Using urban runoff simulations for addressing climate change impacts on urban runoff quality in a Swedish town

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Urban stormwater quality

Build-up

Wash-off

Rain characteristics

Climatic changes
Approach

Using an urban runoff model for comparing sets of stormwater quality simulations for a test catchment and the current and future climate scenarios
SWMM-engine

• Developed in the 1970s
• Successfully applied for the simulation of stormwater processes
• Hydrographs are calculated based on physical properties
• Build-up during dry days; wash-off and transport of pollutants during rain events
Best practical estimates for quality parameters (TSS)

21 rain events with relatively short return intervals

Modification by increasing the intensity by 20%

Changes for, runoff flow, event mean concentration (EMC) and wash-off load
<table>
<thead>
<tr>
<th>Event</th>
<th>Depth [mm]</th>
<th>Duration [h]</th>
<th>60 min max Intensity [mm/h]</th>
<th>Change Runoff [%]</th>
<th>Change Wash-off load [%]</th>
<th>Change EMC [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>7.8</td>
<td>4.6</td>
<td>26.6</td>
<td>33</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>14.9</td>
<td>3.3</td>
<td>8.1</td>
<td>77.3</td>
<td>75.8</td>
<td>-0.9</td>
</tr>
<tr>
<td>3</td>
<td>39.4</td>
<td>8.3</td>
<td>18.8</td>
<td>42.2</td>
<td>14.8</td>
<td>-19.3</td>
</tr>
</tbody>
</table>
Changes for wash-off load

![Graphs showing changes in percentage and absolute change related to 60 min max intensity.](image-url)
Changes for EMC

![Graph showing the relationship between 60 min max intensity [mm/h] and change EMC [%]. The graph includes data points and a linear trend line with an R² value of 0.9313.](image)
Summary

- A changing climate characterized by higher intensity storms influences the simulated stormwater quality.
- Stormwater quality for frequent low-to-medium intensity storms was sensitive to climate changes.
- Rain events with a high intensity and volume show decreasing EMCs for the climate change scenario studied.
- Pervious areas are likely to have a significant influence on the runoff and pollution generation processes.
- Significant implications for stormwater management.
Thank you for your attention!