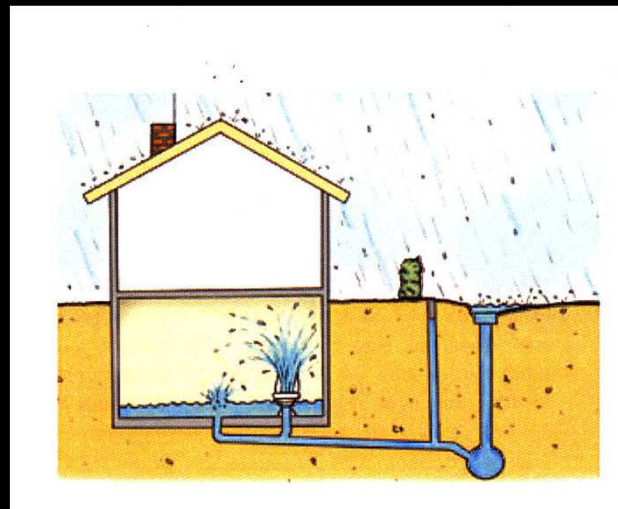


# **Downscaling of Short-term Precipitation Time Series for Climate Change Impact Assessment**



**J. Olsson<sup>1</sup>, L. Gidhagen<sup>1</sup>, A. Kawamura<sup>2</sup>**

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**<sup>2</sup>Tokyo Metropolitan University, Tokyo, Japan**

# Outline

- Urban hydrology
- Climate change
- Rainfall downscaling by Delta Change
- Automated system
- Future work



Sustainable Urban Development Planner for Climate Change Adaptation

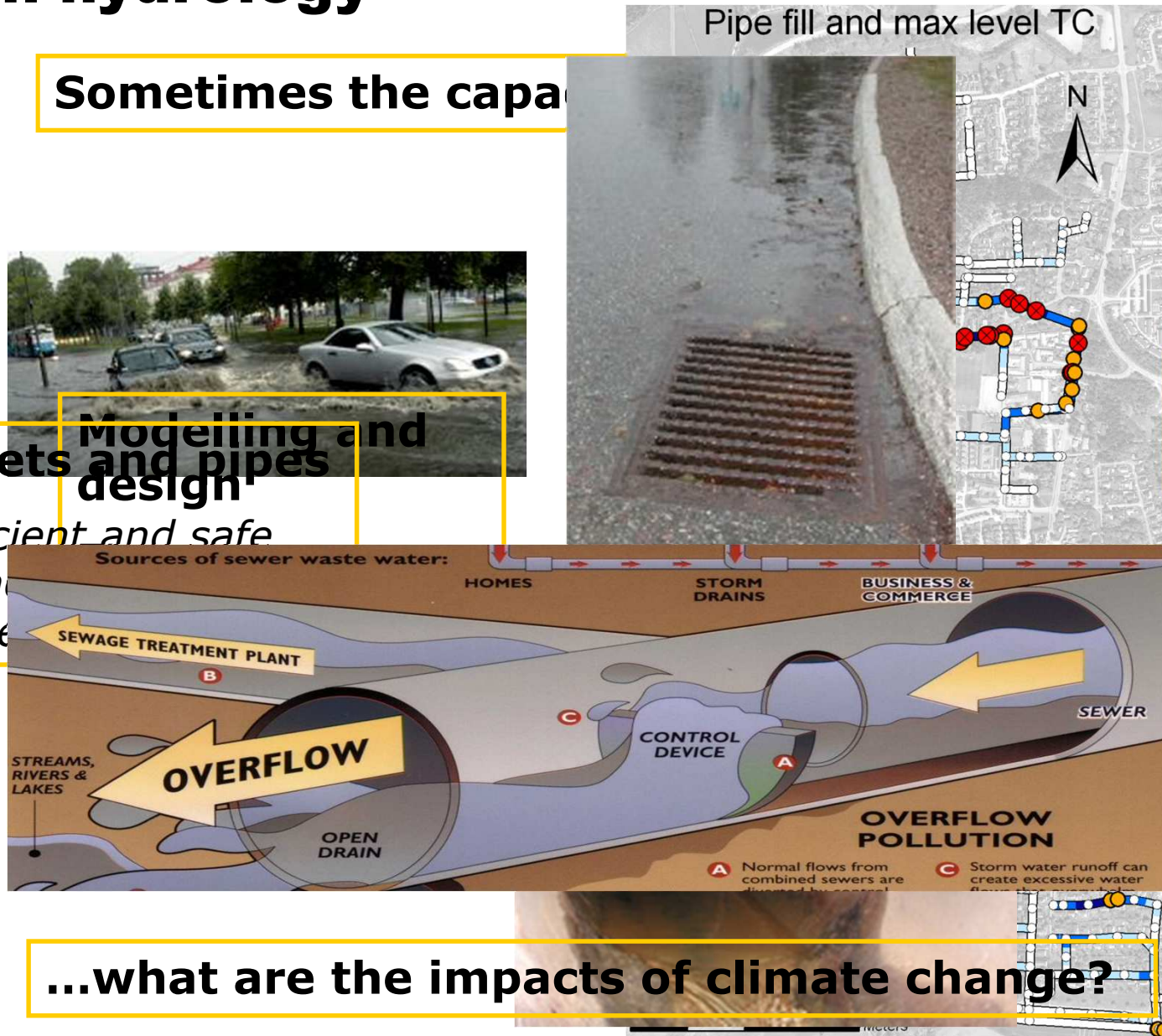
# Urban hydrology

SMHI

Sometimes the capacity

Inlets and pipes  
Modelling and design

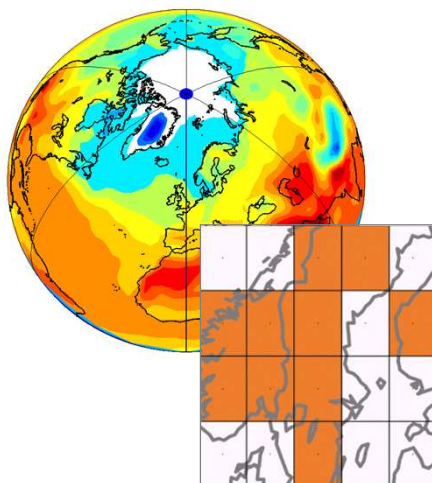
Efficient and safe  
removal of  
waste water



...what are the impacts of climate change?

# Climate modelling

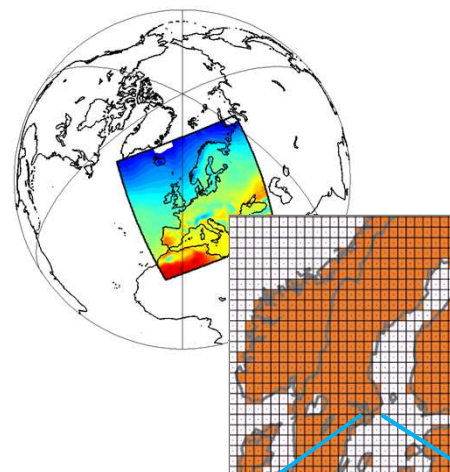
**GCM**



**Dynamical  
downscaling**



**RCM**



**Local precipitation extremes  
(e.g. in sewer system design)**



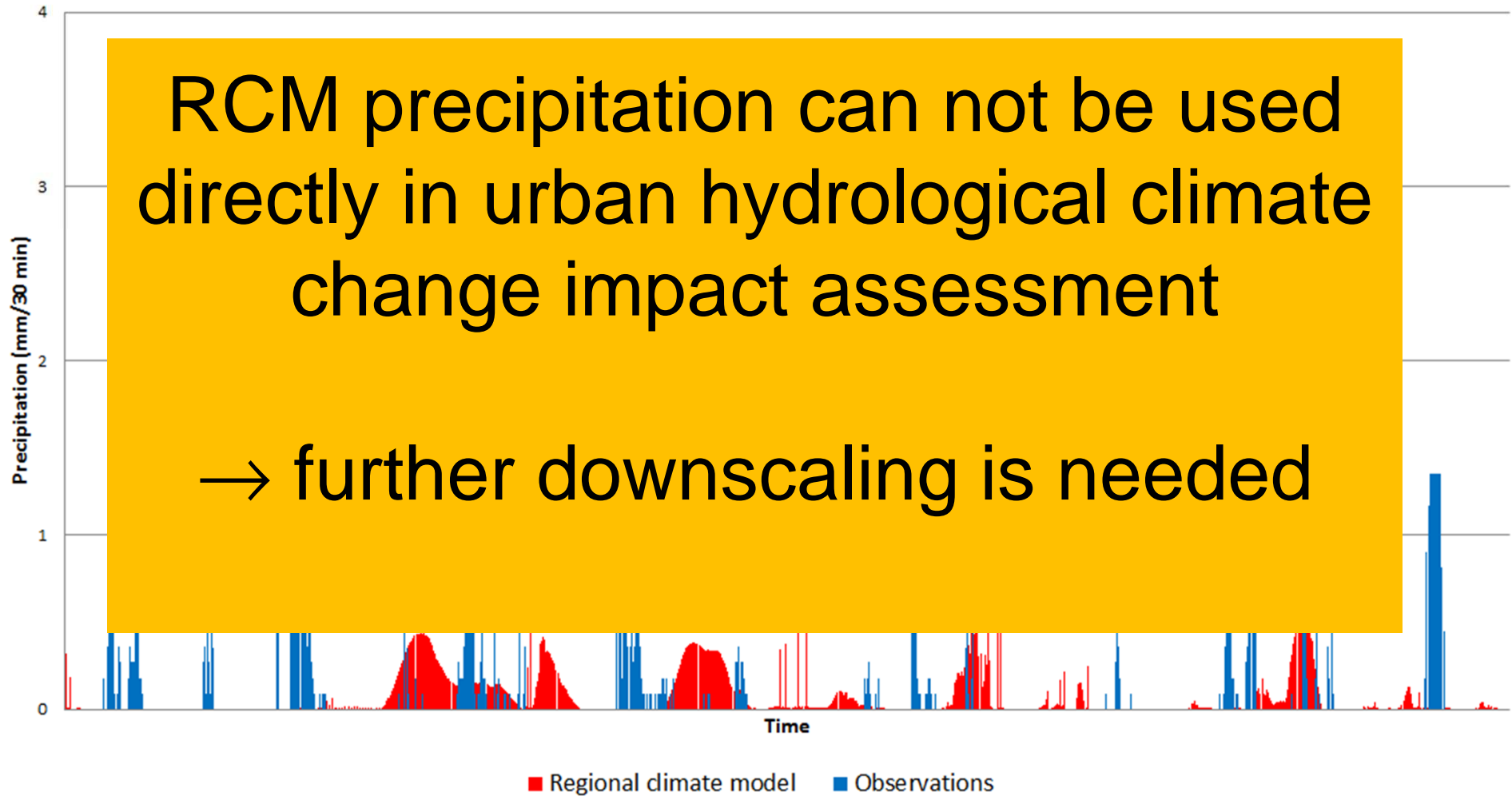
**Area: 200 cm<sup>2</sup>**



**Area: 1000-2000 km<sup>2</sup>**

# Precipitation data, an example

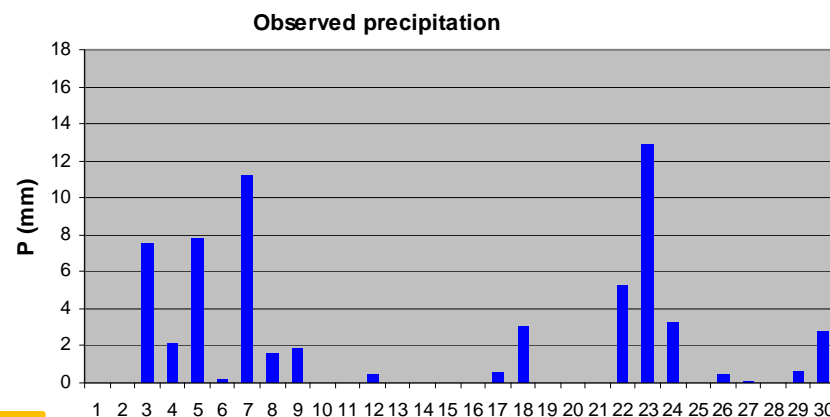
30-min precipitation during 3 weeks



# Delta Change – principal approach

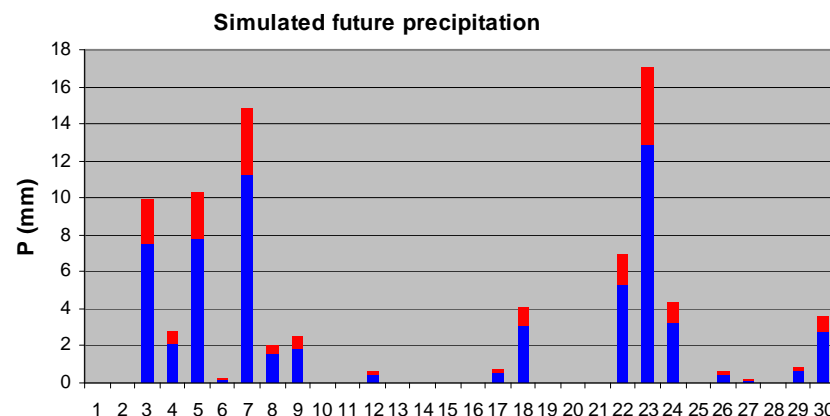
- Modify historical observations in line with the change found in climate model scenarios

Observed local time series:



Estimate change from RCM grid-scale data:  
*e.g., the mean rainfall will increase by 33%*

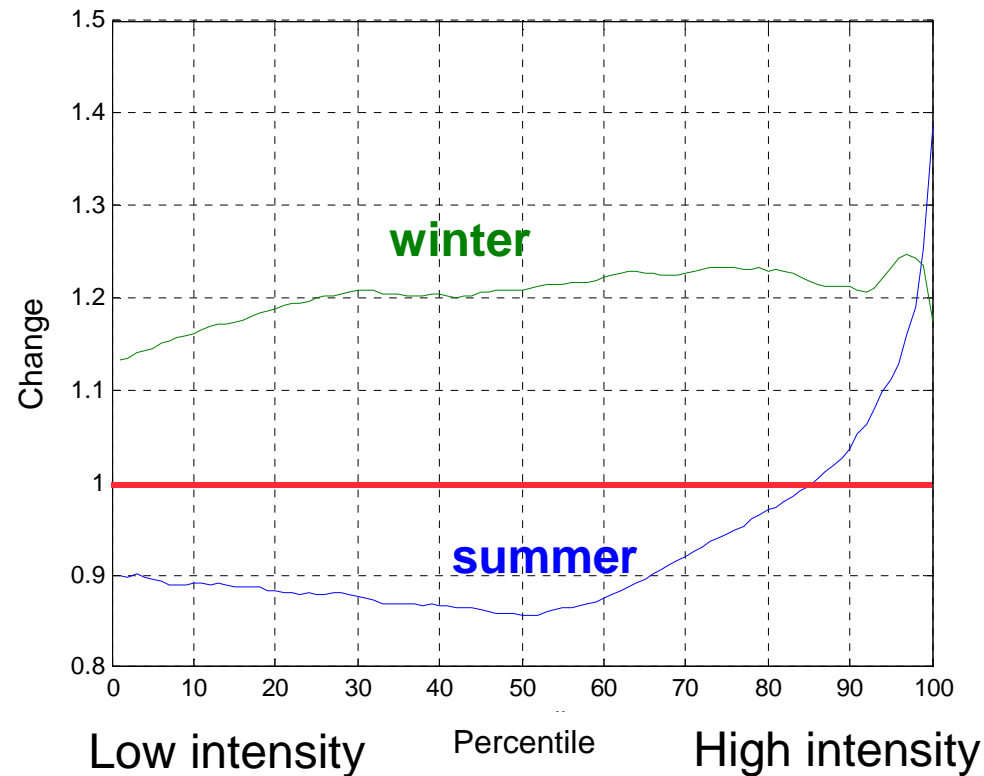
Downscaled local time series:



# Delta Change – SUDPLAN approach

- Modify historical observations in line with the change found in climate model scenarios

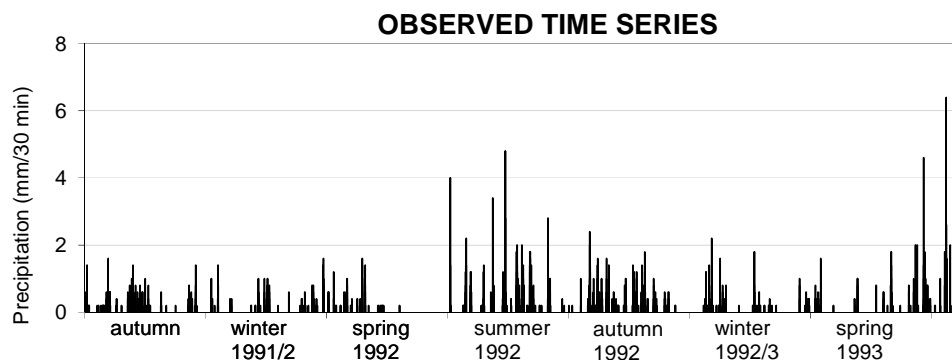
*Treat different seasons and intensity levels separately*



# Automated Delta Change system

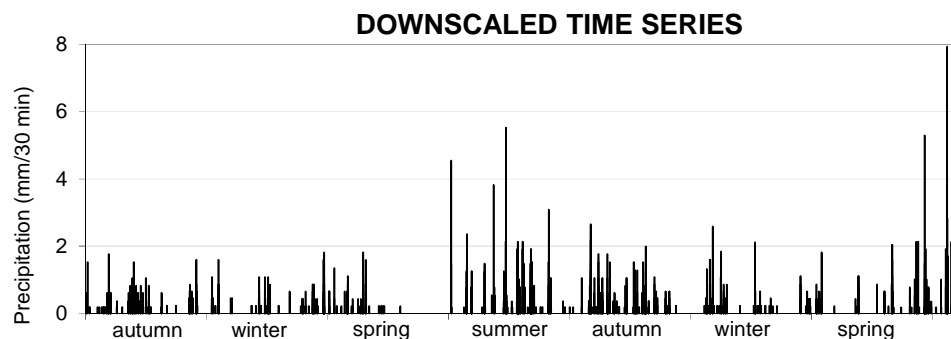
- Observations uploaded by the user are modified by Delta Change to represent future climate conditions

TODAY'S CLIMATE



SUDPLAN Common Services

FUTURE CLIMATE  
(emission scenario,  
time period)



REFERENCE ☒ —

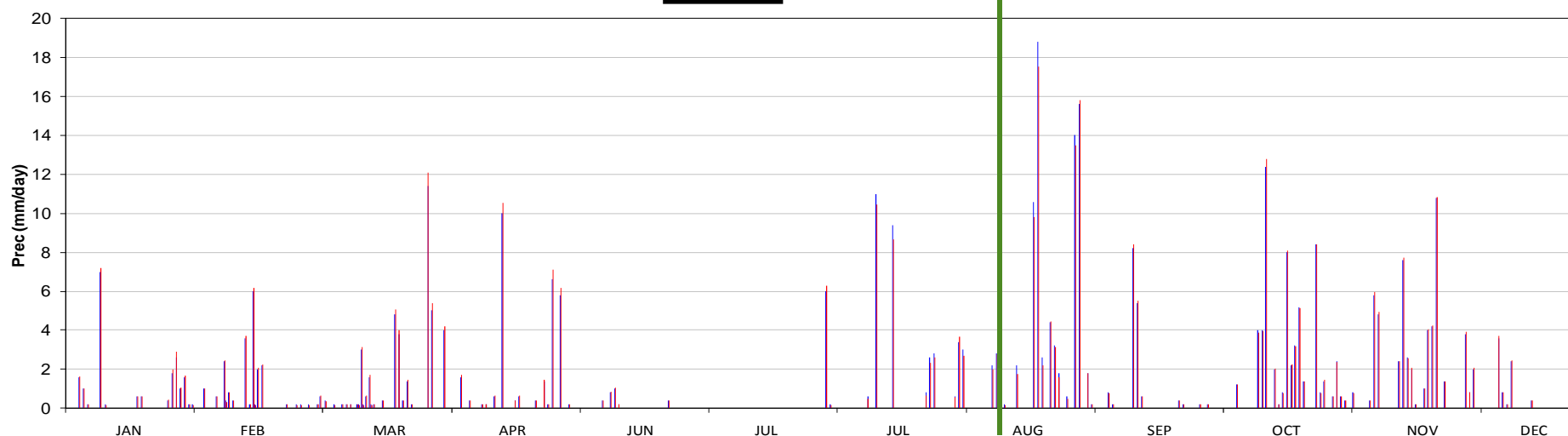
SCENARIO1 ☒ —

SCENARIO2 ☐ —

Year2

DAY GRAPH  
SLIDER

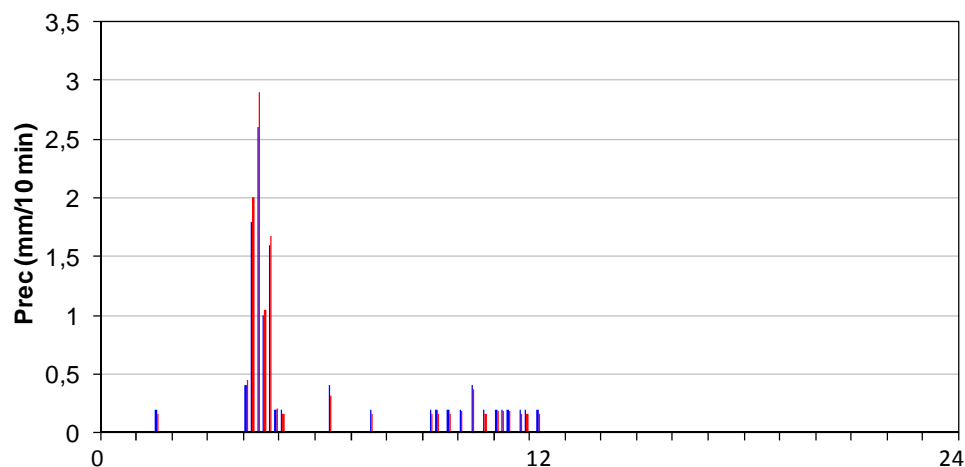
Station: Stockholm  
Reference period: 1991-2004  
Target period: 2061-2074



Year1 Year2 Year3 Year4 Year5 Year6 Year7 Year8 Year9 Year10 Year11 Year12 Year13 Year14

YEAR GRAPH  
SLIDER

Aug 13

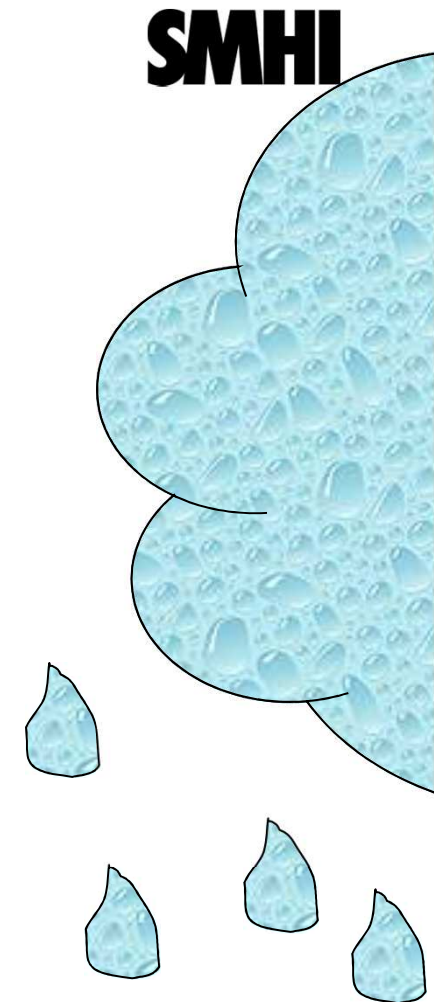


General precipitation changes  
From REFERENCE to SCENARIO1

	Total	Maximum	Frequency
Winter (Dec-Feb)	+26%	+27%	+9%
Spring (Mar-May)	+14%	+16%	+7%
Summer (Jun-Aug)	-14%	+20%	-16%
Autumn (Sep-Nov)	+22%	+36%	+4%

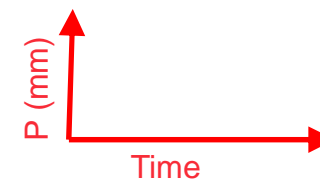
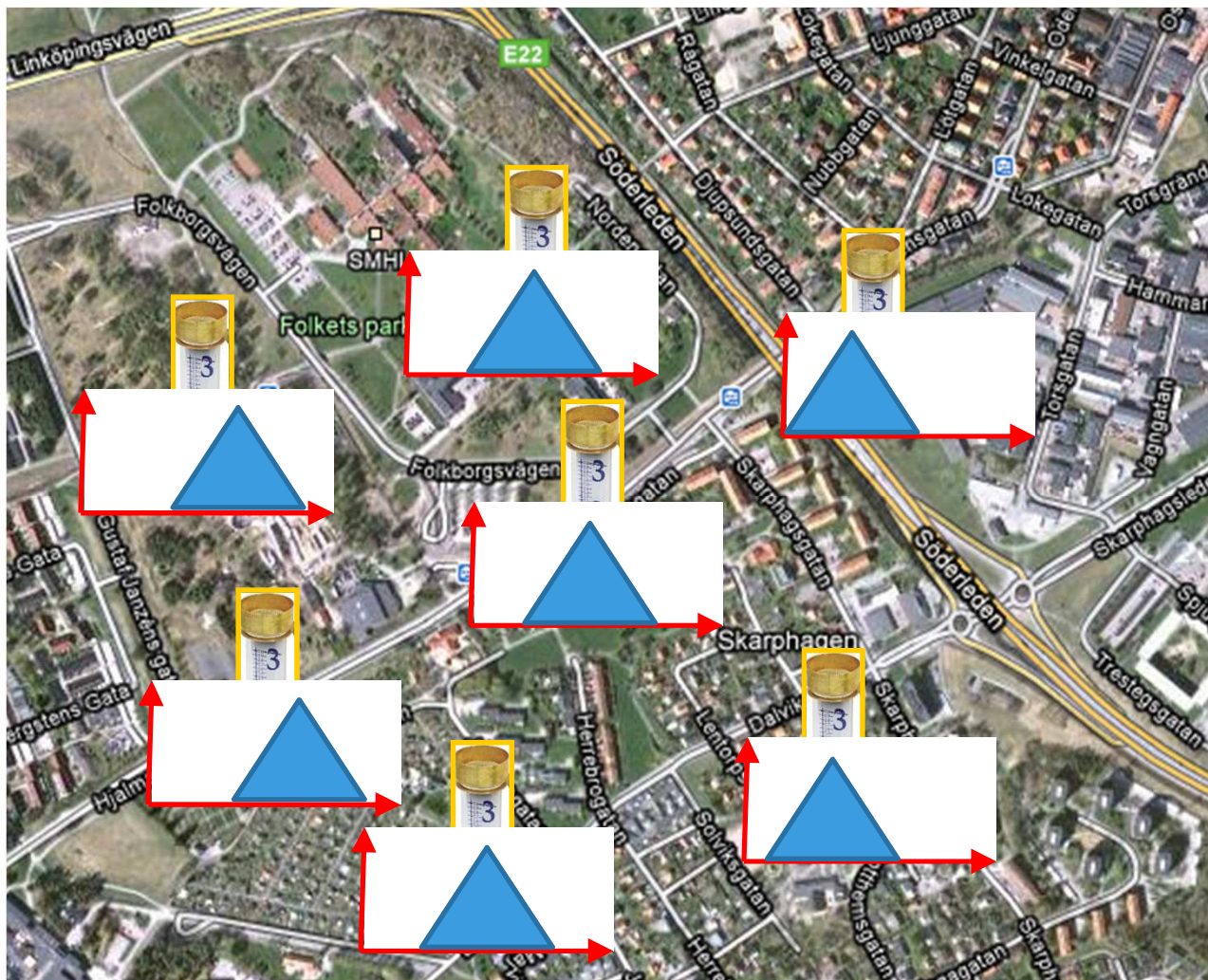
# Next step: dynamic design storm

- Simulate the passage of a rain storm over a catchment



# Dynamic design storm

- The climate change impact will be estimated by Delta Change



## Concluding remarks

- Downscaling of RCM precipitation is required for urban hydrological climate change impact assessment
- Delta Change is a practical approach to RCM precipitation downscaling
- In SUDPLAN, an automated system for Delta Change downscaling is being developed
- The system will be able to downscale both long time series and single extreme events in entire Europe
- The spatial resolution of RCMs is rapidly increasing, potentially making further downscaling redundant

# Thank You!