Joint approach to climate change adaptation in the Meuse basin

AMICE project

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In the last episode...
Scenarios of climate change and Rainfall-runoff scenario:
2020 – 2050 / 2070 – 2100

Hydraulic modelling

Economical impact assessment: cost of inaction

Climate-proofing of existing and planned measures

Proposition of an internationally agreed adaptation strategy for water management
Hydraulic models

Questionnaire
Hydraulic models available from spring to mouth
Steady modelling in Wallonia

<table>
<thead>
<tr>
<th></th>
<th>Main stream</th>
<th>Flood plain</th>
<th>Modelling mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>1D</td>
<td>Storage cells</td>
<td>Unsteady</td>
</tr>
<tr>
<td>W</td>
<td>2D ($\Delta x = \text{max. 5 m}$)</td>
<td></td>
<td>Steady</td>
</tr>
<tr>
<td>FL</td>
<td>1D</td>
<td>Storage cells</td>
<td>Unsteady</td>
</tr>
<tr>
<td>NL</td>
<td>1D</td>
<td>1D Cross sections</td>
<td>Unsteady</td>
</tr>
<tr>
<td></td>
<td>(2D Waqua / Not in AMICE)</td>
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<tr>
<td>GE</td>
<td>1D</td>
<td>Storage cells</td>
<td>Unsteady</td>
</tr>
</tbody>
</table>
Hydraulic models

Main gauging stations have more than 30 years of measurements (100 years in Borgharen)

Applied statistical methods differ along the Meuse; Nevertheless reasonable agreement at the borders

Offsets in altitude due to different system of reference:

\[ Z_W = Z_F + 1.794 \text{ [m]} \rightarrow \text{Topographic measurement of the gauging station in Chooz} \]

\[ Z_{W,FL} = Z_{NL} + 2.32 \text{ [m]} \rightarrow \text{Confirmed by both W and NL partners, as well as historical data} \]
Hydraulic modeling procedure

→ Trade-off methodology, combining unsteady and steady modelling, in accordance with

• existing practice in each region
• the storage capacity of the floodplains
• enabling parallel (instead of sequential) runs of the models
• ensuring reasonable continuity of the results at the borders
Explanations of differences and how to solve them
Inundation extents along Lanaken - Kessenich

Significant increase on the left bank (FL)

No change on the right bank (NL)

Effect of dikes

- Green: Q100
- Yellow: Q100+15%
- Red: Q100+30%
Return of experience

Maximum water elevation (m) at the F-W border

• Let the technicians discuss – no politics!
• Be open about your model’s characteristics, updates, parameters
• Extra bilateral meetings are required (web tools)
• Accept that your own model can be improved
• Do not forget the purpose of the study: the additional impact of climate change
Hydraulic modeling results

- Mean changes in water depth

<table>
<thead>
<tr>
<th>Location</th>
<th>2021-2050 Q100 + 15%</th>
<th>2071-2100 Q100 + 30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper part</td>
<td>+ 0.3 m</td>
<td>+ 0.5 m</td>
</tr>
<tr>
<td><em>Upstream of Sedan</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central part</td>
<td>+ 0.6 m</td>
<td>+ 1.3 m</td>
</tr>
<tr>
<td><em>Sedan → Monsin</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower part</td>
<td>+ 0.3 m</td>
<td>+ 0.7 m</td>
</tr>
<tr>
<td><em>Downstream of Monsin</em></td>
<td></td>
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</tr>
</tbody>
</table>
Flood impact assessment

- Damage functions
  - Section scale
    - Failure-based approach
  - Basin scale
    - No consideration of failure
    - Failure-based approach
      - Direct
        - Tangible
          - Mobile
            - Price/ha, price/m²
              - National data
              - IKSM approach
            - Territory specific
          - Immobile
        - Intangible
      - Indirect

- Flood
  - Transnational scenario
  - Land-uses
    - 2071-2100
    - 2021-2050
    - National databases
    - Corine Land Cover
      - Q100
      - Q50
      - Q25
      - 6 categories
      - 44 categories

- Partially common approach

- Insurance damage declarations?
- Property prices estimates?

Flood damage
Return of experience

HYDRAULIC MODELING

Juxtaposition
Return of experience

DAMAGE CALCULATION

Overlapping method

+
In the next episode …

Low-flows impact assessment

- **Navigation:**
  - Pumping costs at sluices
  - Waiting times at sluices

- **Energy:**
  - Discharge / temperature thresholds for cooling water

- **Agriculture:**
  - Losses on yield

- **Drinking Water**
  - Additional costs when drinking water extraction has to be stopped
Flood crisis management transnational exercise

• Dates: between November 2\textsuperscript{nd} & November 10\textsuperscript{th}
• Flood scenario: Q100 + 15%
• Virtual exercises
• On-field practices: voluntary base
• Unexpected incidents: France only?
• New software / platforms
• Observers
Works have started …
Works have started …
Adaptation of the Meuse to the Impacts of Climate Evolutions

Thank you for your attention

www.amice-project.eu