

# “ Climate change ” and vulnerability analysis

## Poor will become poorer

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SCK-CEN **ACADEMY**, Mol, 7 November 2013  
Topical Day | Vulnerability analysis: an interdisciplinary overview

### What is « vulnerability » ?

- Vulnerability is the *exposure*, *risk knowledge* and *adaptation capacity* of individuals and/or collective groups and/or authorities (system) to livelihood stress as a result of the impacts of climate change and consecutive socioeconomic and environmental changes.
- ❑ *Exposure* : the nature and degree to which a system experiences climate change impacts;
- ❑ *Risk knowledge* : the degree of knowledge/understanding of how a system could be affected by climate change impacts;
- ❑ *Adaptation capacity* : the ability of the system to cope with stresses induced by climate change impacts.

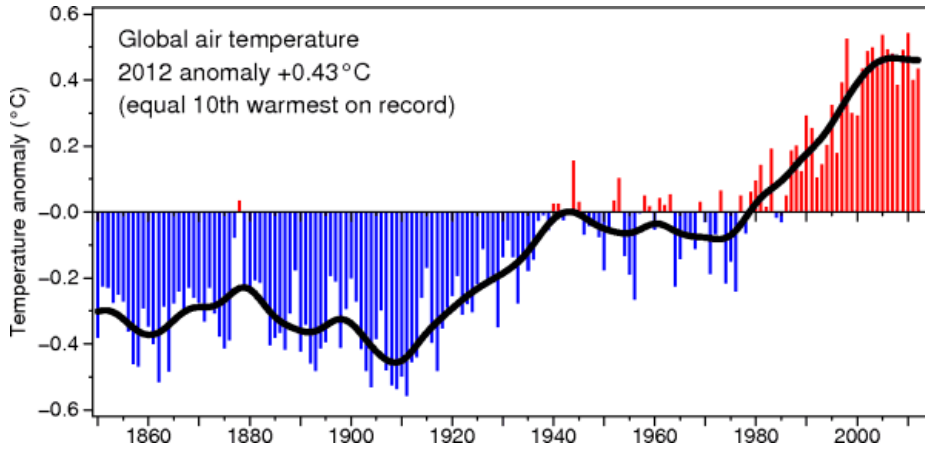
## What is « vulnerability » ?

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## Climate change or « Climate change » ?

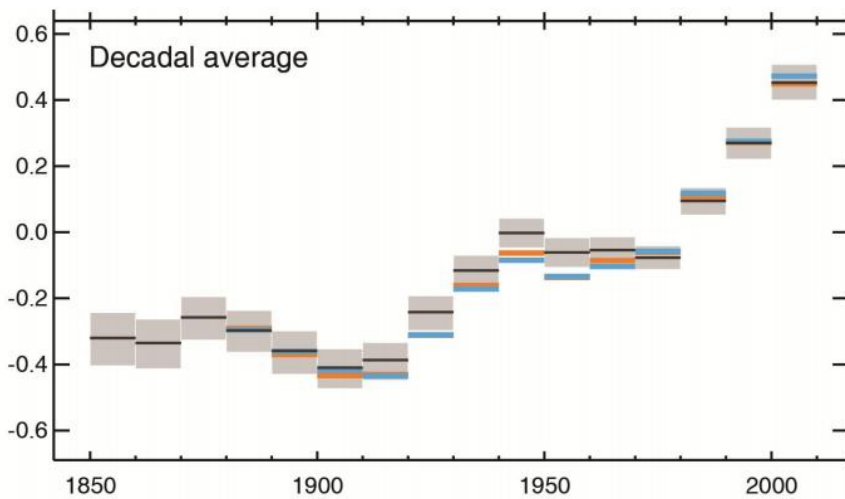
- Climate change : introduction
- « Climate change » : 3 case studies
- **ALWAYS** : Poor (will) become poorer

## Global air temperature from 1850 to 2012



Jones, 2013

## Global air temperature per decade from 1850 to 2010

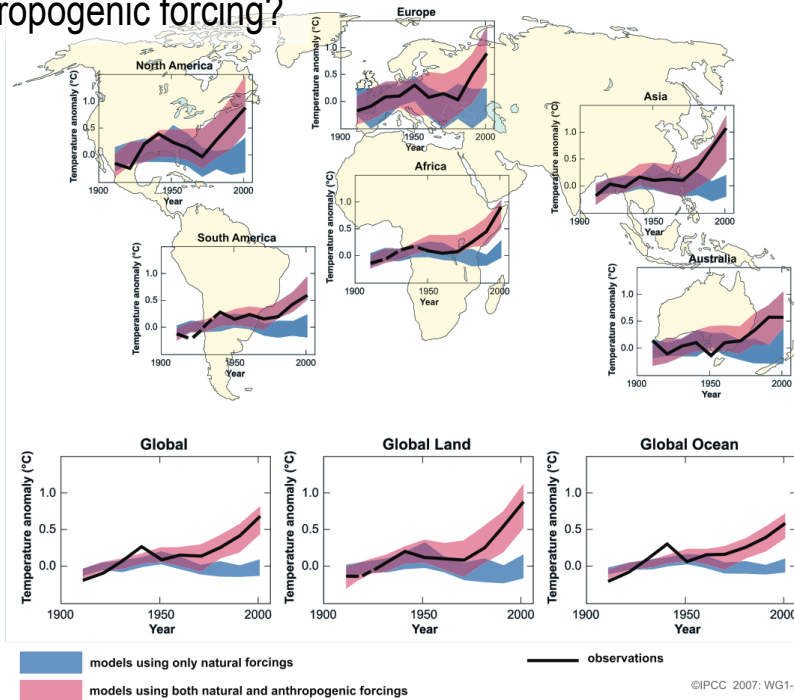


IPCC, 2013

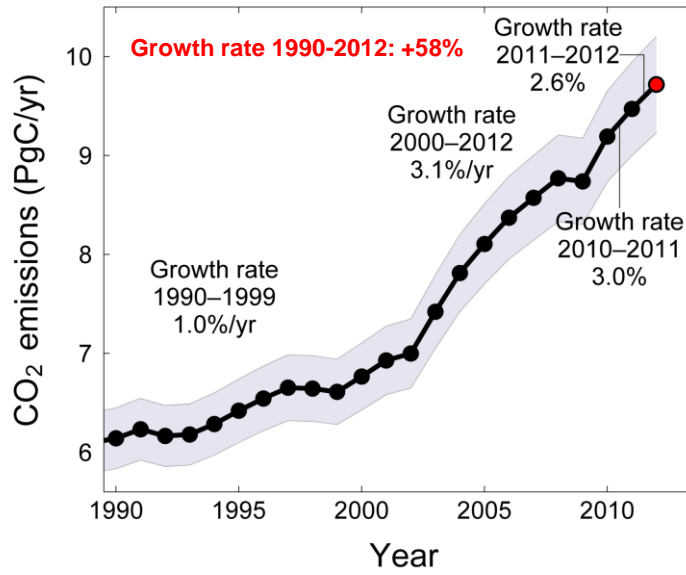
# Past and future consequences of global warming



## Anthropogenic forcing?



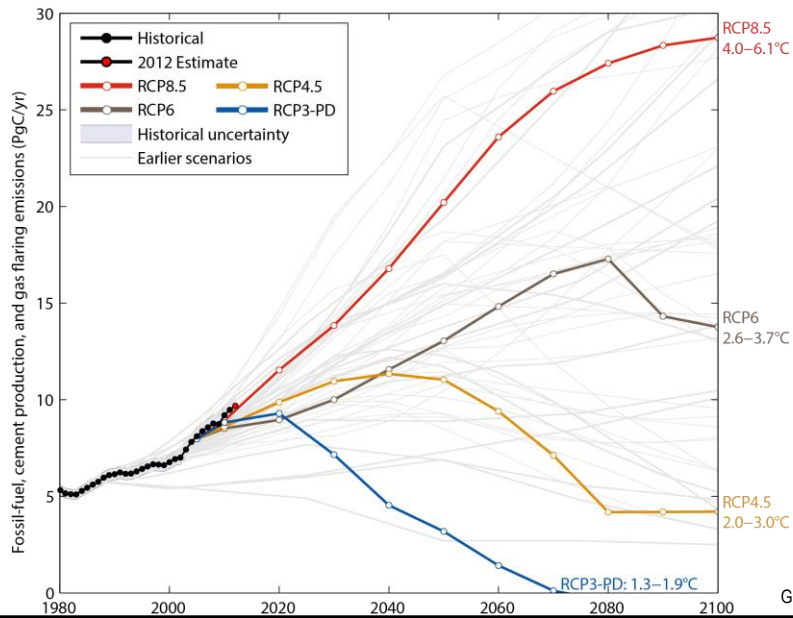
## Global fossil fuel CO<sub>2</sub> emissions



Global Carbon Project (GCP), 2012

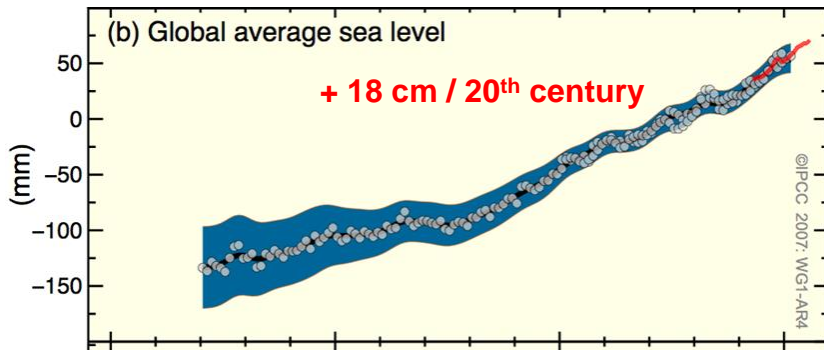
## Fossil fuel CO<sub>2</sub> emissions vs IPCC scenarios

Emissions are heading to a 4.0-6.1°C "likely" increase in temperature



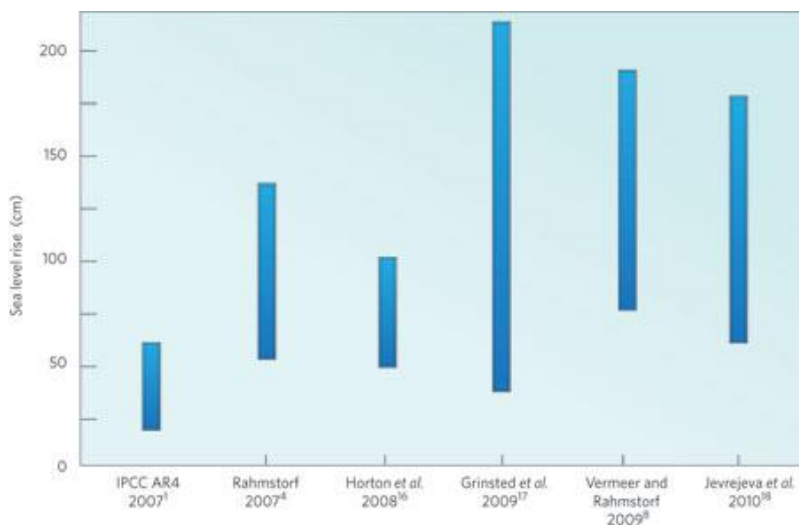
GCP, 2012

## Sea level rise during the 20th century



IPCC, 2007

## Estimates for 21st century sea level rise from semi-empirical models vs IPCC Fourth Assessment Report



Rahmstorf, 2010

## Potential impact of sea level rise: Nile Delta

Population: 3 800 000

Cropland (Km<sup>2</sup>): 1 800



Population: 6 100 000

Cropland (Km<sup>2</sup>): 4 500



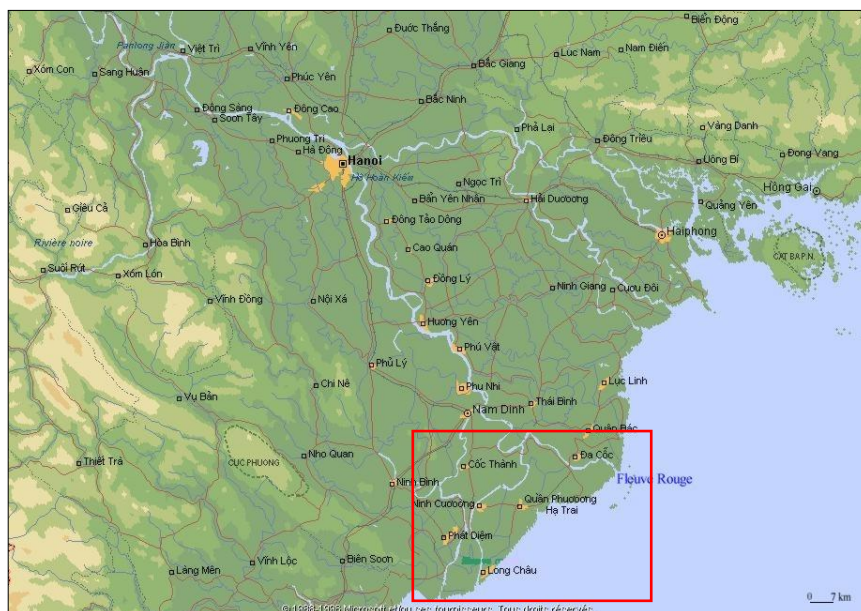
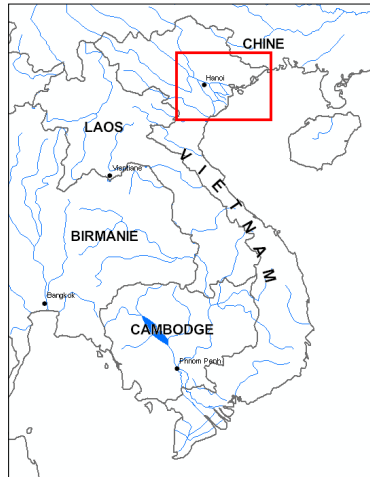
GRID  
Arendal



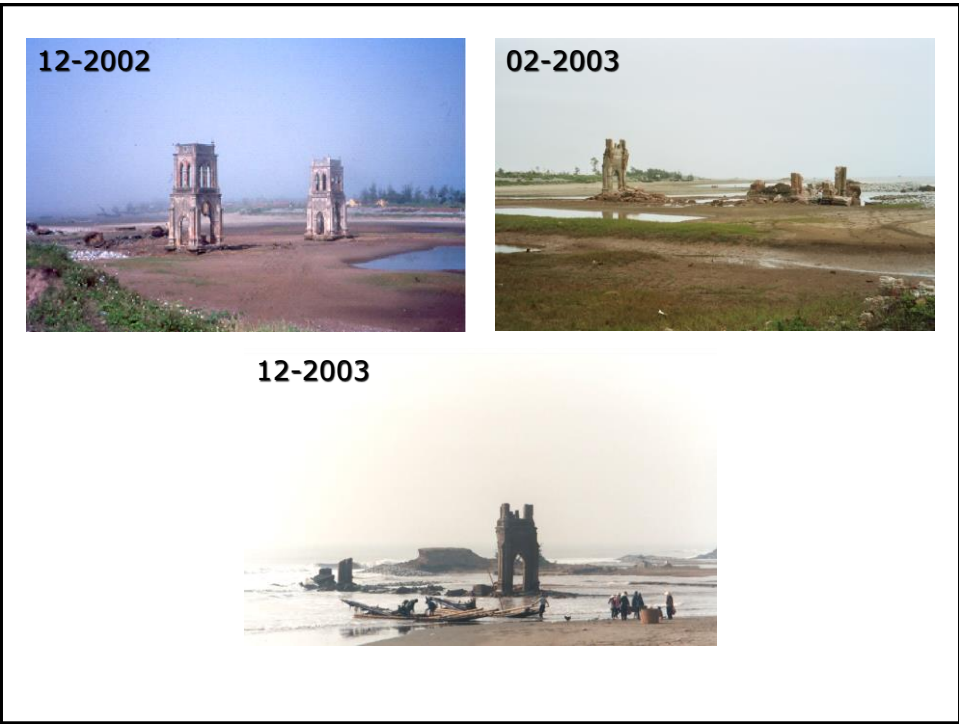
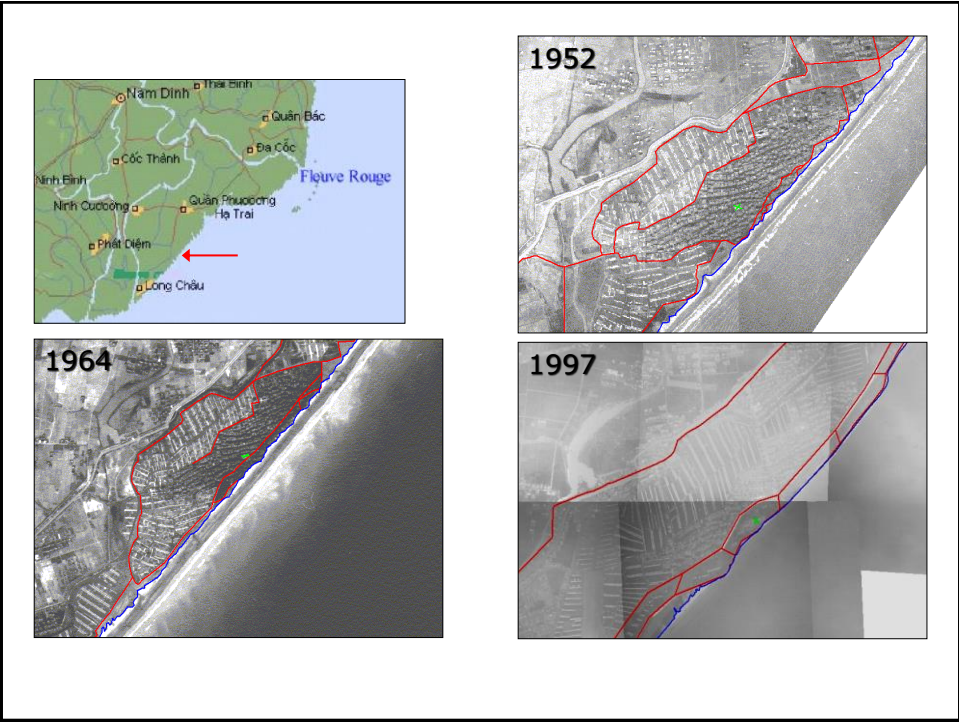
0 50 km



# Vietnam – Red River Delta







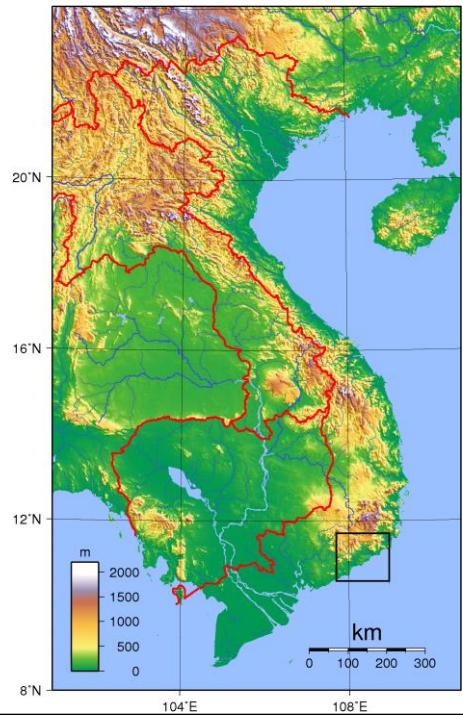


# Case study # [1]

# VIETNAM

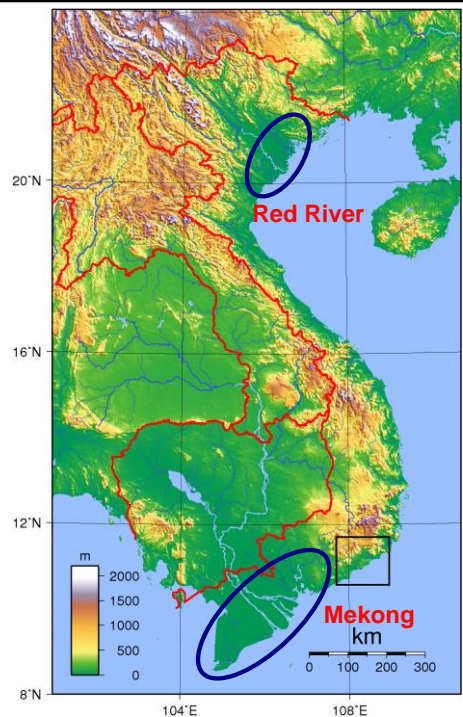
# VIETNAM

- 3,200 km of shorelines



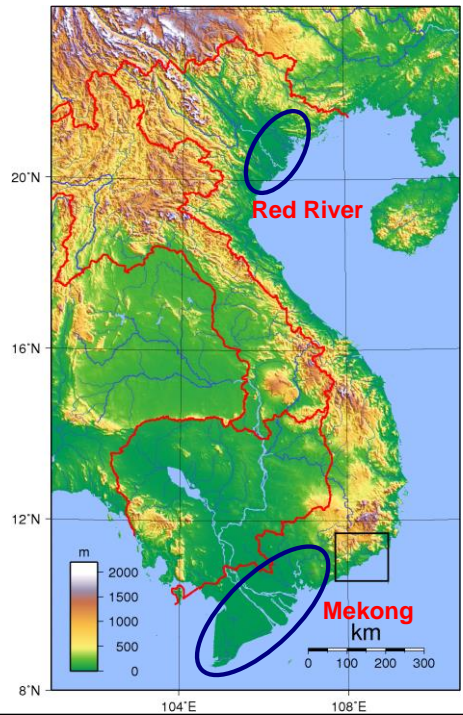
# VIETNAM

- 3,200 km of shorelines
- 2 deltas with extremely high vulnerability to sea level rise



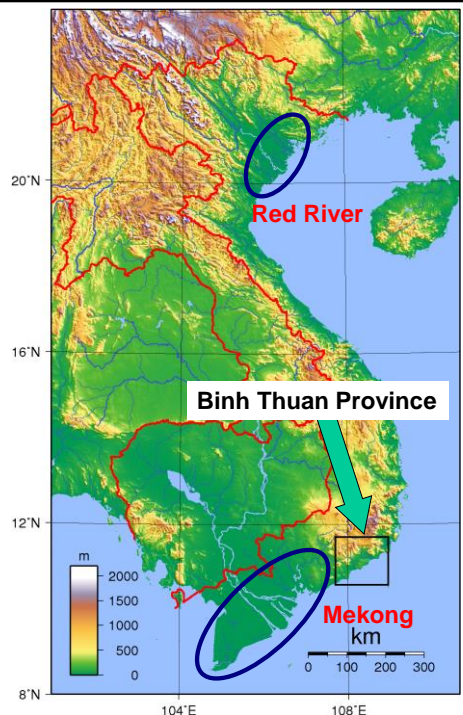
# VIETNAM

- 3,200 km of shorelines
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- Located on the highway of tropical cyclones



# VIETNAM

- 3,200 km of shorelines
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- Located on the highway of tropical cyclones





# THE STORY

RTL info .be

ACTU | SPORT | MAGAZINE | VOUS | BLOGS | VIDEOS | Ale

Belgique | Votre région | Monde | Economie | Emissions TV & Radio

Patrick Dupriez (ECOLO) futur | Ce sera une vraie co-présidence ? | INCENDIE mortel à Mons: les explications | ECOLO va-t-il cl

RTL info > Monde > International > Vietnam: des maisons du littoral s'effondrent, victimes de l'érosion

## Vietnam: des maisons du littoral s'effondrent, victimes de l'érosion

12 Janvier 2009 13h19

A<sup>+</sup> A<sup>-</sup> Imprimer

Des maisons du littoral sud du Vietnam, pays à vastes côtes fortement menacé par le réchauffement climatique, se sont effondrées pendant le week-end, rongées par de fortes vagues.

Les autorités ne faisaient état d'aucune victime lundi matin dans la ville de Phan Thiet, zone très tounstique à quelque 200 kilomètres à l'est de Ho Chi Minh-Ville, l'ex- Saigon et capitale économique du Vietnam.

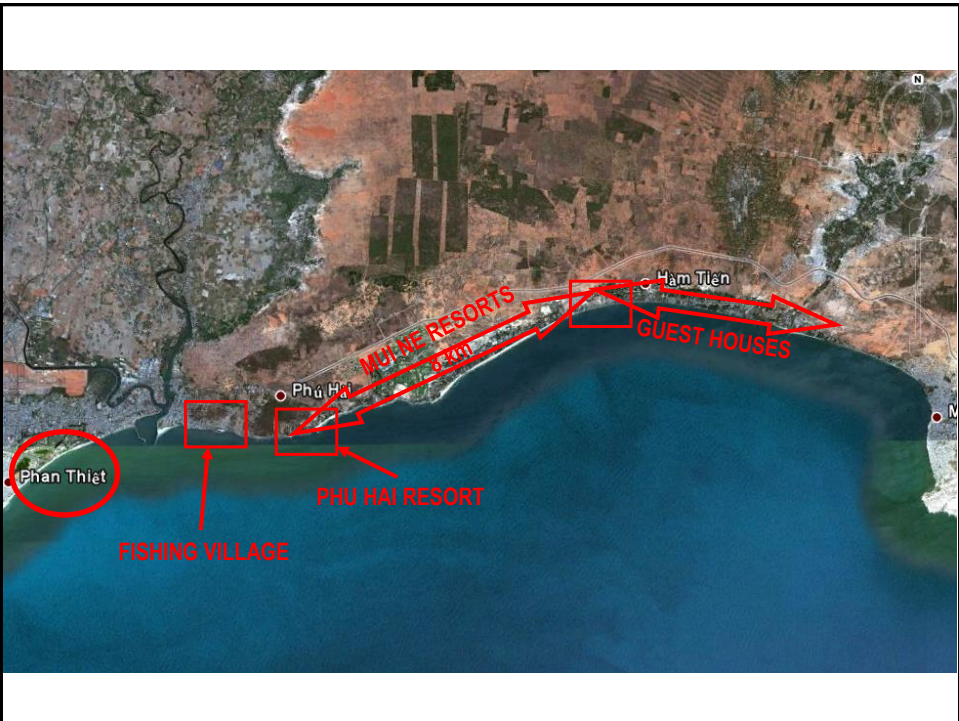


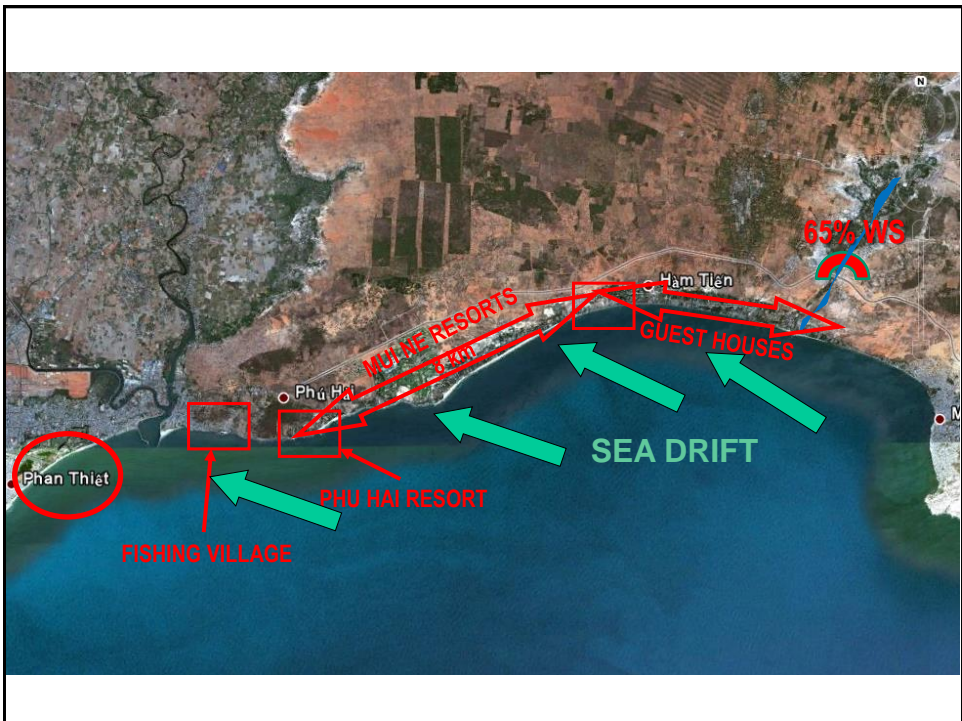
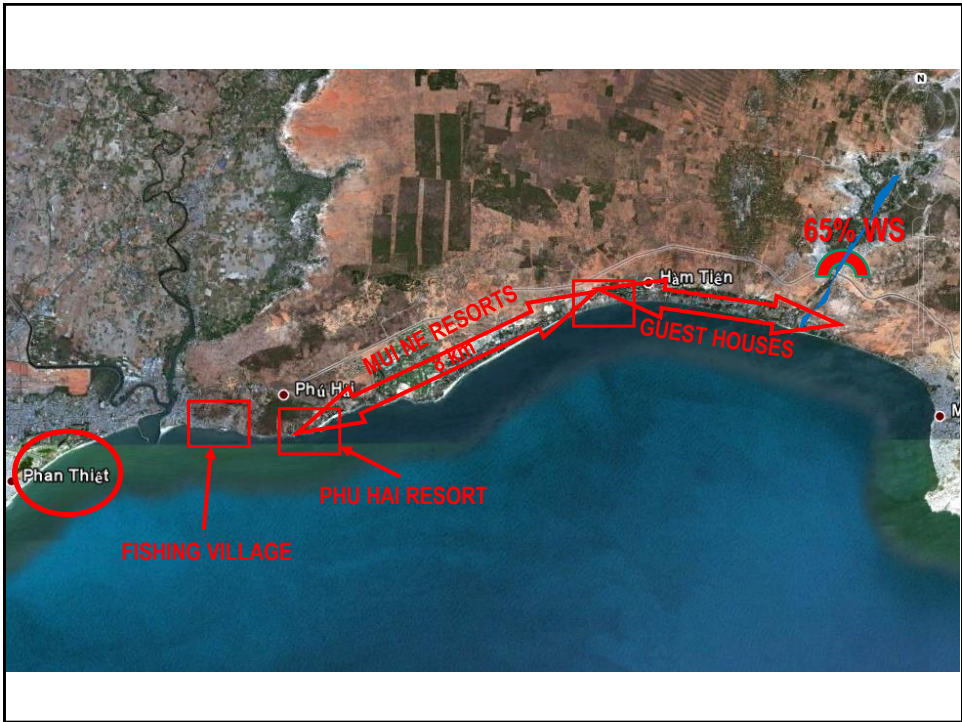
# THE STORY

## THE FISHING VILLAGE OF PHAN THIET « DISAPPEARS » ““VICTIM OF CLIMATE CHANGE””











# FISHING VILLAGE OF PHAN THIET



# FISHING VILLAGE OF PHAN THIET 27 March 2006



FISHING VILLAGE OF PHAN THIET  
10 May 2009



FISHING VILLAGE OF PHAN THIET  
February 2011





## PHU HAI RESORT



## PHU HAI RESORT



PHU HAI RESORT



PHU HAI RESORT  
27 March 2006





PHU HAI RESORT  
10 May 2009



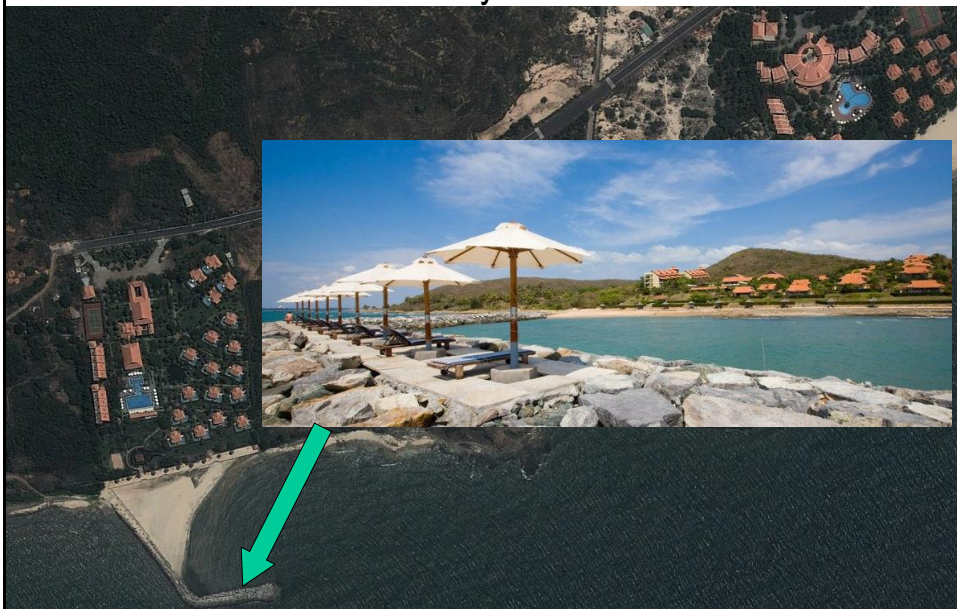
PHU HAI RESORT  
26 April 2010



PHU HAI RESORT  
20 May 2012



PHU HAI RESORT  
20 May 2012













**Mui Ne, Resorts & Spa**



**Mui Ne, Resorts & Spa**



# DISCUSSION & CONCLUSION



## CLIMATE CHANGE ?

- First hotel, *Coco beach*, 1994
- Second hotel, *Novotel*, 1995
- Third hotel, *Victoria*, 1997
- ...
- 2012, everything is constructed

### ALL

are western hotels

**FOR** Western tourists...

## STORY TELLING

[A] TO PROTECT THE TOURISM BUSINESS  
[B] TO RECEIVE MORE ATTENTION FROM THE  
INTERNATIONAL COMMUNITY ABOUT THE THREAT OF  
GLOBAL WARMING IN VIETNAM

**BUT:**

Increasing CO<sub>2</sub> emissions:

2009 → 1,8 million Western tourists → traveling by air, from  
Europe (40%), Northern America (40%), Russia (10%) and  
Australia (10%) → emissions of about 8.2 10<sup>6</sup> tons of CO<sub>2</sub>-eq.

That represents the CO<sub>2</sub> emissions from fuel combustion of Benin  
+ DR Congo + Togo for 2009 !!! (IEA, 2012).

**2006**



**2012**



**NO**

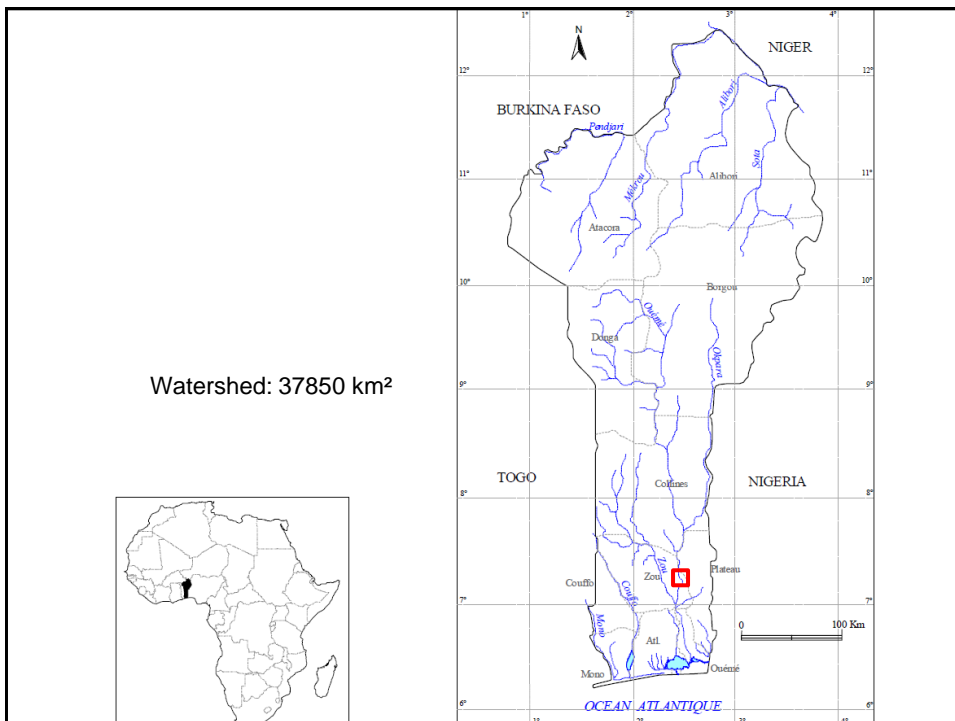
THE FISHING VILLAGE  
OF PHAN THIET  
WAS NOT VICTIM OF  
CLIMATE CHANGE

**YES**

THE FISHING VILLAGE  
OF PHAN THIET  
WAS VICTIM OF  
« CLIMATE CHANGE »:  
POOR BECAME POORER

# Case study # [2]

## BENIN



In September 2010, Benin has been affected by **exceptional** floods, «**the most disastrous of its history**», due to **climate change**.

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### **IMPACTS**

680 000 people affected  
150 000 homeless  
455 schools affected  
92 health centres destroyed

In September 2010, Benin has been affected by **exceptional** floods, «**the most disastrous of its history**», due to **climate change**.

### **WHO SAYS THAT ?**

Medias

NGOs

United Nations

...

In September 2010, Benin has been affected by **exceptional** floods, «**the most disastrous of its history**», due to **climate change**.

### **WHO PROVIDES THE DATA ?**

The President (Yayi Boni)

The government

A special « commission »



**1st October 2010**  
The Government of the Republic of Benin declares a state of emergency in the country and appeals for international support

**3 October 2010**  
OCHA's team arrives in Cotonou

**7 October 2010**  
« **Rapport de situation OCHA #1** »  
300 000 people affected.

**16 October 2010**  
« **Rapport de situation OCHA #5** »  
358 621 people affected.

**25 October 2010**  
« **Rapport de situation OCHA #7** »  
680 000 people affected, that is 10% of the last population census (6,769,914 inhabitants in 2002)

**Benin • Inondations 2010**  
**Rapport de situation # 05**  
16 octobre 2010

**United Nations Office for the Coordination of Humanitarian Affairs**  
**PARTNERSHIP FOR HUMANITY**

**Secrétariat du Comité national de Crise, Cotonou - Benin**  
Tél. : +229 66 62 25 68 / +229 66 62 25 69 ; courriel : [benin.floods2010@gmail.com](mailto:benin.floods2010@gmail.com)

**I. Evénements clés**

- Grande ampleur des inondations au Benin, 42 communes sur 77 sont affectées par les inondations
- 358 621 personnes affectées, 43 morts, 97 815 sans-abri, 55 575 maisons détruites / inondées et 276 écoles inondées/ détruites.
- Epidémie de cholera à Cotonou : 800 cas pour l'ensemble du pays et 07 cas de décès.
- Finalisation de la requête CERF pour un montant de US\$ 8 094 596

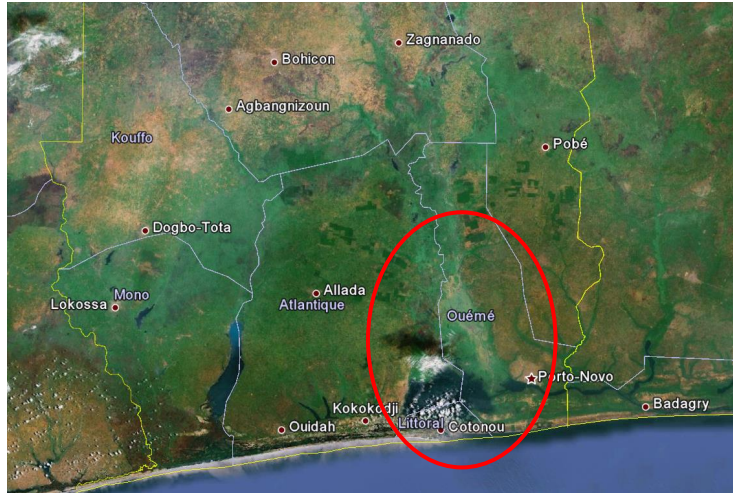
**II. Contexte**

- Survols de la ville de Cotonou et du Sud du pays par hélicoptère pour l'appréciation des sinistres. Il ressort de cette vue aérienne que la crise a été sous-estimée. En substance, le pays est atteint par des inondations à près des 2/3 en termes de superficie, soit plus 76500 km<sup>2</sup>
- Finalisation de la requête CERF, Réponse rapide et transmission de la requête au secrétariat du CERF à OCHA- New York ;
- Le processus d'élaboration du Flash Appeal pour la réponse aux inondations a été initié ;
- La situation humanitaire dans le pays devient de plus en plus inquiétante.
- Plus de 360 000 personnes affectées et 43 morts à cause de la persistance des pluies
- Augmentation des cas de cholera à Cotonou. Avec les inondations, il est à craindre une

16 October 2010

**Rapport de situation OCHA #5:**

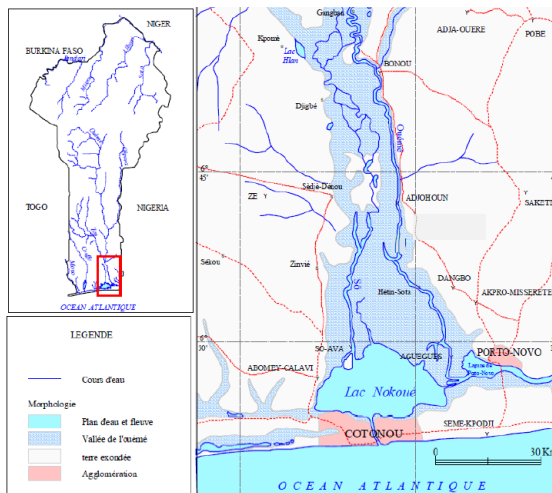
« Overview of the city of Cotonou and South of the country by helicopter for the assessment of claims. It appears from this aerial view that the crisis was underestimated. In essence, the country is hit by flooding in nearly 2/3 in terms of area, over 76 500 km<sup>2</sup> » .



16 October 2010

**Rapport de situation OCHA #5:**

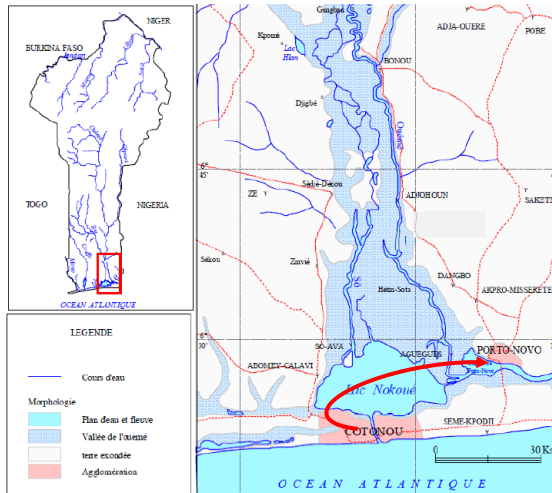
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16 October 2010

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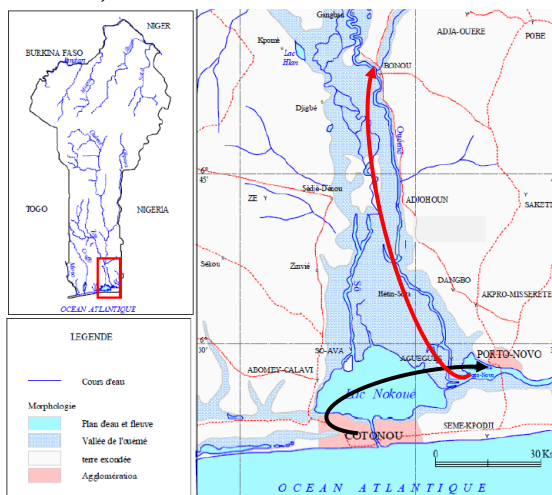
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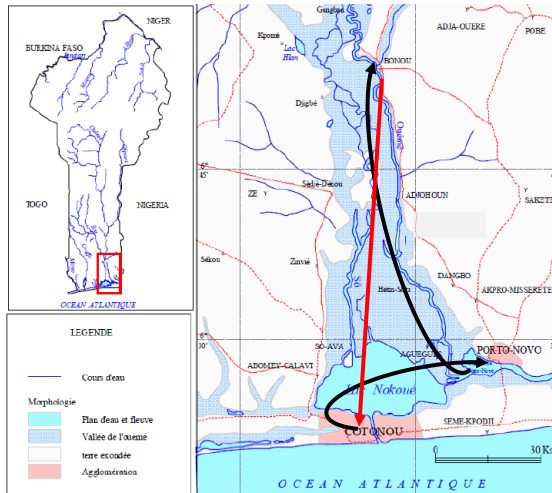
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**WHO PROVIDES THE DATA ?**

The President (Yayi Boni)

The government

A special « commission »

**Election campaign communication**



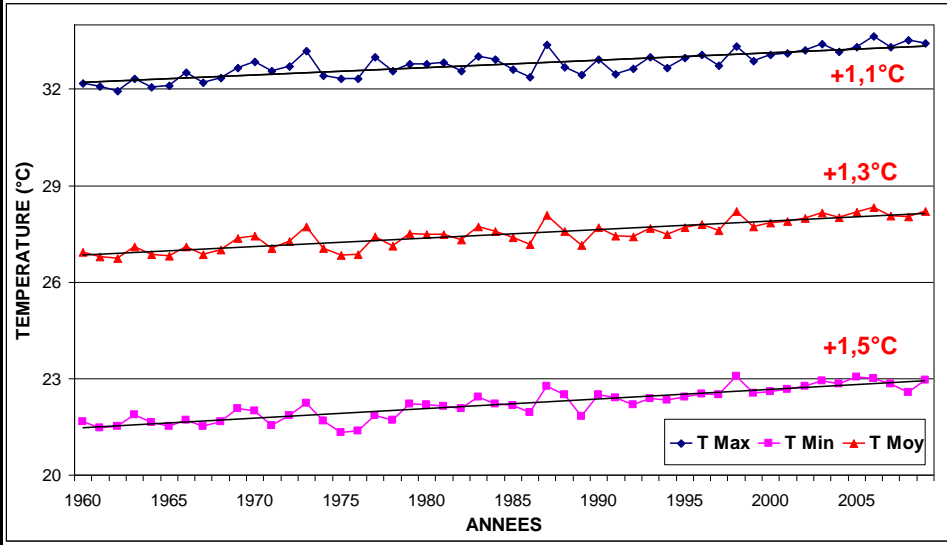
**Powerful story telling for  
election campaign purposes**



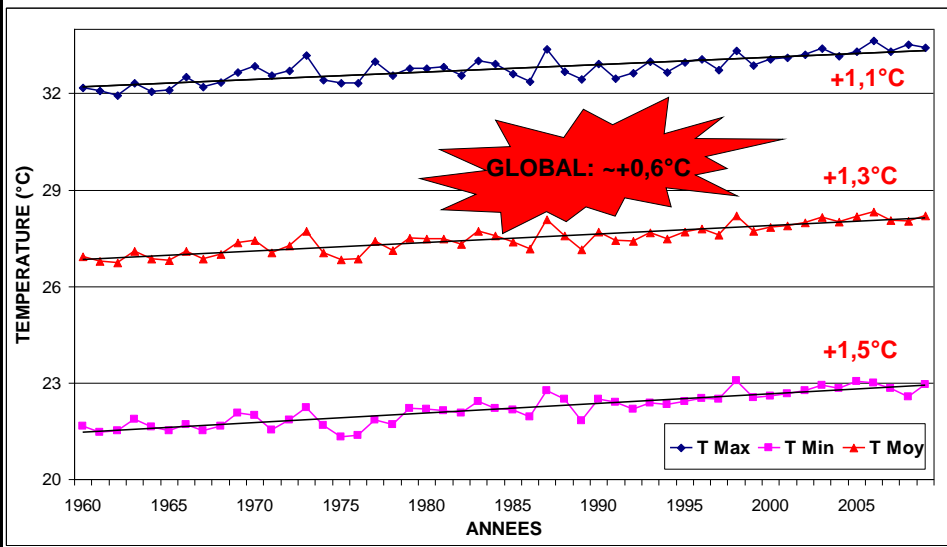
**IS BENIN AFFECTED BY  
CLIMATE CHANGE ?**

**TEMPERATURES**

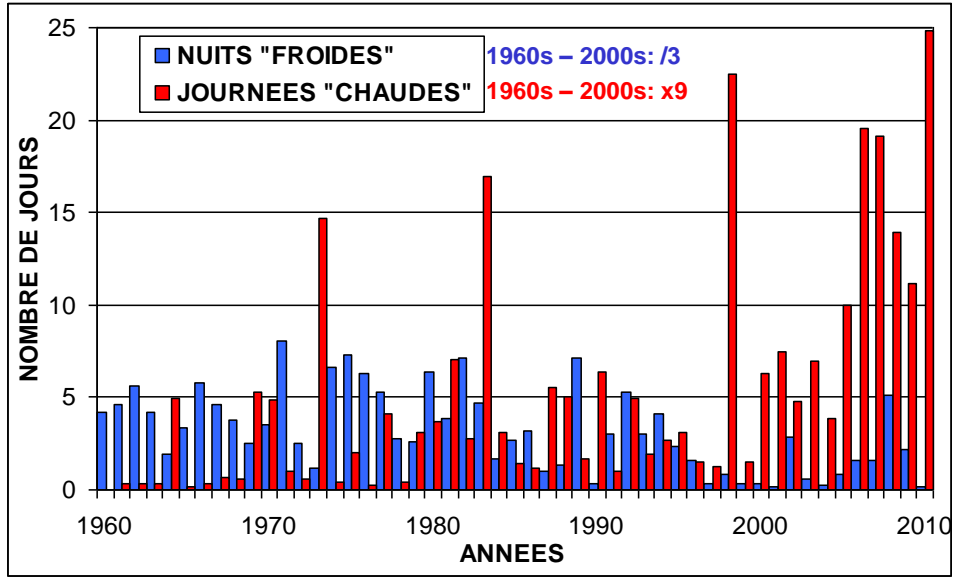
## TEMPERATURES IN BENIN (SYNOP) 1960-2009



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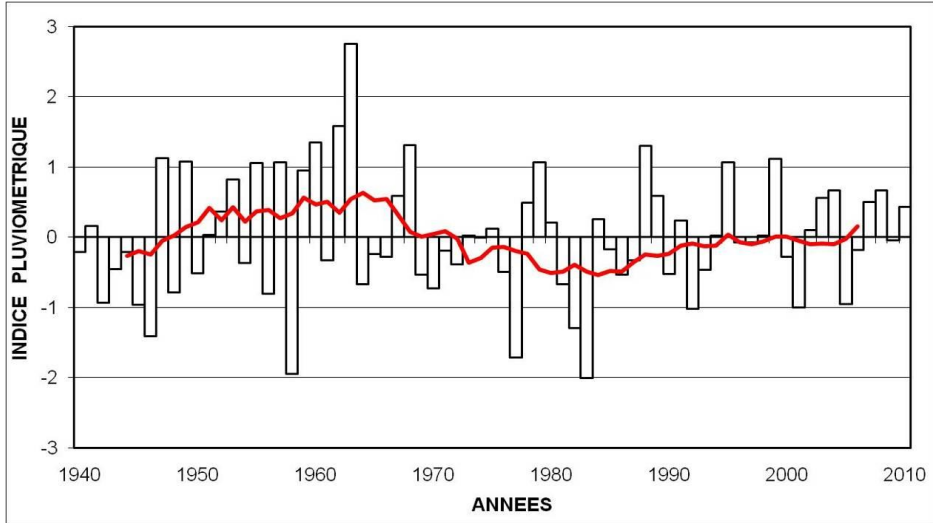
## EXTREME TEMPERATURES IN BENIN (SYNOP) 1960-2010



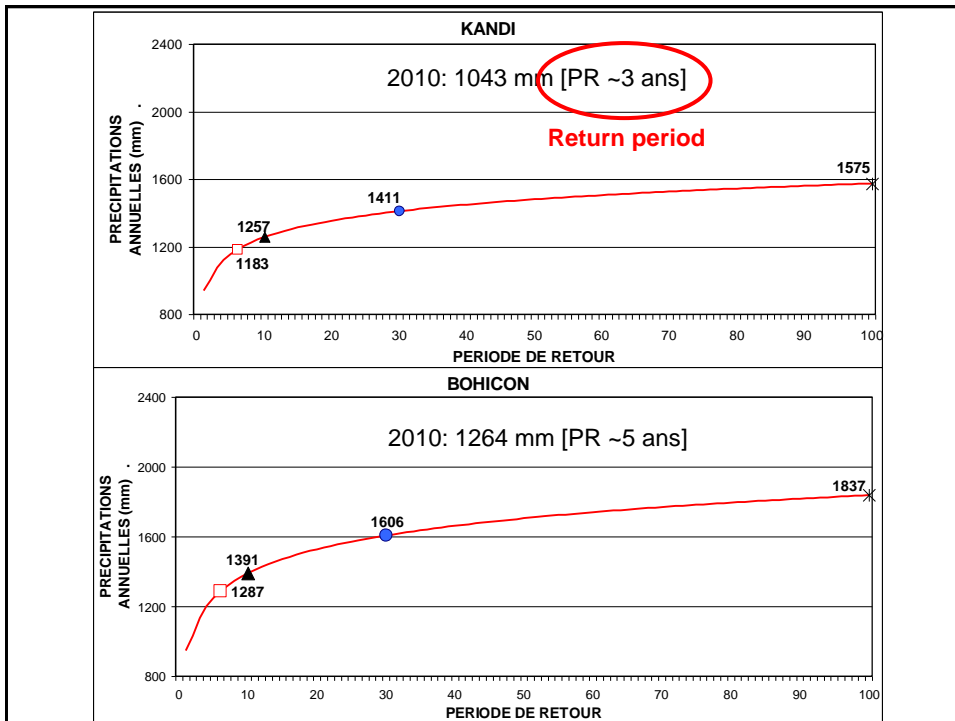
IS BENIN AFFECTED BY  
CLIMATE CHANGE ?

**RAINFALL**

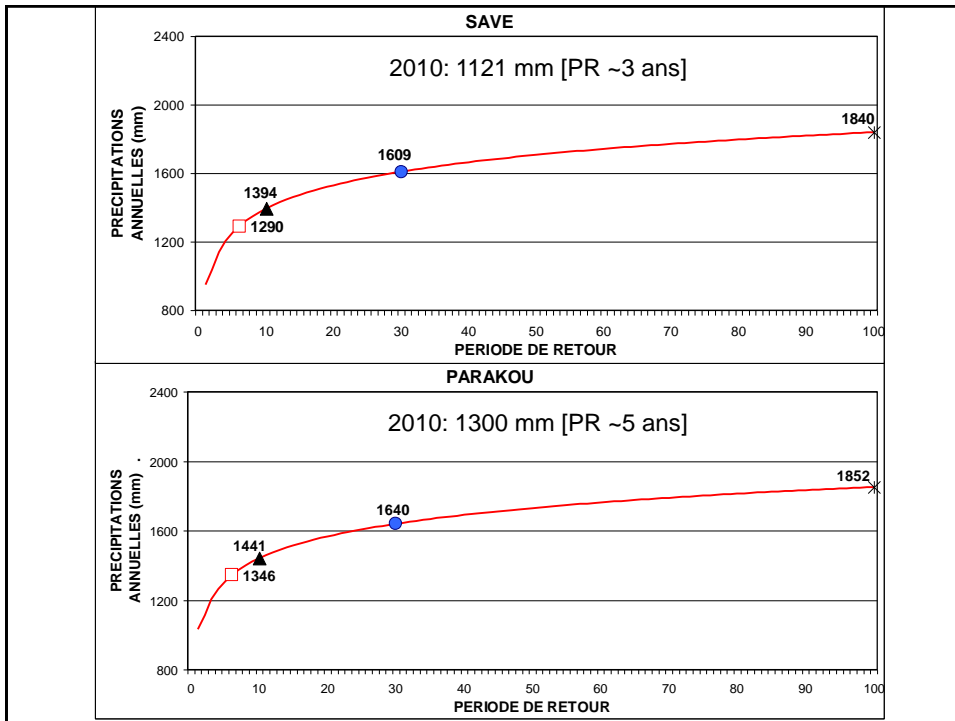
## RAINFALL ANOMALY INDEX IN THE OUEME WATERSHED (SYNOP), 1940-2010



Based on rainfall data from SYNOP stations of Bohicon, Parakou and Savé

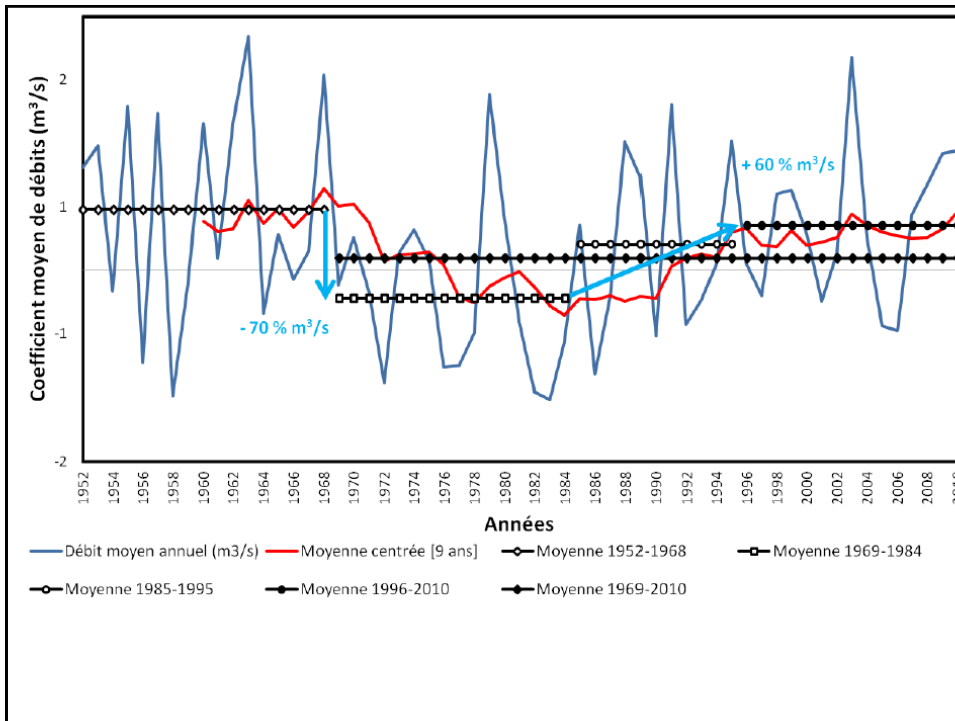




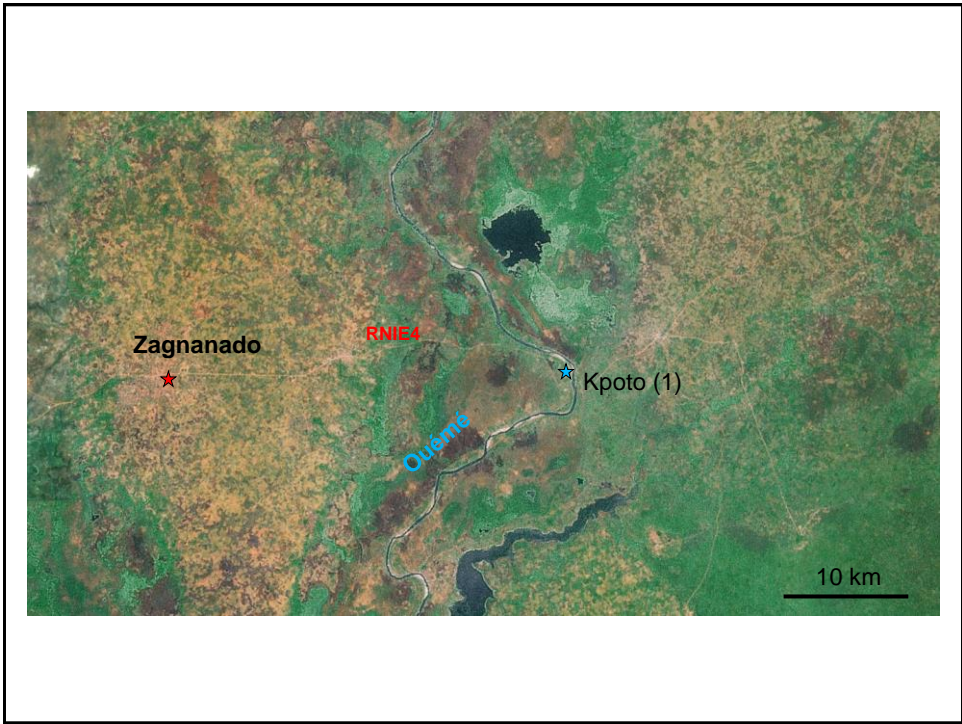
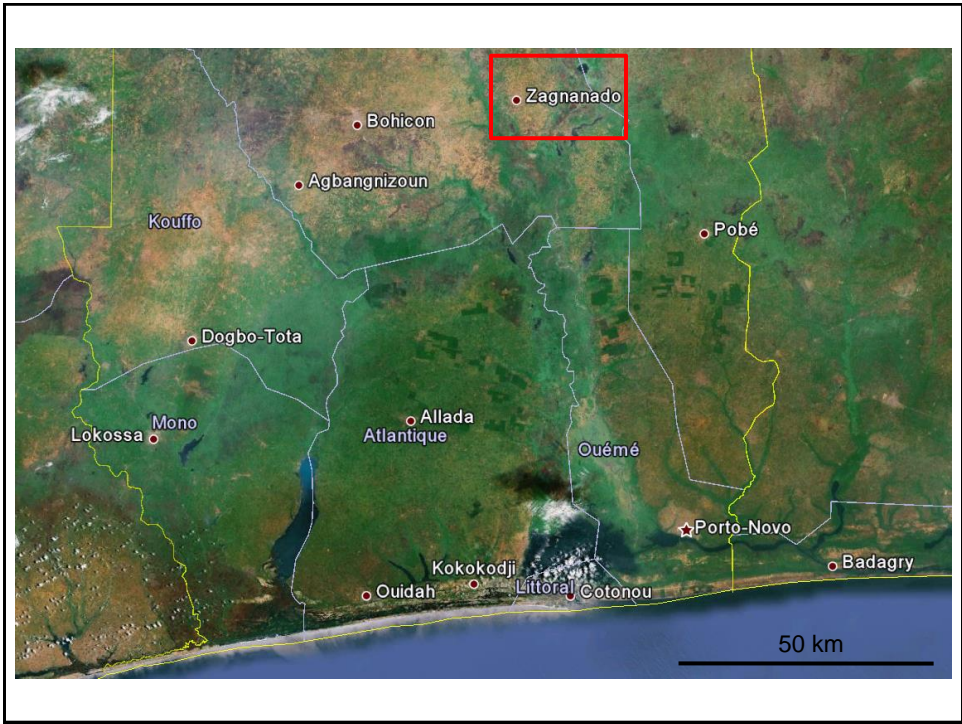


IS BENIN AFFECTED BY  
CLIMATE CHANGE ?

**STREAMFLOW**



**IS BENIN AFFECTED BY  
 CLIMATE CHANGE ?**  
  
**THE CASE OF KPOTO**



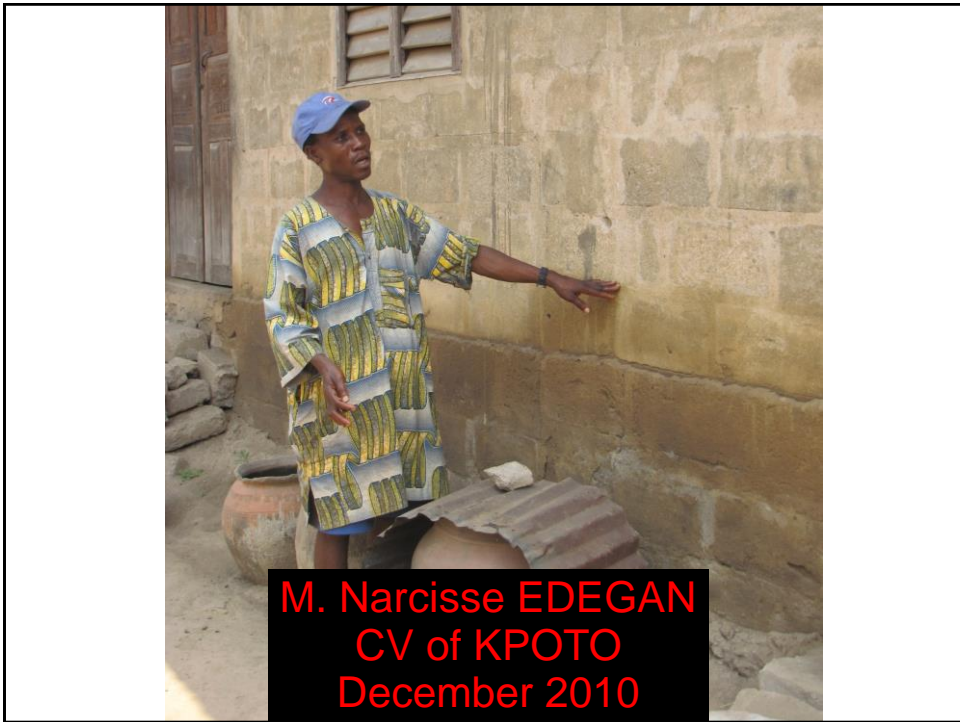


September 2010  
KPOTO, Commune of Zangnado



REFUGEE CAMP :  
800 people, < 1/2 ha  
at 2 km from KPOTO, Commune of Zangnado  
December 2010





**M. Narcisse EDEGAN  
CV of KPOTO  
December 2010**



**Village of KPOTO  
December 2010**



### Strong resignation among the affected population

« *Durant les deux premiers mois, nous avons fait l'objet de visites incessantes de politiciens et autres mécènes pour des 'dons' très médiatisés. Puis, plus rien... »*

<http://www.youtube.com/watch?v=l1vD6AzU8cc>

'dons' [donation] means 500,000 FCFA (762 EUR) for the commune of Zagnanado (5940 affected people), that is 0.13 EUR per capita.

**BUT**, this donation rarely reached the targeted people !!!

### Local authorities response to prevent future floods

- Creation of a communal cell for flood early warning.

**MATINAL**  
LE DEFI D'UNE GÉNÉRATION

**GI**  
Consultation / Assiste  
Représentation et Trac

ACCUEIL | POLITIQUE | SPORT | SOCIÉTÉ | ART & CULTURE | IN  
ACTU NATIONALE | ACTU AFRIQUE | ACTU MONDE | INSOLITES | EMPLOI

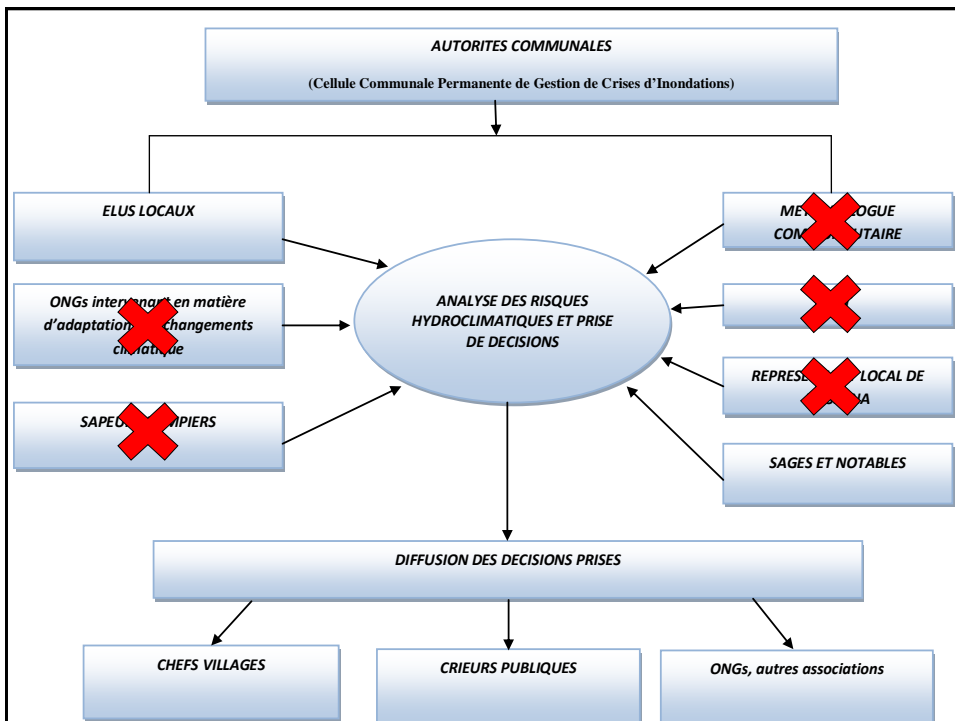
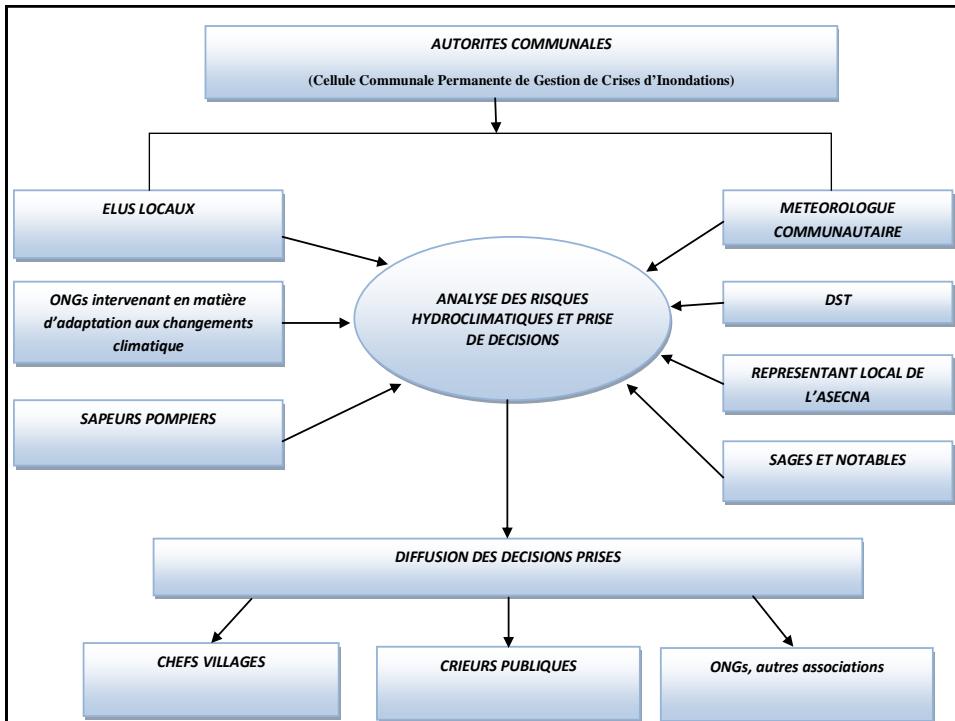
27 septembre 2012

**Zagnanado, Ouinhi et Zogbodomey. Les autorités s'arment contre les inondations**

**Le débordement des cours d'eau dans le Septentrion met en état d'alerte les élus locaux des Communes de Zagnanado, Ouinhi et Zogbodomey dans le département du Zou. Ils activent déjà leur plan de contingence pour prévenir les calamités naturelles auxquelles sont confrontées chaque année leurs populations.**

→ September 27th, 2012







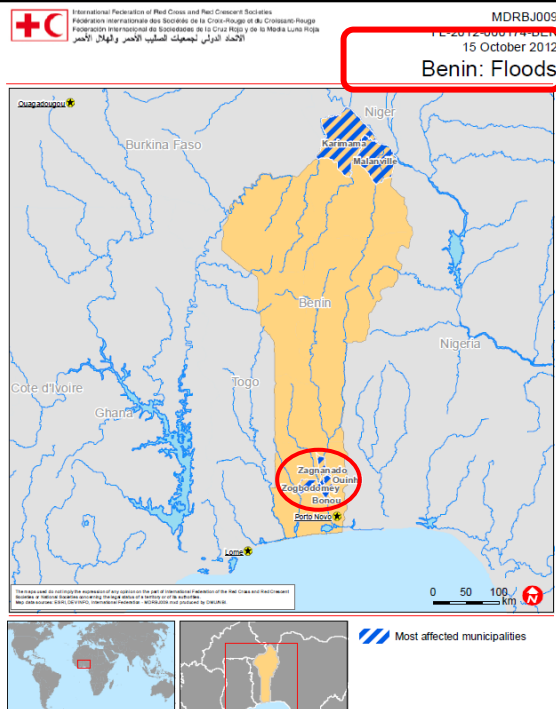
## September 2012

- 100% of the population of Kpoto left the refugee camp to go back to the village.



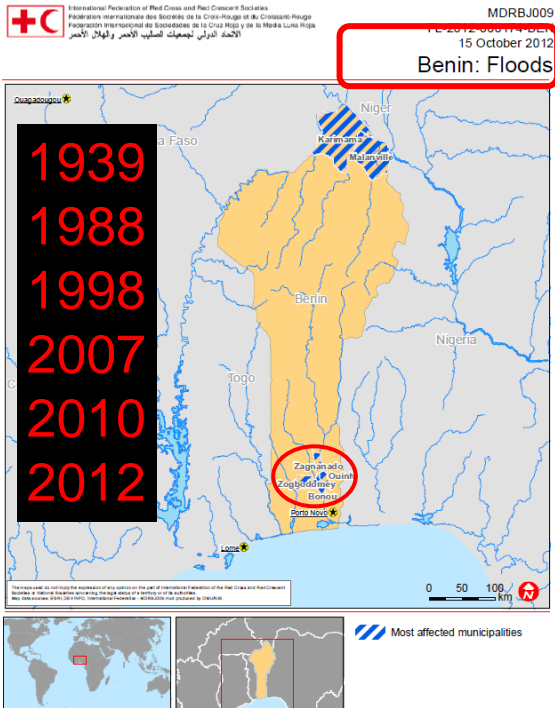
## September 2012

- 100% of the population of Kpoto left the refugee camp to go back to the village.



September  
2012

- 100% of the population of Kpoto left the refugee camp to go back to the village.



**NO**

**BENIN  
WAS NOT VICTIM OF  
EXCEPTIONAL FLOODS DUE TO  
CLIMATE CHANGE**

**YES**

**BENIN  
WAS VICTIM OF  
« CLIMATE CHANGE » (but who cares?):  
POOR BECAME POORER**

## **Case study # [3]: BENIN**



## Cotonou: Shorelines from the sky



## Cotonou: Shorelines from the sky





## Cotonou: Shorelines from the sky



## Cotonou: Shorelines from the sky



16 November 2012



9 September 2013



## Cotonou: Shorelines from the sky



9 September 2013



## Cotonou: Impacts of shoreline erosion

- We analyzed a stretch of 6 km from 2002 to 2011 at the eastern part of Cotonou.
- A total land area of **53 ha** disappeared in the sea.
- A total of **487 homes** were destroyed by the encroachment of the sea, out of which **426 informal settlements** and **61 villas**.
- **1900 people were forced to leave** because of the advance of the sea: that is **316 people per linear km**.

## Cotonou: shoreline erosion – RESPONSE (2013-09)





Cotonou: shoreline erosion – RESPONSE (2013-09)



Cotonou: shoreline erosion – RESPONSE (2013-09)



## Cotonou: shoreline erosion – RESPONSE



## Cotonou: shoreline erosion – RESPONSE



- The project to protect the coastline is supported by the White House's Millennium Challenge Account (MCA) together with the Islamic Development Bank (IDB), Saudi, Kuwait and OPEC Funds.
- The MCA aims to adapt to climate change & to reduce poverty.

## Cotonou: shoreline erosion – RESPONSE



- The project to protect the coastline is supported by the White House's Millennium Challenge Account (MCA) together with the Islamic Development Bank (IDB), Saudi, Kuwait and OPEC Funds.
- The MCA aims to adapt to climate change & to reduce poverty.
- **People are displaced by force without any compensation.**

**NO**

**COTONOU  
WAS NOT VICTIM OF  
SHORELINE EROSION DUE TO  
CLIMATE CHANGE**

**YES**

**COTONOU  
WAS VICTIM OF  
« CLIMATE CHANGE »:  
POOR BECAME POORER (and disappeared)**

**“ Climate change ”  
and vulnerability analysis**

**Poor will become poorer**

**THANK YOU**

**pozer@ulg.ac.be**



## References (work in progress)

- [1] Ozer, P. (2012). Is the fishing village of Phan Thiet victim of climate change? *Geo-Eco-Trop*, 36, 29-38. <http://hdl.handle.net/2268/157495>
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