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Climate change: an opportunity for progress in construction ?

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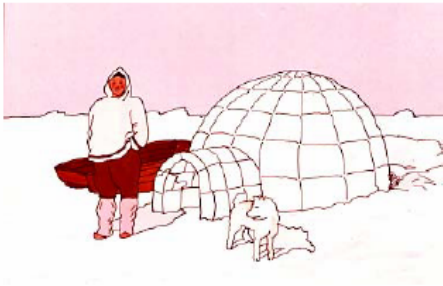
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Back to basics: Functions of a building

One of the main function of a building is to **protect** occupants (and goods) against natural hazards such as **climatic events**: rain, wind, sun, heat and cold weather...



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Natural hazards

Ordinary/exceptional events

Storms (doc CSTB)

Seisms (doc BRGM)

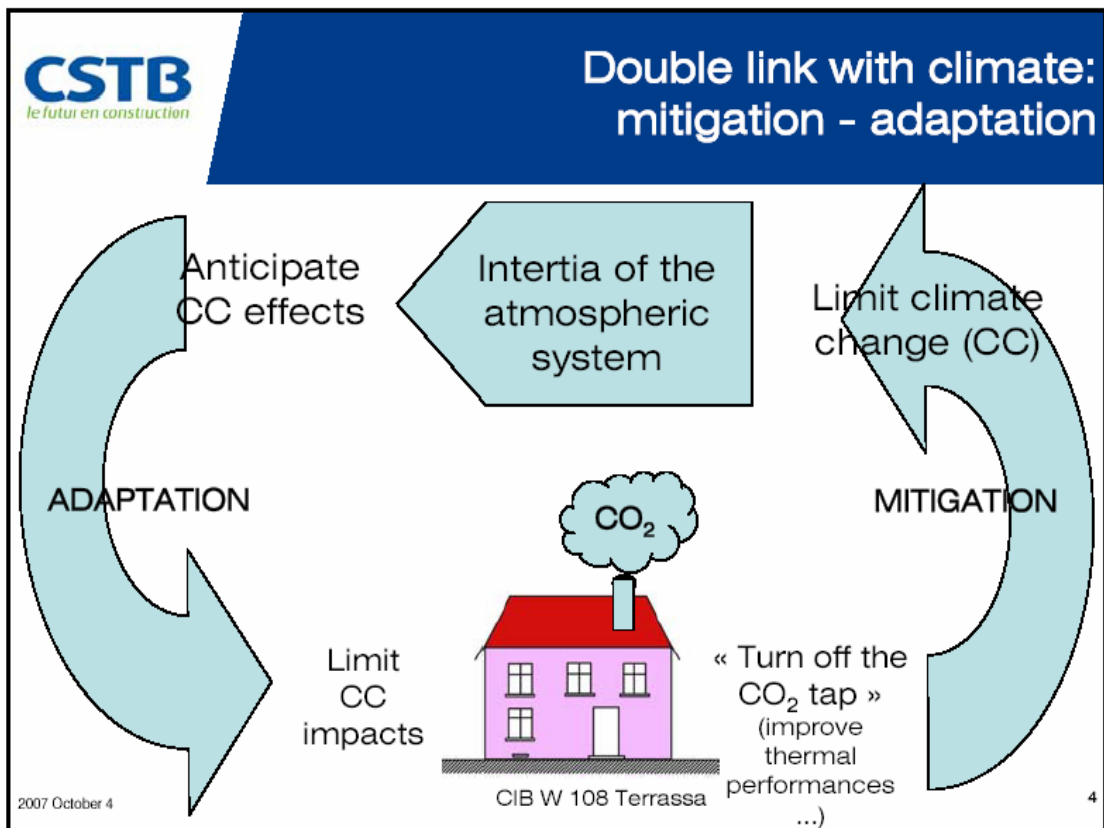
Floods (doc CSTB)


Lans slide eruption (doc MEDD) 2007

Forest fire (doc MEDD)

Heat wave (doc web) CIE

Snow/avalanches (doc CSTB) 3






Recent climatic warnings in Europe

- **1999 storms** Lothar et Martin
- **floods** (last decade: 1999, 2001, 2002, 2003, 2005)
- **2003, 2005, 2007 heat waves**
- **many other events in different parts of the world**
- **no confirmed links with climate change but severe human and economical consequences**
- **after event measures (French case)**


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1999 storm

Consequences	Improvement measures in France
<i>Economical:</i> 15 billions €	Damages assessment on building stock
<i>Damages :</i> buildings	<ul style="list-style-type: none"> • Suitable design reference wind speed but better acknowledgement of local roughness • Organisation of return of experience procedure (ministry of education)
<i>Damages :</i> energy supply	Emergency procedures, « rescue » teams (EDF)

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 floods	
Consequences	Improvement measures in France
<i>Human</i> : 30-40 deaths	Information/training of stakeholders (citizens, services, ...)
<i>Economical</i> : > 1,6 billions €	Information/training of stakeholders (prevention measures)
<i>Damages : buildings</i>	<ul style="list-style-type: none"> • Assesment of flood barriers (MEDD-CSTB protocol) • Vulnerability assessment guides

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 heat wave	
Consequences	Improvement measures in France
<i>Human</i> : extra mortality > 30000 in Europe (50% in France)	Organisation of a « heat-wave plan » including recommandations for buildings 
<i>Economical</i> : clay soil subsidence (3 billions € in 2003 ≈ ∑ 1989-2002)	<ul style="list-style-type: none"> • Mapping of clay soil zones  • Reform of the CAT-NAT insurance system
<i>Damages</i> : <ul style="list-style-type: none"> • impact on nuclear power • plants increase of energy demand for air conditionning 	<ul style="list-style-type: none"> • More demanding building thermal regulation • Certification of (air conditionning system) installers

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Quality improvement/progress perspectives

NEW BUILDINGS

- Thermal regulation (planned reinforcement : 2000-2005-2010, summer comfort concern)
- Information/training of professionals (maintenance)
- **Application of existing technical and urban rules** (floods, wind, subsidence)


EXISTING BUILDINGS

- Thermal regulation
- Information/training of inhabitants (how to manage a building?)
- **Assess the vulnerability of the building stock** (what can be done to adapt to a changed situation?)

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Research perspectives

- **How to better use existing rules** (before defining new ones)
- Better understanding of local climate impacts 
- Vulnerability assessment methods
- Awareness raising of population
- Technical solution for adaptation: design and construction practices

- Demography (share of elderly people increases)
- Urban concentration (cost of land rises)
- Concentration of economical assets

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Recommandations for buildings

BUILDINGS

- Avoid vulnerable people occupying rooms on top floor (collective) or under the roof (individual) for
- Improve thermal insulation
- Use less heat-absorbent materials
- Install blinds and shutters (outside! ... and easy to use)
- Facilitate ventilation
- Create “air conditioned room” in retirement homes

SURROUNDINGS

- Develop « green surfaces » (buildings, urban areas)
- Limit water-proof surfaces
- Use less heat-absorbent materials

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CAT NAT insurance system


French natural catastrophe (CAT NAT) insurance system (1982 law)

Compensation fund is triggered when two conditions are met:

- 1-declaration of the state of natural disaster by an interministerial decision,
- 2-the owner must have subscribed a “property damage” insurance policy that covers the damaged property (a mandatory contribution of 12 % of yearly premium is brought to the compensation fund)

More on www.ccr.fr (natural disasters in France)

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Examples of research actions

CLIFURBAIN (Future Urban Climate)

The aim of the project is to elaborate a set of future climatic data over urban areas to study the impact of climate change on micro climate. This is achieved through a downscaling method applied onto the outputs of the two French climatic models (ARPEGE-CLIMAT and IPSL-LMDZ) as well as observations (Meteo stations and ERA40). Current data are used to validate the results. For the chosen urban areas (Nantes, Saint Nazaire: west of France) the emphasis is put on:

- risk of strong wind
- risk of heat wave
- risk of pollutions during heavy rainy episodes

On going PhD :

The aim is to assess the potential influence of urban transformation (demolition, construction, greening, ...) on the urban climate and to draw out proposals to improve urban climate.

This is achieved through a bibliographic analysis of the stakes of urban climate as well as from the results of urban climate simulation for different urban structures, using an urban surface scheme (Town energy Budget, Météo-France).

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