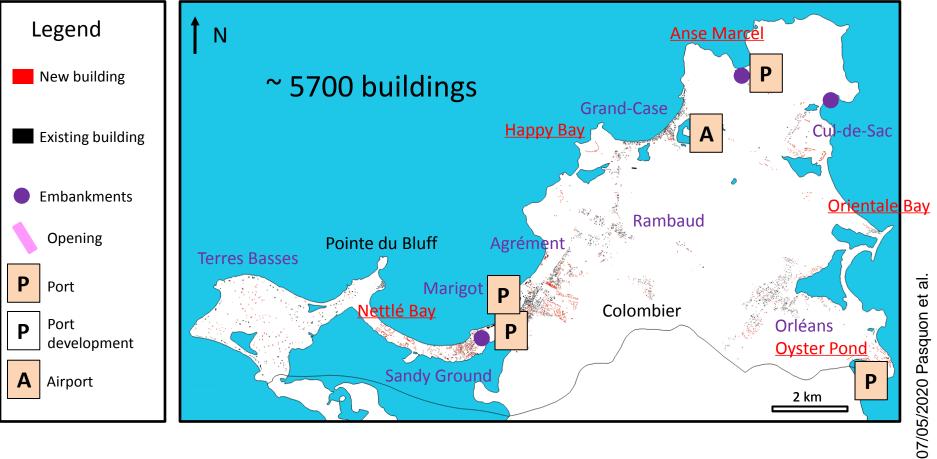




Modified environment: embankments, channel creation at Sandy Ground

Saint-Martin 1989

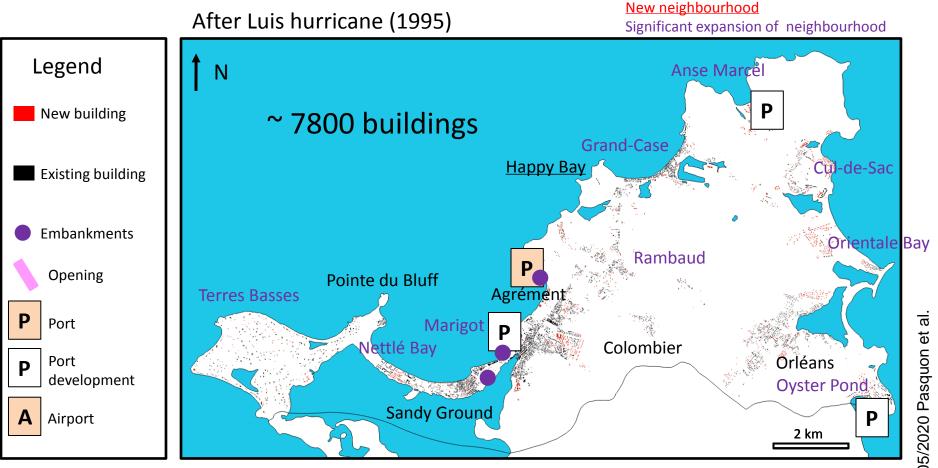
New neighbourhood Significant expansion of neighbourhood





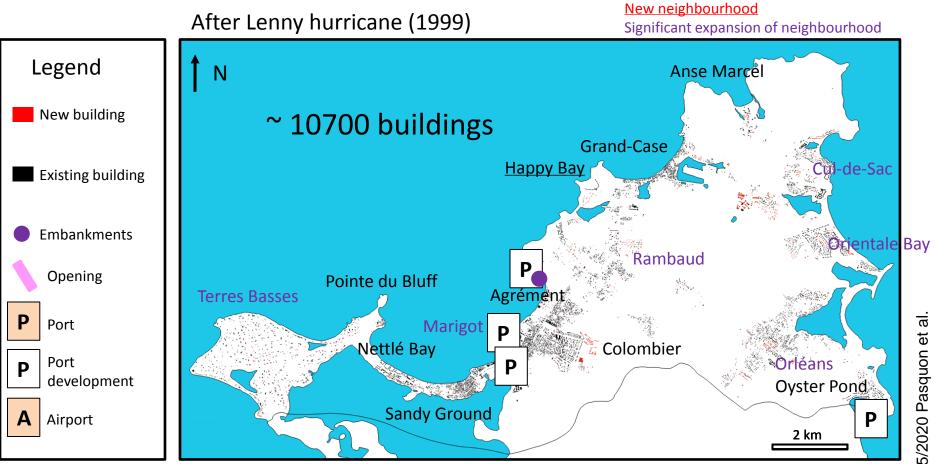
Constructions increase, transports increase (ports, airport), major development of Terres Basses 12

Saint-Martin 1999 **Before Lenny**



Transports development, first trading port

Saint-Martin 2010



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Saint-Martin 2017 **Before Irma**

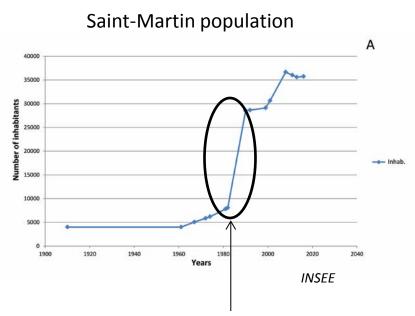
New neighbourhood

Significant expansion of neighbourhood Legend Anse Marcel Ν New building ~ 11800 buildings **Grand-Case** Happy Bay Cul-de-Sac **Existing building** Embankments Orientale Bay Rambaud Opening Pointe du Bluff Agrément **Terres Basses** Port Marigot Colombier Nettlé Bay Port Orléans development **Oyster Pond** Sandy Ground Airport 2 km

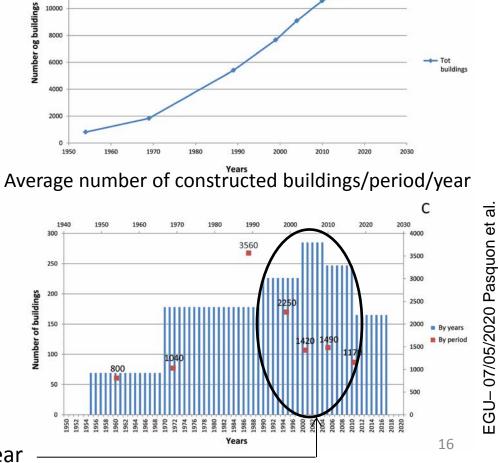
Population and number of buildings

14000

12000



Important increase in population



Number of total buildings of Saint-Martin

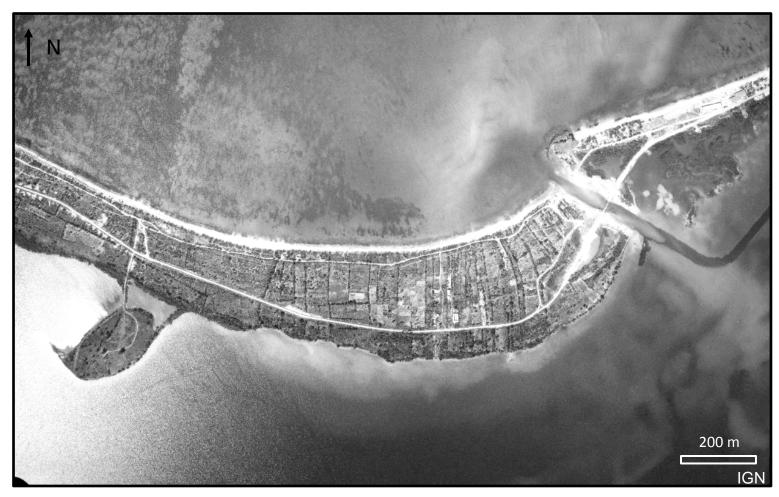
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More important constructions/year

Assessment global maps

- Over 11 000 buildings were built between 1954 and 2017
- Start over significant changes in environment from 1954 to 1969
- Early development of transport (ports/airport) between 1969 and 1989
- Increase in population in the 1980s and increase of constructions in the 1990s and 2000s

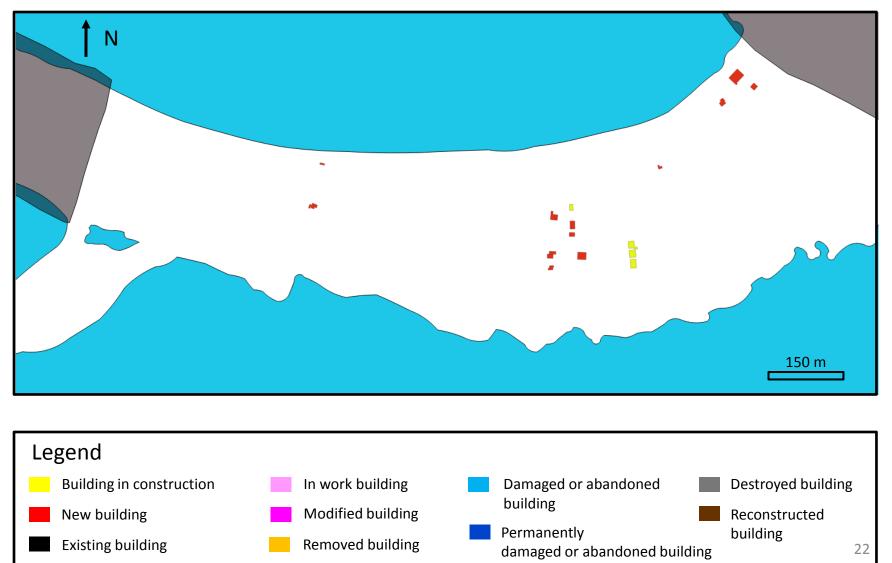


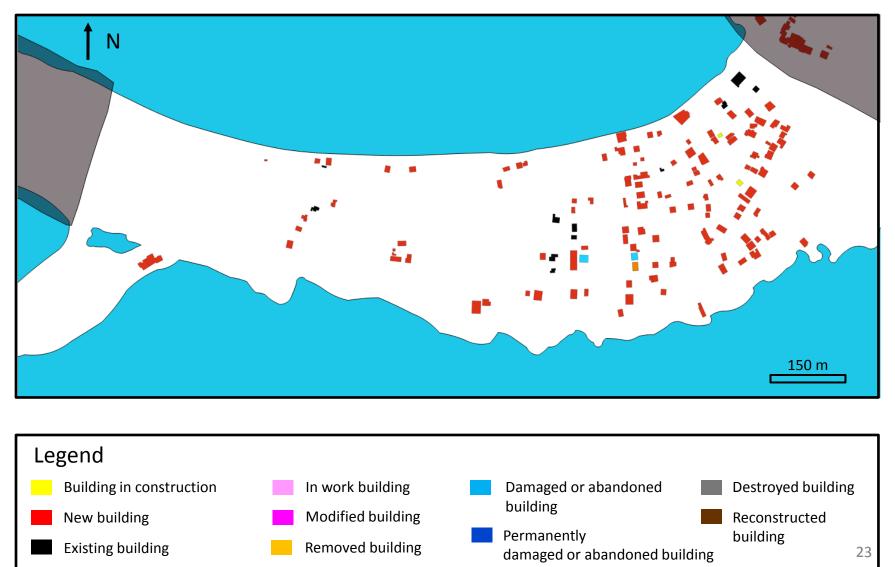


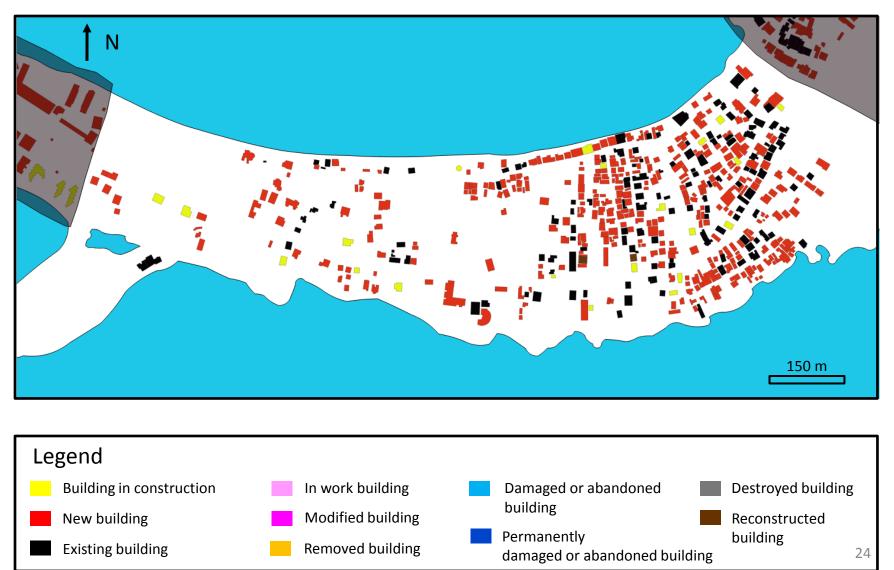


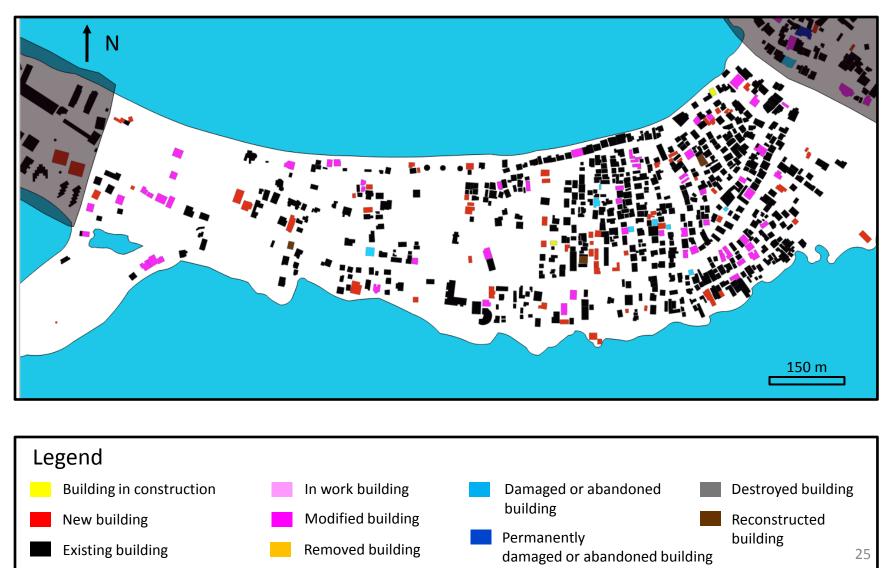






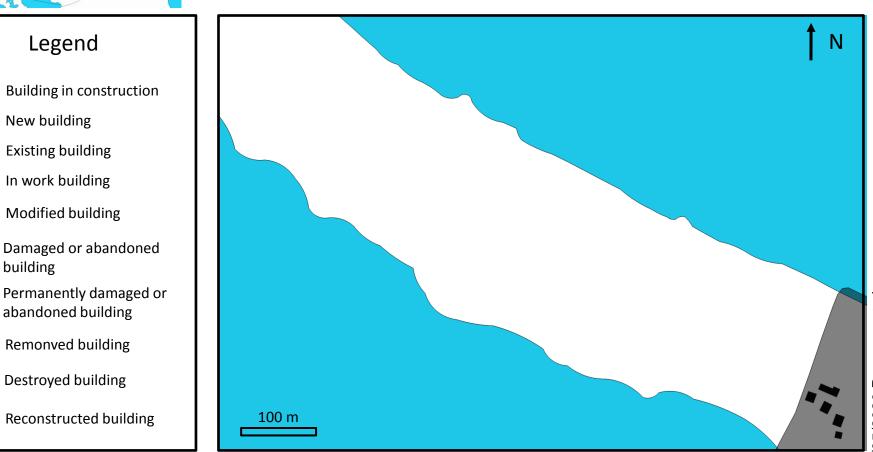




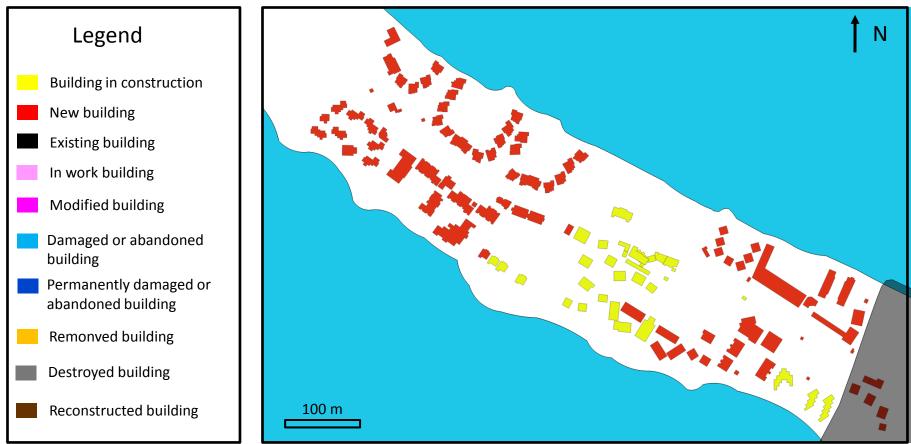




Nettlé Bay 1984



Nettlé Bay 1989

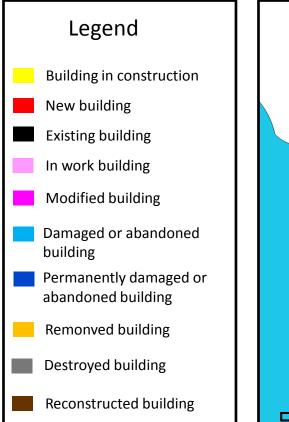


Nettlé Bay 1999

Before Lenny



Nettlé Bay 2004







Terres Basses 1969

Legend

- Building in constructionNew buildingExisting building
 - In work building
 - Modified building
- Damaged or abandoned building
- Permanently damaged or abandoned building
- Remonved building
- Destroyed building
- Reconstructed building



Terres Basses 1984

Legend

- Building in construction
 New building
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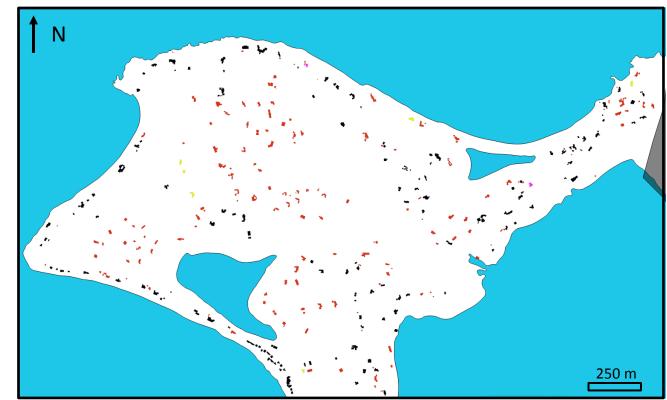
Terres Basses 1989

Legend

- Building in construction
 New building
 Existing building
 In work building
 Modified building
 Damaged or abandoned
 - buildingPermanently damaged or abandoned building
 - Remonved building

Destroyed building

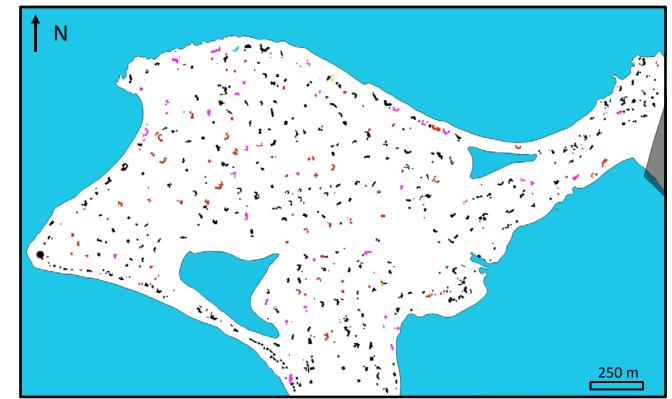
Reconstructed building



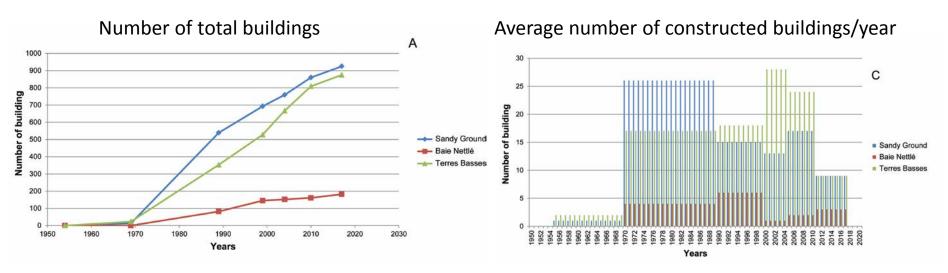
Terres Basses 2004

Legend

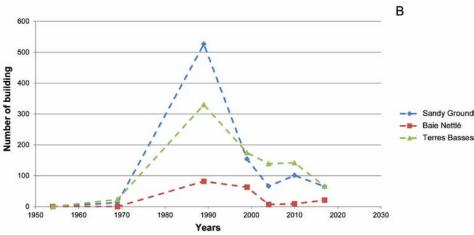
- Building in construction
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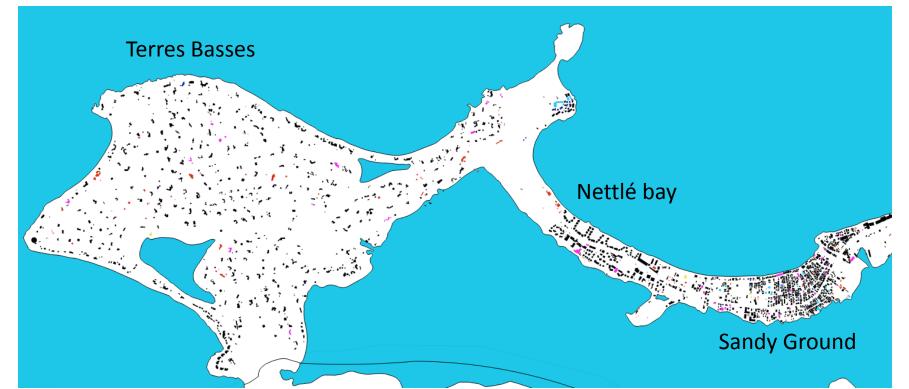
Results: Exemple neighbourhoods maps – Comparative study of 3 neighbourhoods 1) Evolution of the number of buildings by neighbourhood since 1954



Number of constructed buildings by period



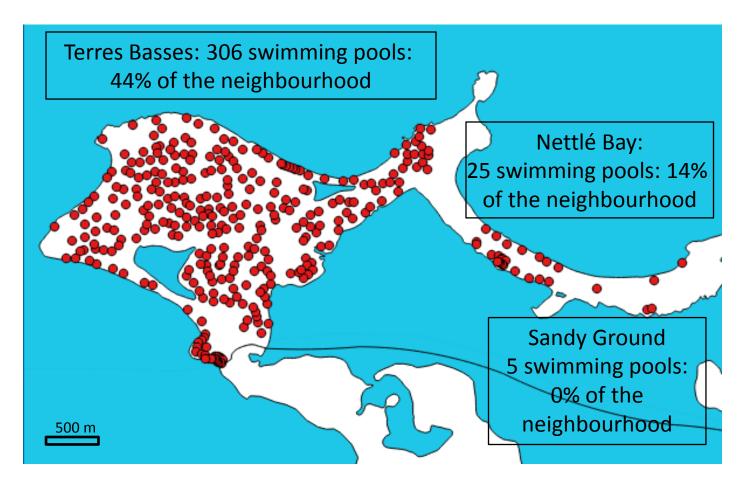
Results: Exemple neighbourhoods maps – Comparative study of 3 neighbourhoods 2) Buildings density by neighbourhood in 2017 (Before Irma)



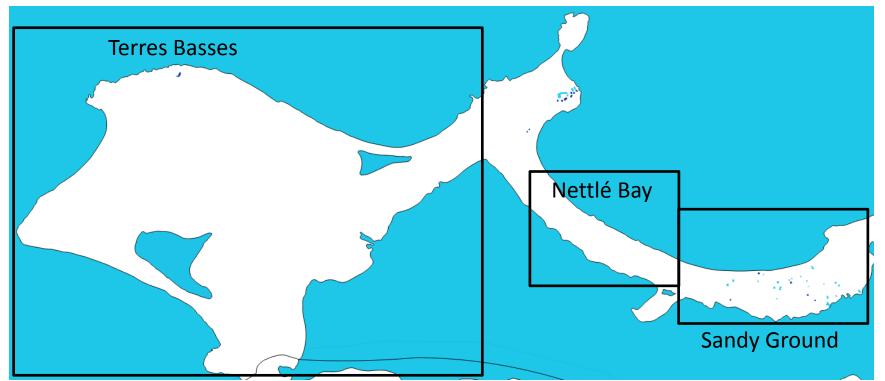
	Terres Basses	Nettlé Bay	Sandy Ground
Buildings number	880	186	929
Size of neighbourhoods (km²)	4	0.250	0.520
Buildings number/km ²	220	745	1790

Results: Exemple neighbourhoods maps – Comparative study of 3 neighbourhoods 3) Percentage of swimming pools by neighbourhood in 2017 (before Irma)

Swimming pools



Results: Exemple neighbourhoods maps – Comparative study of 3 neighbourhoods **4) Damaged or adandoned buildings in 2017** (before Irma)



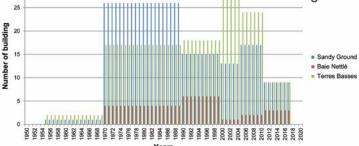
	Terres Basses	Nettlé Bay	Sandy Ground
Number of damaged or abandoned buildings	1	0	28
Total building number	880	199	929
% of damaged or abandoned buildings	0,1%	0%	3%

37

Results: Exemple neighbourhoods maps – Comparative study of 3 neighbourhoods Assessment: comparison of 3 neighbourhoods

- Neighbourhoods constructed at different times

Average number of constructed buildings/year



Differences in their present apparent wealth (2017 before Irma)

	Terres Basses	Nettlé Bay	Sandy Ground
Building density	220	745	1790
% of swimming pools	44%	14%	0%
% of damaged or abandoned buildings	0,1%	0%	3%

Impact of policy incentives and economic projects on urban planning

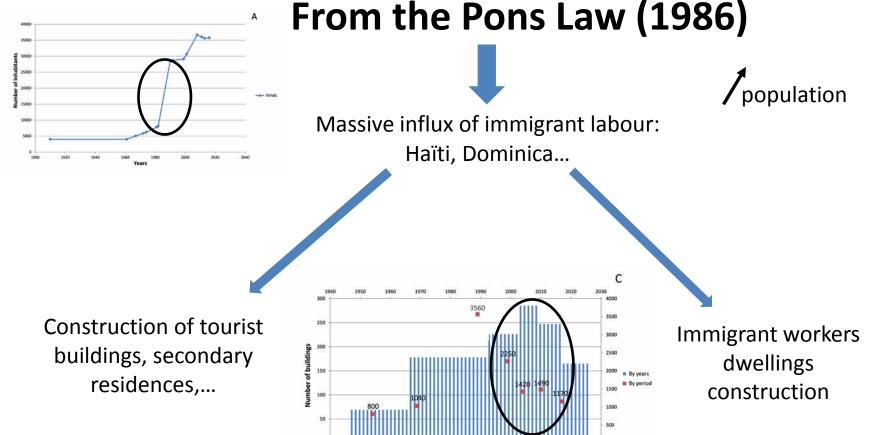
Urban development of Saint-Martin

- Years 60-80 = beginning of urban development: European immigration mainly but also North American: beginning of real estate investment.
- 1986: Pons law: tax deduction of a large part of real estate investments (hotels, residences, transports, etc.) granted in France Overseas from 1986 for individuals and developers (duration 5 and 10 years).
- In 2001 and 2003, Paul law and Girardin law or «Programme pour l'outre-mer»: tax reduction on new investments (apartments or houses). (Follow the Scellier low in 2009, Duflot in 2014 and Pinel in 2015).
 In the same time, resale and transformation of hotel structures into private apartments.

The total number of dwellings continues to increase after 2009, but less than under the Pons law.

Impact of policy incentives and economic projects on urban planning

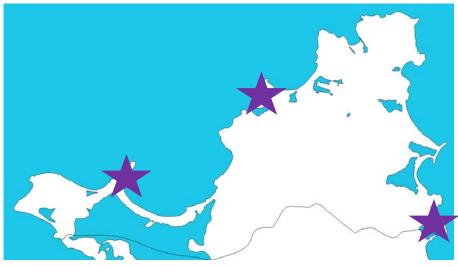




Hurricane impact on urban planning

- Luis (1995) et Lenny (1999) hurricanes:
- As a result of these hurricanes, some hotels have not been rebuilt or repaired. New construction is more cost-effective (Magnan 2008). Following Luis, 30% decrease in tourist between 1995 and 1996.
- 3 years after Luis, hotel occupancy had not yet returned to its value before Luis (Duvat, 2008).

Damaged and abandonned hotels visible in 2017 (before Irma) after Luis/Lenny



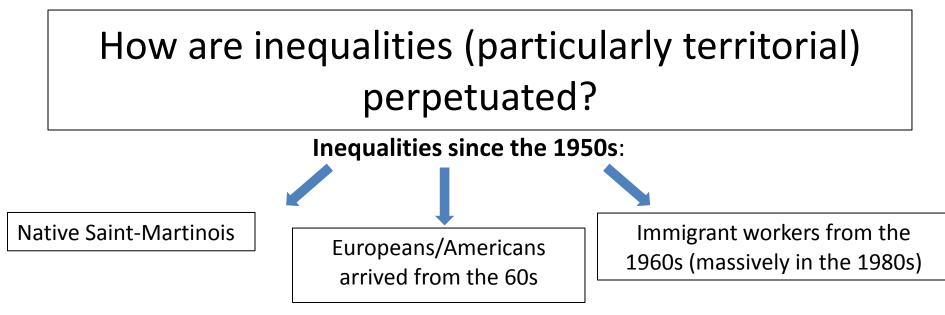
Adaptation of inhabitants of Saint-Martin ?

The population of Saint-Martin has adapted to:

- 1) the massive arrival of Europeans and North Americans on the island since the 1960s,
- (2) the arrival of construction workers (Haitians, Dominicans, etc.),
- (3) the important transformation of the environment through new construction,
- (4) tourists,
- (5) new shopkeepers,
- (6) the use of the French language more significantly (example: french used in school),
- (7) hurricanes and other natural disasters,



The inhabitants of the island have constantly adapted since the 1950s



Today, **urban inequalities** are materializing in Saint-Martin: :

- 1) by differences in building density
- 2) by different housing sizes
- 3) by a larger number of swimming pools by building, built in more affluent areas
- 4) by more abandoned and "under construction" permanent buildings

Conclusion

The main factor that influenced urban planning in Saint Martin was not the repeated impact of hurricanes, but the **development of tourism and the construction industry**.