

# Advanced real-time precipitation components for urban hydrological applications as part of a digital twin for the city of Hanover

*Composantes avancées de l'information sur la précipitation en temps réel pour des applications hydrologiques urbaines dans un jumeau digital pour la ville de Hanovre*

## Digital Twin components:

### #1 Present State

What is the current state of the sewage infrastructure?



### #2 Acute Measures

How do we react in case of an extreme event?



### #3 Planning and Adaptation

What is the long-term adaptation need for our sewage system?



Sewer system

Sewage treatment plants

Surface flooding

Recommendations for actions

Risk analysis for scenarios of extreme events

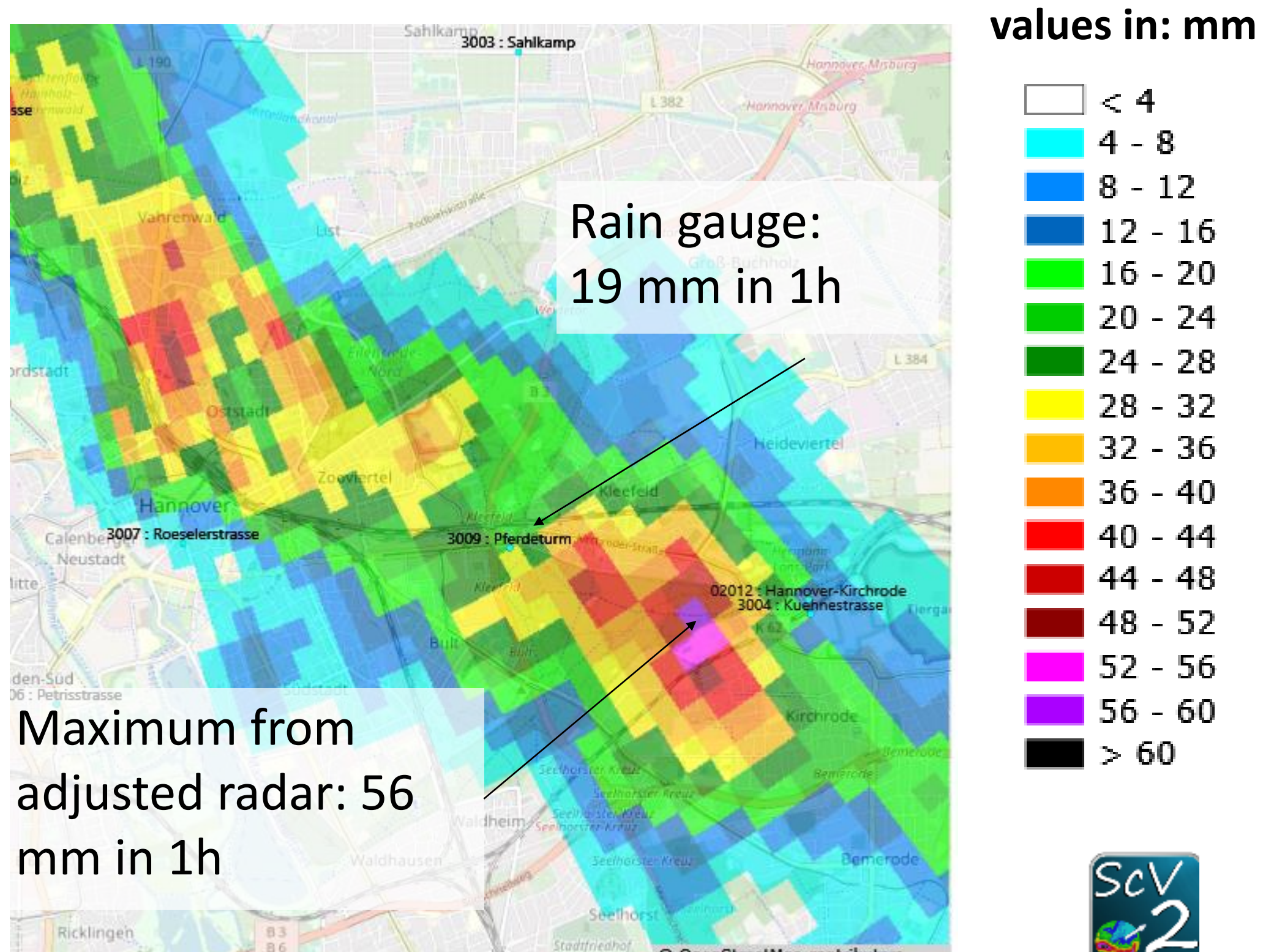
#### Precise measurements

Weather radar data from DWD: polar scan data with resolution 250m x 1°, 5 min, & real-time post-processing:

- Correction filters for clutter, beam blockage etc.
- Advection correction
- Quasi-Adjustment with station data from a dense rain gauge network from SEH and DWD

#### Ensemble Nowcasts

Radar based ensemble nowcasts with a lead time of up to 2 hours, blended with numerical weather predictions (ICON-D2-EPS) for longer lead times of up to 48 hours



**The heavy rain event of the 16th June 2020** caused flooded cellars and streets in Hanover, numerous fire brigade operations, and overflow of combined waste water. Radar measured precipitation amount was up to 56 mm over 1 hour in the corrected and adjusted radar sum.

**Left:** 1-hour radar precipitation sum from 13:40-14:40 UTC with resolution 250m x 1°, corrected and adjusted with the software SCOUT (hydro & meteo)

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The joint research project Zwille aims to support the management of water extreme events building up a digital twin of the drainage infrastructure for the city of Hanover in Germany.

It is supposed to give an integrated view of the current state of the infrastructure with sewer system and sewage treatment plants under the respective current hydrological and meteorological conditions and under future extreme scenarios.

An AI-based assistant is being developed using the information of the data and simulations in the digital twin together with formalized expert knowledge to derive comprehensible recommendations for actions.

The target users are employees of the municipal wastewater company of Hanover («Stadtentwässerung Hannover SEH»).