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Consequences on world cities

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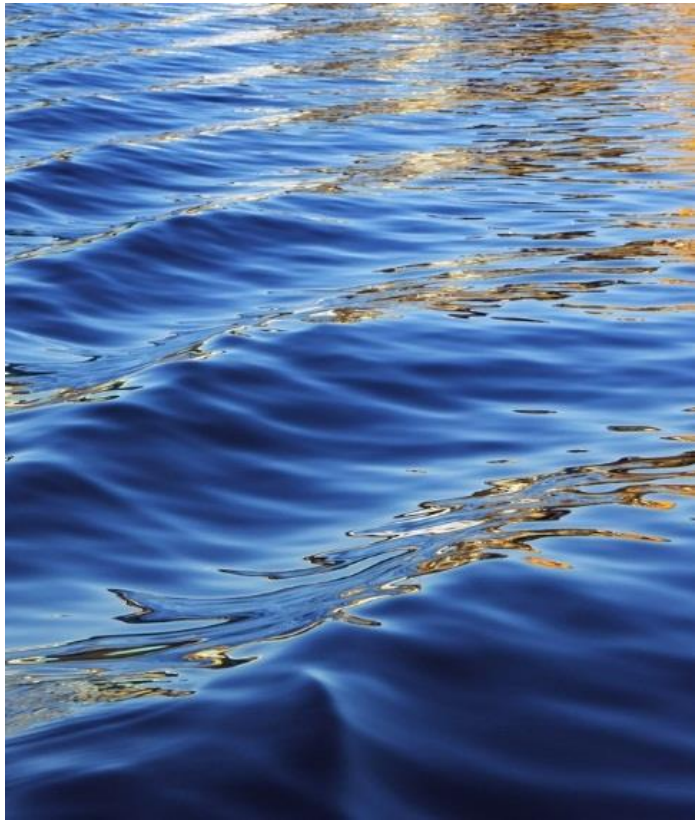
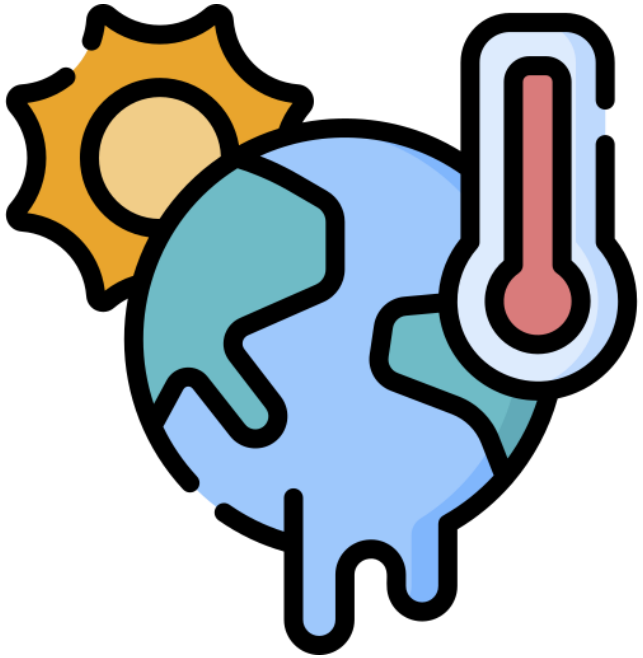
Is global warming far away us ?



Global warming is something far away
This is not concerning me !

- Are you really sure ?

- Global warming is not limited to few regions of the world
- Global warming affects all regions and all humans at varying weights
- Let's review these disparities



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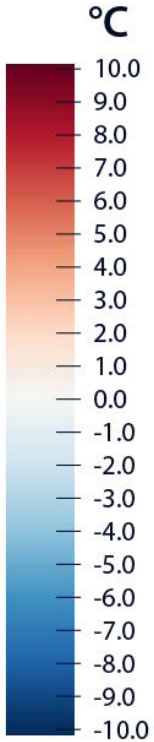
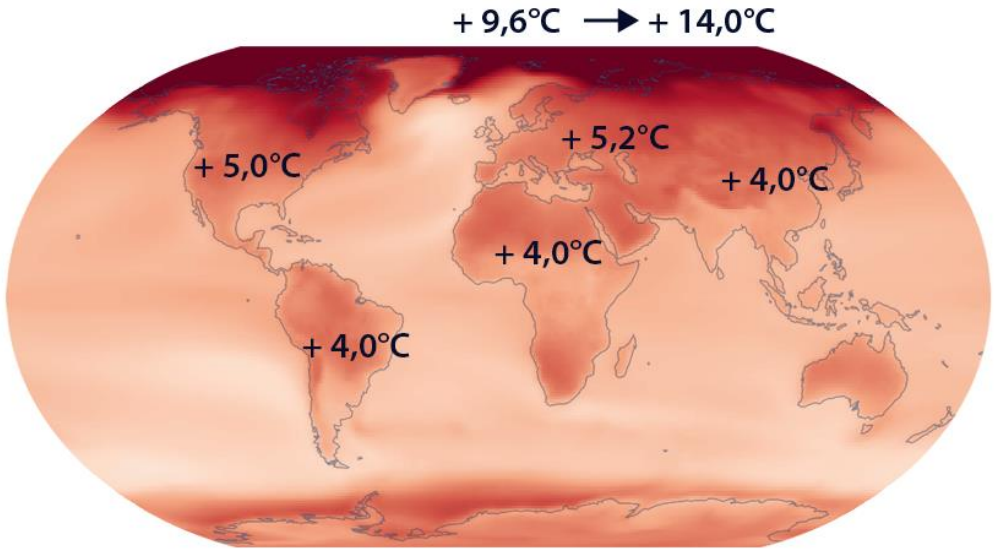
Global warming is not homogeneous

Global warming is not homogeneous

- Here is the projected warming for 2100 with the highest scenario
  - Arctic will be the region that warms the most (+9,6 to +14°C)
  - USA and Europe +5°C
  - Africa India, Brazil +4°C





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INTERGOVERNMENTAL PANEL ON climate change

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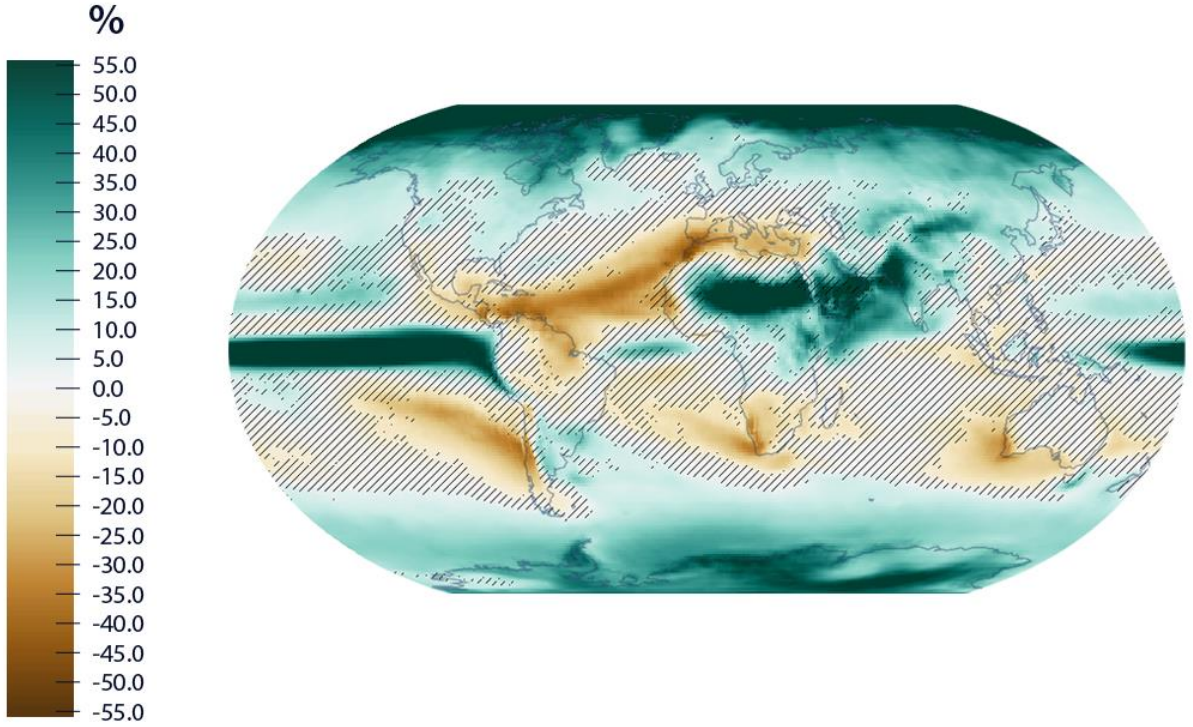
Global warming is not homogeneous

- Here is the projected precipitation changes for 2100 with the warmest scenario
  - South Africa, Australia, Mediterranean region : decreasing precipitation
    - -20% for Mediterranean region
    - -40% for north Africa
    - ⟶ hydraulic stress of vegetation (and population)
  - North Europe, North America : increasing precipitation
    - + 15% for Scandinavia
    - + 20% for north Canada



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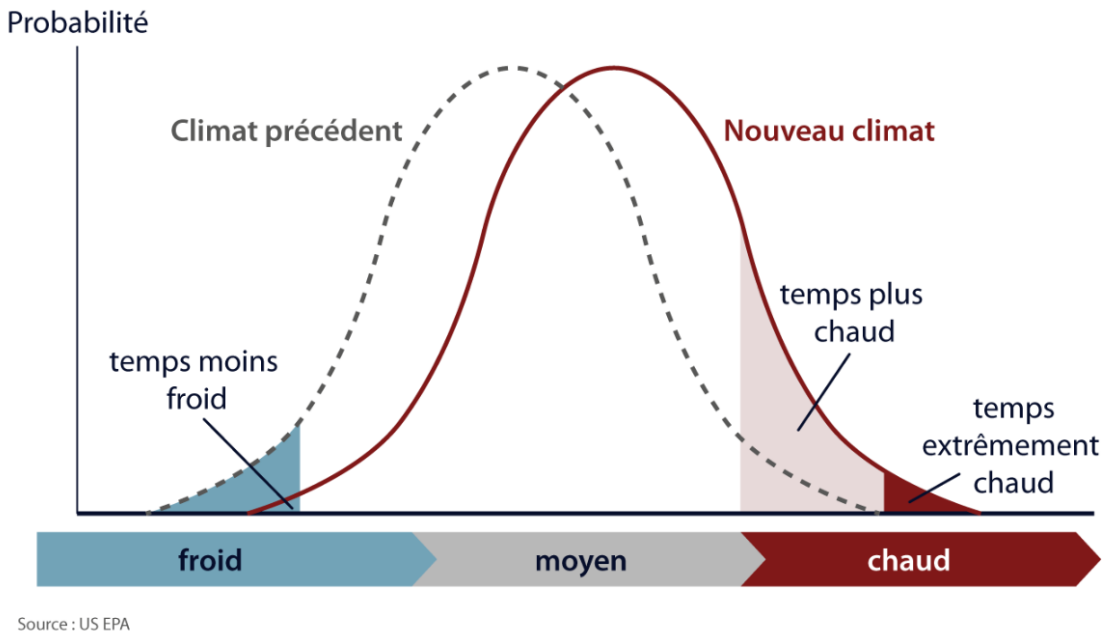
Global warming increase extreme …

- … of temperature :
  - Cold extremes become milder (and less frequent)
  - Hot extremes become even hotter (and more frequent)



Source : US EPA

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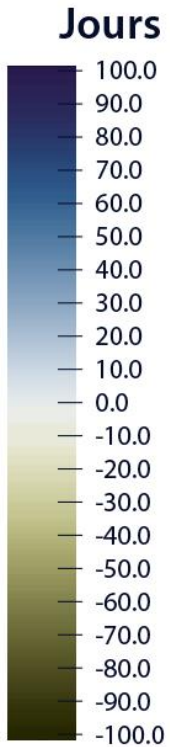
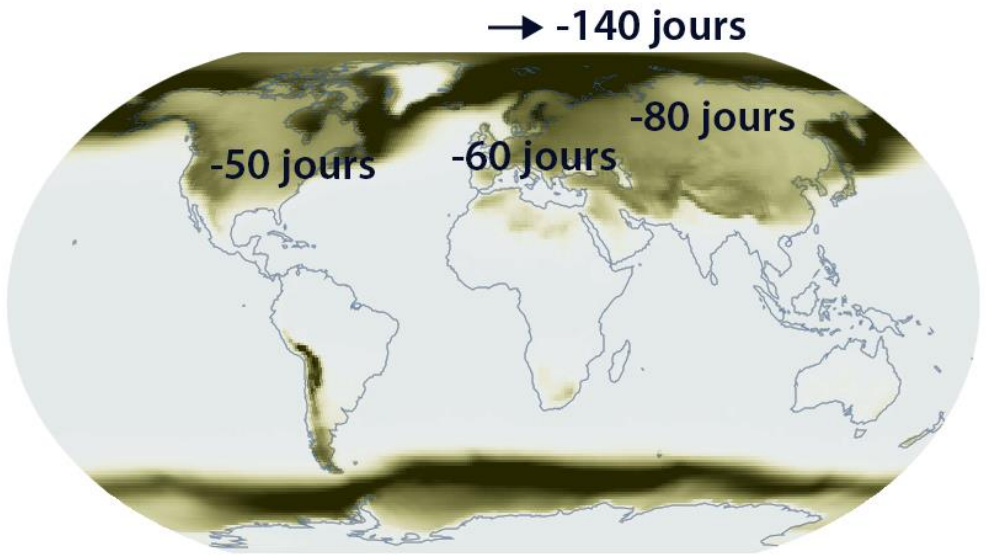
Global warming increase extreme …

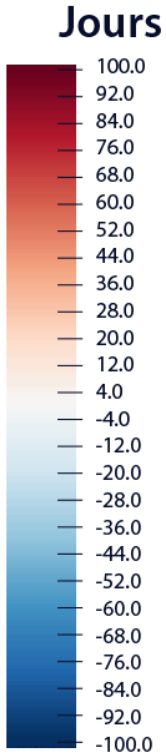
- … of temperature :
  - Cold extreme become milder
    - Nbr of frost days will decrease
      - -60 days for Europe
      - -140 days for Arctic
  - Hot extremes become even hotter

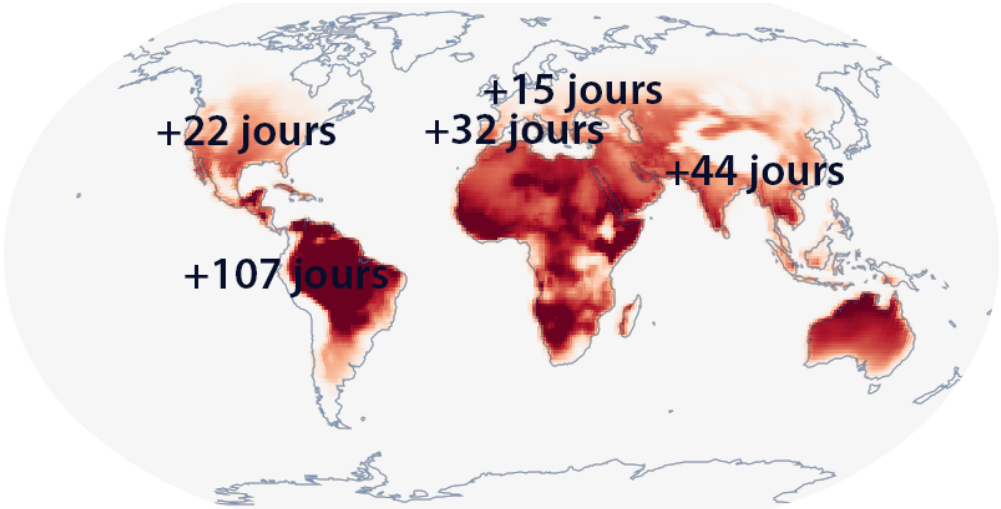




Global warming increase extreme …

- … of temperature :
  - Cold extreme become milder
    - Nbr of frost days will decrease
      - -60 days for Europe
      - -140 days for Arctic
  - Hot extreme become even hotter
    - Nbr of hot days (>35°C) will increase
      - +15 days in Europe
      - +32 days in Mediterranean region
      - +107 days for northern latin america





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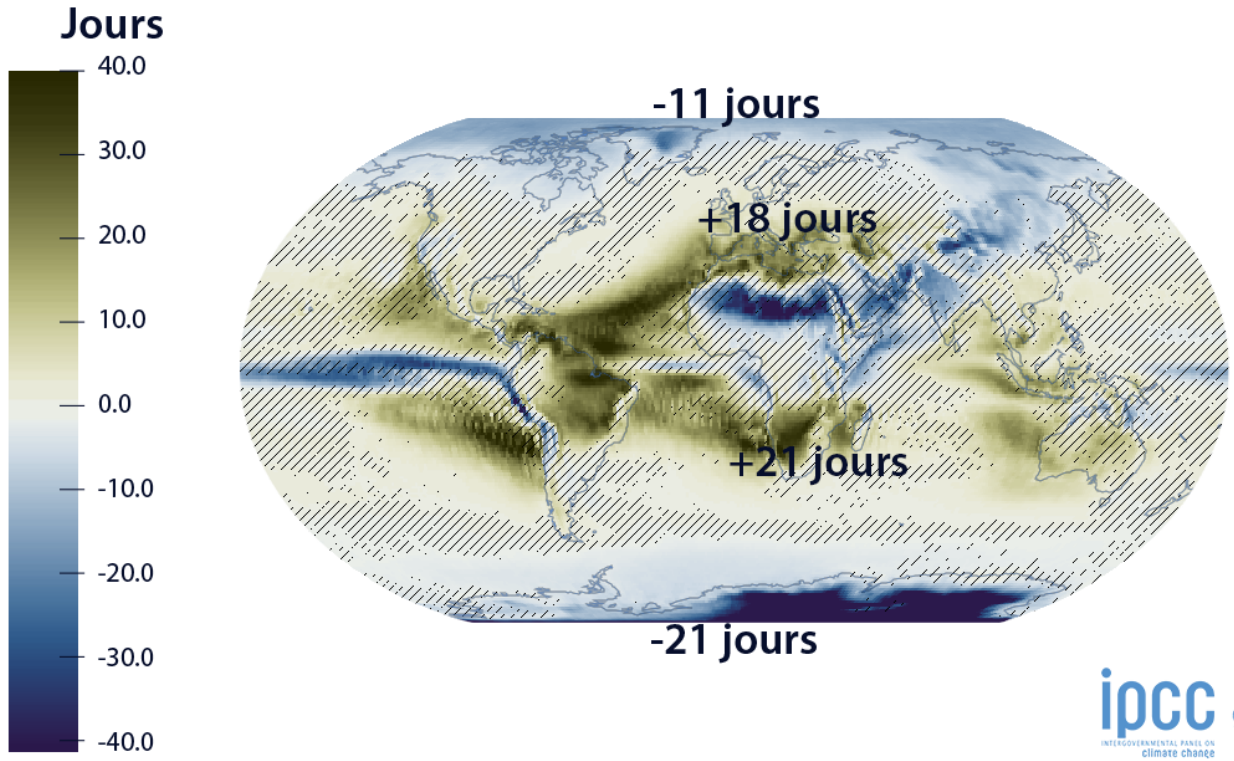
Global warming increase extreme …

- … of precipitation :
  - Lack of precipitation
    - Consecutive days without rain
      - +18 days for Mediterranean regior
      - +21 days in South Africa



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INTERGOVERNMENTAL PANEL ON climate change

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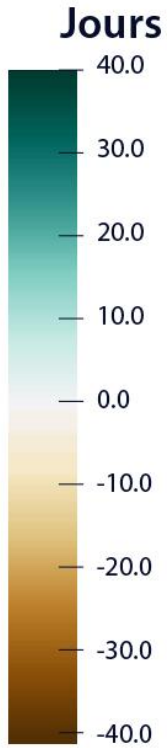
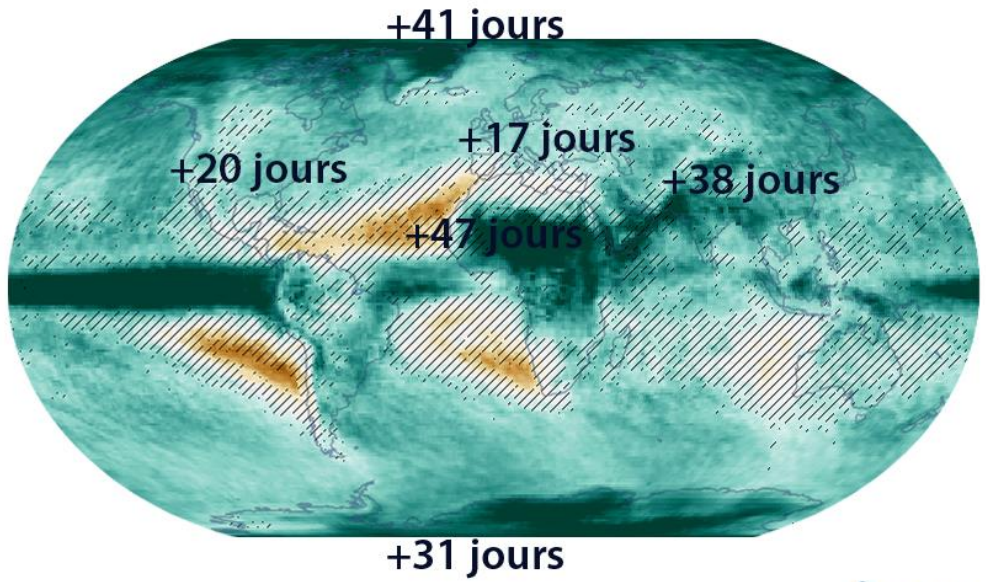
Global warming increase extreme …

- … of precipitation :
  - Lack of precipitation
    - Consecutive days without rain
      - +18 days for Mediterranean region
      - +21 days in South Africa
  - Increase of extreme precipitation
    - Max of precipitation in 5days change
      - +17 days in Europe
      - +41 days in Arctic
      - +20 days in USA





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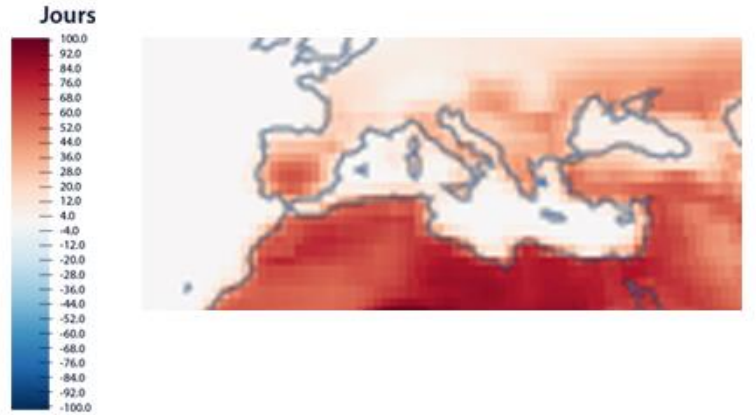
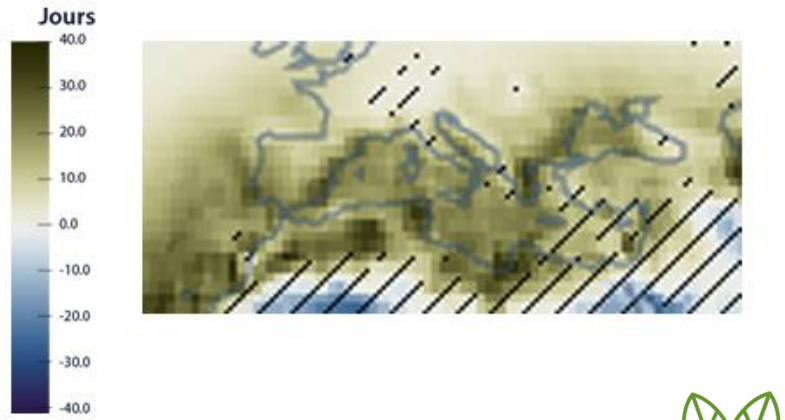
Global warming increase extreme …

- regardless of the climate scenario used, the Mediterranean region will suffer from global warming
  - increase in temperature
  - a concomitant decrease in precipitation
  - an increase in water stress
  - impacts on agriculture
  - impacts on the food of the basin's populations.





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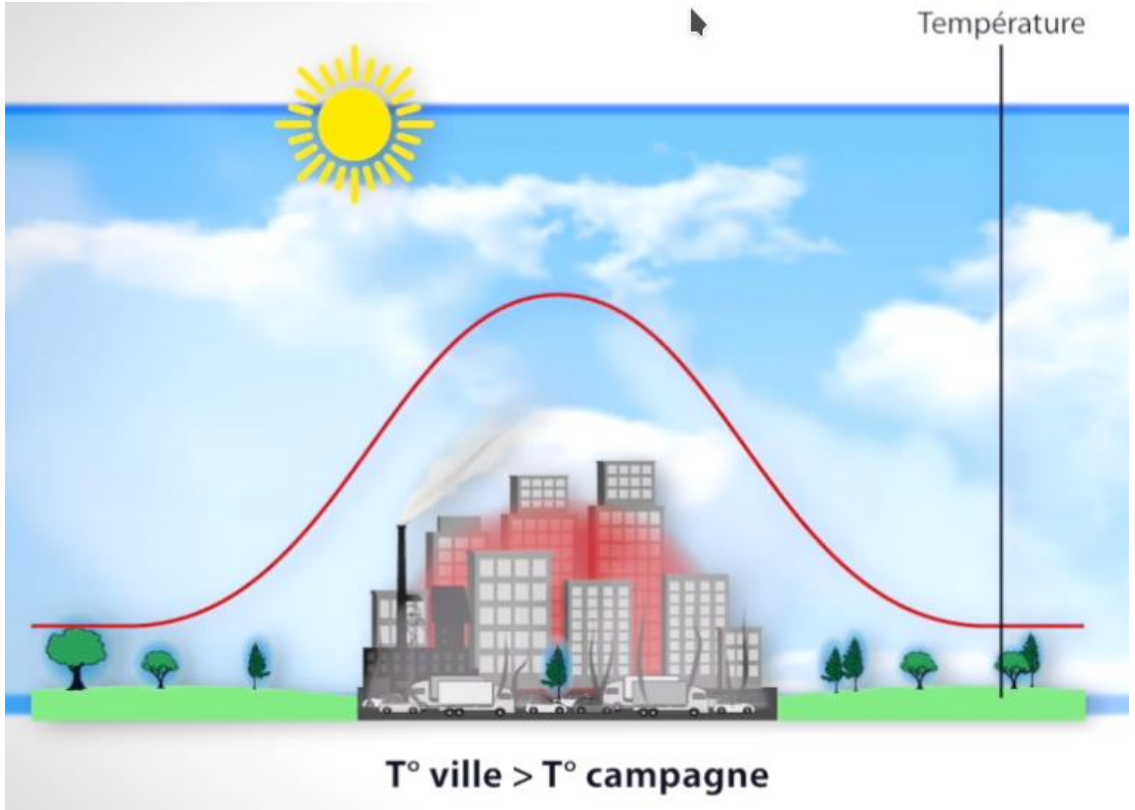
Global warming at local scale ?

The urban heat island

- Temperature in a city is very often higher than temperature in the suburban region
  - Due to :
    - Materials of the city
      - Transmit more heat to atmosphere
    - Human activities
      - which reject heat in atmosphere
    - Urban configuration
      - Which prevents the good ventilation of the city

→ This is the urban heat island (UHI)



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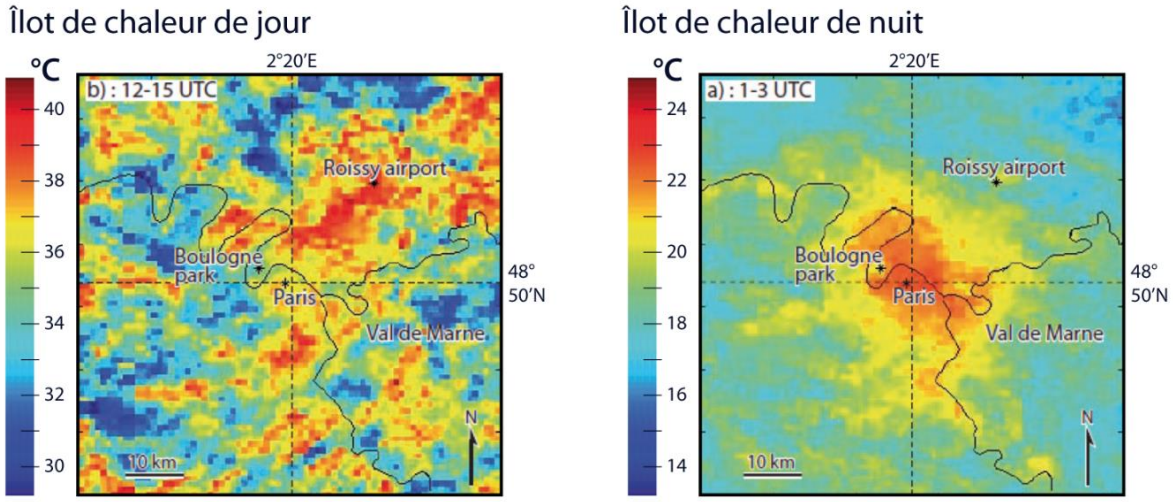
Example of UHI of Paris during the heatwave of 2003

- the urban heat island was 10°C
  - During day :
    - Paris almost reached 40°C during the day
    - Suburban region barely exceeded 30°C
  - During night :
    - Paris recorded Tmin of 25°C
    - Suburban region Tmin 17°C
  - Temperature extremes are obviously very harmful to human health
    - Paris recorded an excess mortality rate of +141%
    - While this rate is +48% for the rest of France.



Source : Laaidi K. Rôle des îlots de chaleur urbains dans la surmortalité observée pendant les vagues de chaleur- Synthèse des études réalisées par l'Institut de veille sanitaire sur la vague de chaleur d'août 2003. Saint-Maurice : Institut de veille sanitaire; 2012. 4 p. Disponible à partir de l'URL: http://www.invs.sante.fr

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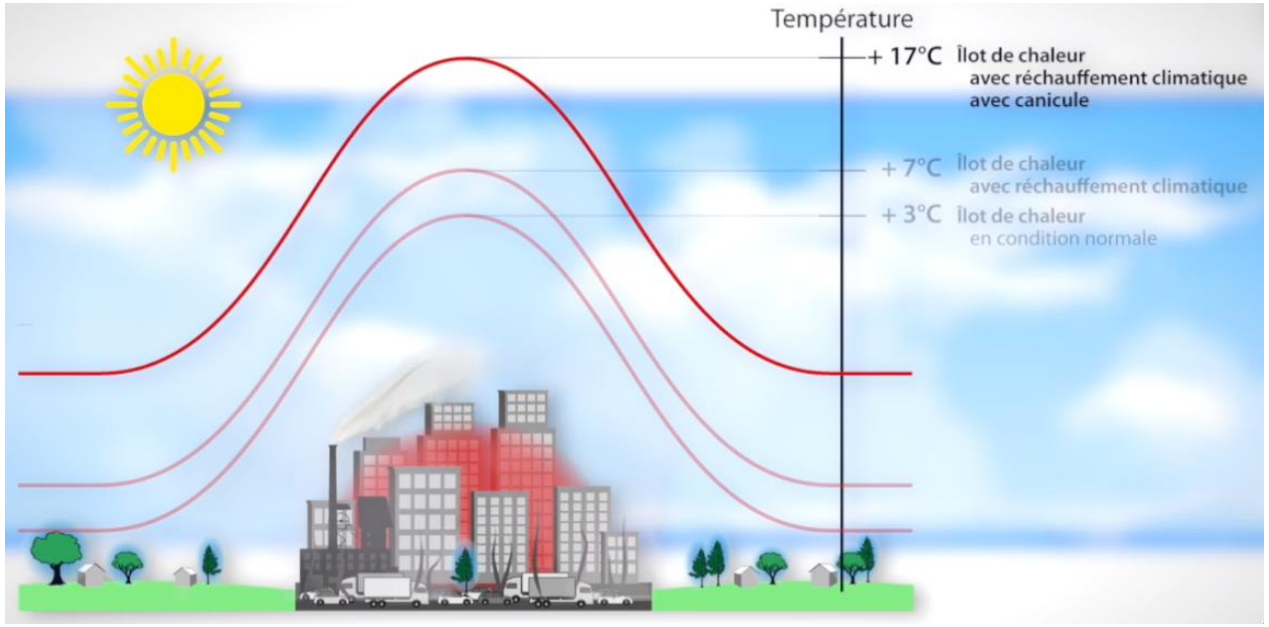
urban heat island + global warming =

- Example of Paris :
  - Average urban heat island = +3°C
  - global warming = +4°C
  - Heatwave = +10°C
  - Total = Paris reach +17°C
  - Ex : 30°C + 17°C = 47°C
- Temperatures in the city will become almost lethal



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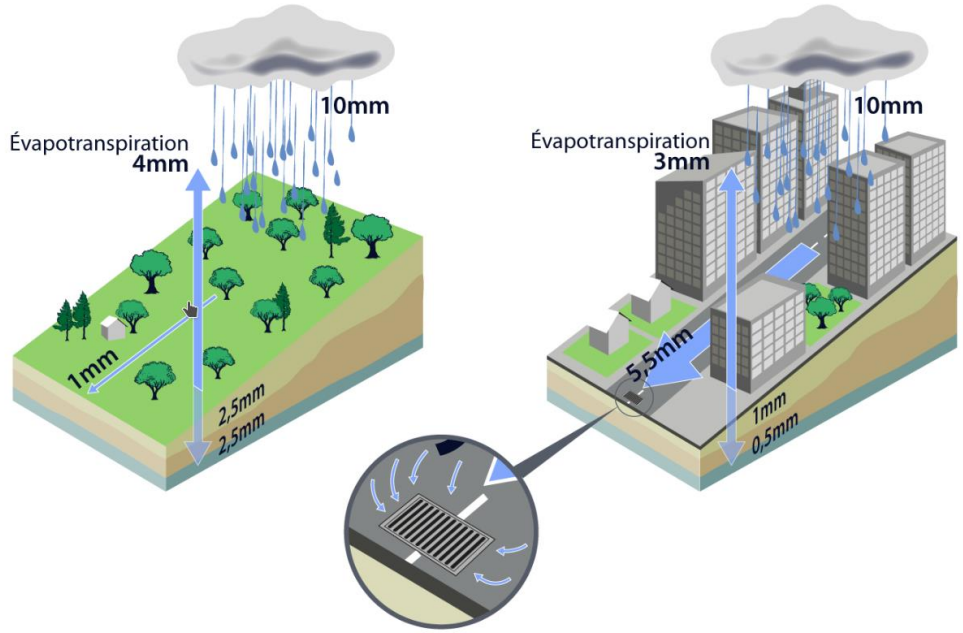
What about urbanization ?

- Rainfall is not absorbed in cities
- Rainfall is concentrated in low points
  - In rural area : 10% run off on the surface
  - In urban area : >55% run off on the surface
- Global warming increases extreme precipitation
  - gutters and sewers can no longer absorb water
  - ⟶ flash floods, like in Dinant 2021 in Belgium

https://www.youtube.com/watch?v=XRL7w4e1af4



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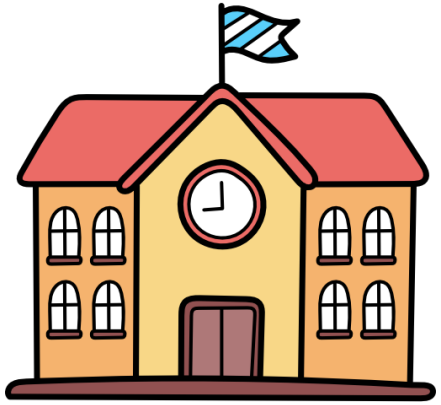
Solutions ?

Solutions ?

- Our choices at local level is important :
  - Urbanization
  - Soil management
- To decrease amplification of impacts of global warming



- At school scale ?
  - Decreasing urbanized area
    - Decrease water run off
    - Increase water infiltration
  - Increasing tree plantation
    - Decrease urban heat island
    - Increase shaded area during heat waves
    - Also increase biodiversity

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