Using the ClimEx Large Ensemble for impact studies in Quebec

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Two case studies

- Impact of climate change on the frequency of occurrence Combined Sewer Overflows (CSO)

- Impact of climate change on heat waves (study realized by Martin Leduc from Ouranos)
Case Study: Combined Sewer Overflow (CSO)
What are Combined Sewer Overflows?
Context and objectives

- Combined Sewer Overflow (CSO) have huge impact on the quality of the receiving water.
- Quebec municipalities can no longer made development that would lead to an increase of CSO frequency.
- Climate change may have an impact of CSO frequency through a change in rainfall event characteristics.
- Development of long term CSO reduction strategy must consider possible impact of climate change.
Link between rainfall event and CSO occurrence

What rainfall events generate CSO?
Which rainfall event do we target to reduce CSO frequency?
ClimEx Symposium 2019

Five rainfall event (RE) categories

<table>
<thead>
<tr>
<th>Rainfall Event (mm)</th>
<th>Long term reduction</th>
<th>No specific control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Light non intense rainfall</td>
<td>Moderate intense rainfall (7 RE/yr)</td>
</tr>
<tr>
<td>10-20</td>
<td>Moderate non intense rainfall (3 RE/yr)</td>
<td>Heavy intense rainfall (5 RE/yr)</td>
</tr>
<tr>
<td>20-30</td>
<td>Heavy non intense rainfall (3 RE/YR)</td>
<td>Long term reduction</td>
</tr>
</tbody>
</table>

2-h maximum rainfall (mm/h)

No CSO (44 RE/yr)
# Changes in RE annual frequency

<table>
<thead>
<tr>
<th>Annual frequency</th>
<th>+2 RE/yr</th>
<th>-2 RE/yr</th>
<th>-5 RE/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No control</td>
<td>To be reduced</td>
<td>No CSO</td>
</tr>
</tbody>
</table>
Case Study: Heat Waves
(study realized by Martin Leduc, Ouranos)
Heat waves as a major health issue: the Paris August 2003 example

Excess mortality increased by 149% in the Paris region!!
Paris-2003 type heat waves for Munich according to ClimEx

Each dot corresponds to a day with Tmax > 33.5°C and Tmin > 19°C

Prob. to have a Paris-2003 type heat wave or worse in Munich in 2003 less than 2% (1/50)
Paris-2003 type heat waves for Munich according to ClimEx

Prob. to have a Paris-2003 type heat wave or worse in Munich in 2050 ≈ 2/50 = 4%
Paris-2003 type heat waves for Munich according to ClimEx

Very long heat wave (48 days!!!)

Prob. to have a Paris-2003 type heat wave or worse in Munich in 2099 ≈ 34/50 = 68%
Key messages

CSO reduction

• Small reduction of the number of rainfall event targeted for CSO control
• Possible increase in CSO volume

Heat wave

• Probability to have Paris-2003 type heat wave in Munich increase rapidly between 2050 and 2100
• Very long heat wave possible by the end of the century
• Do not take into consideration urban heat island effect
• Huge impact in term of public health