Integrated modellng and control in real-time control and warning for urban areas – a case study from Aarhus, Denmark

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Drivers

…Rapid city development

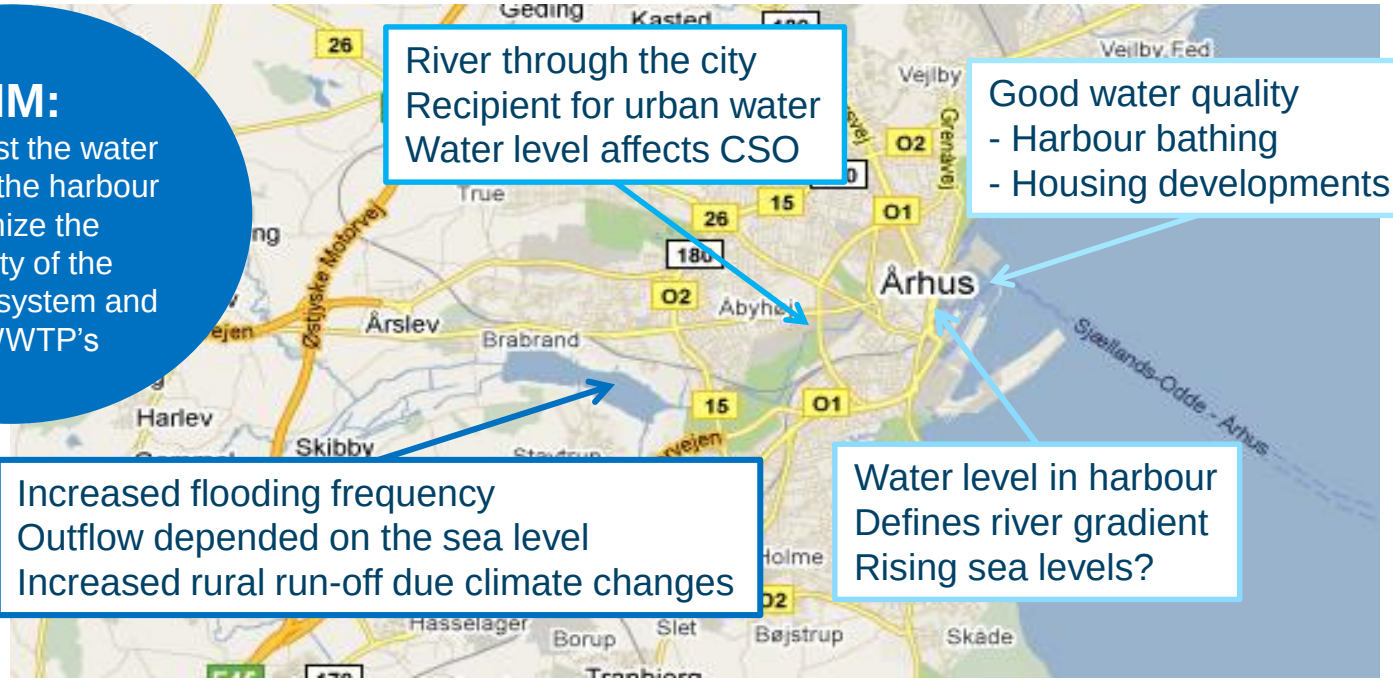
…Integrating water into the urban space

…New housing area on the harbor front

… Recreational use of water

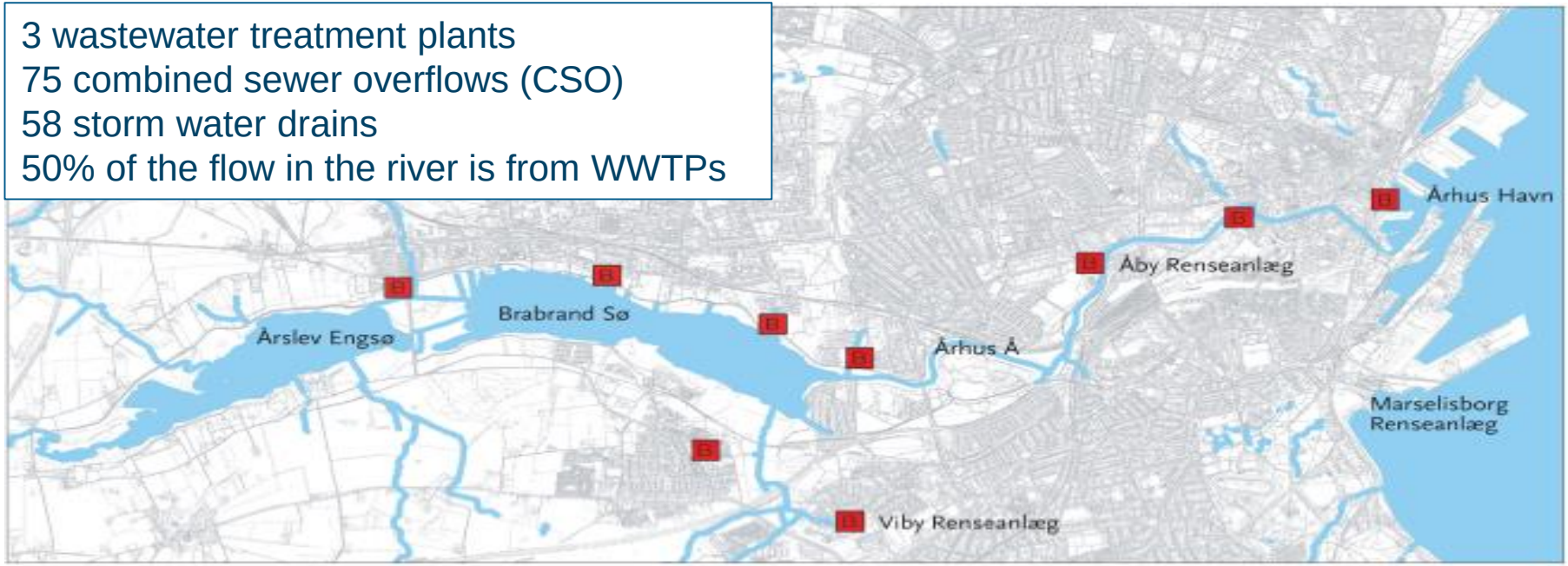
Boundary conditions

AIM:
To forecast the water quality in the harbour
Optimize the capacity of the drainage system and the WWTP's

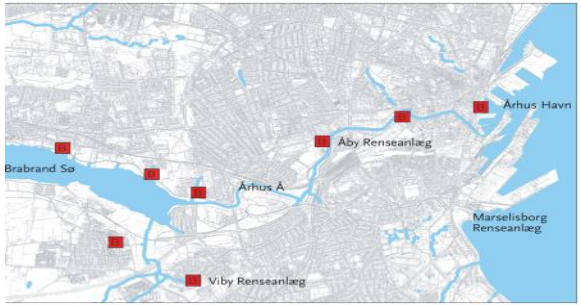


Challenge – Recreational water is receiving water

3 wastewater treatment plants
75 combined sewer overflows (CSO)
58 storm water drains
50% of the flow in the river is from WWTPs

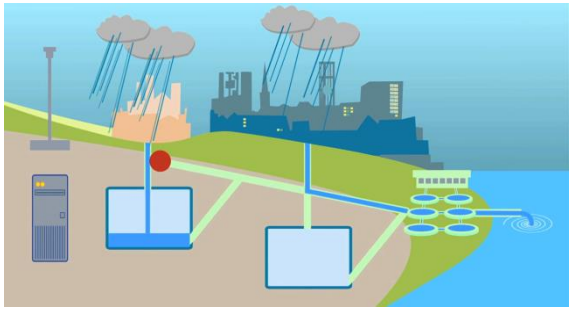


3 projects - 1 solution



…Analysis and design
2006-2007

…Implementation of infrastructure
2007-2012

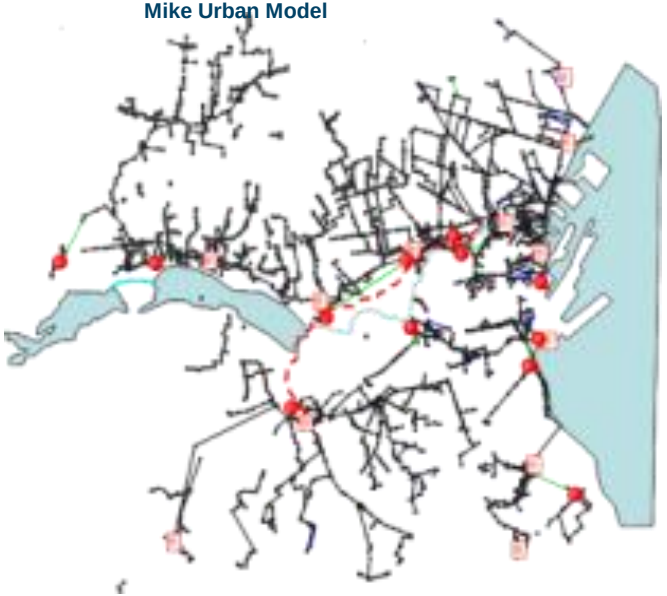


…Integrated modelbased control and warning
PREPARED
2009-2013

Finding the right solution

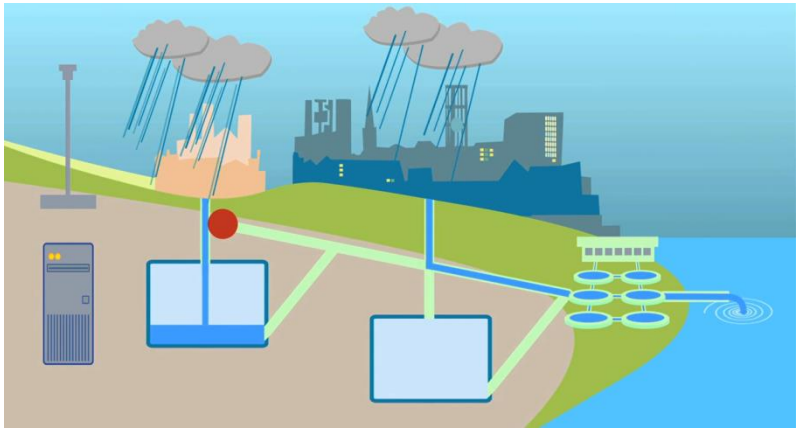
- Multiple scenario analysis based on integrated modelling
  - Retention basin volumes
  - System layout
  - WWTP capacity
  - Storm water system upgrade
  - Removal of CSO structures
  - Disinfection of WWTP effluent
  - Climate scenarios

Mike Urban Model

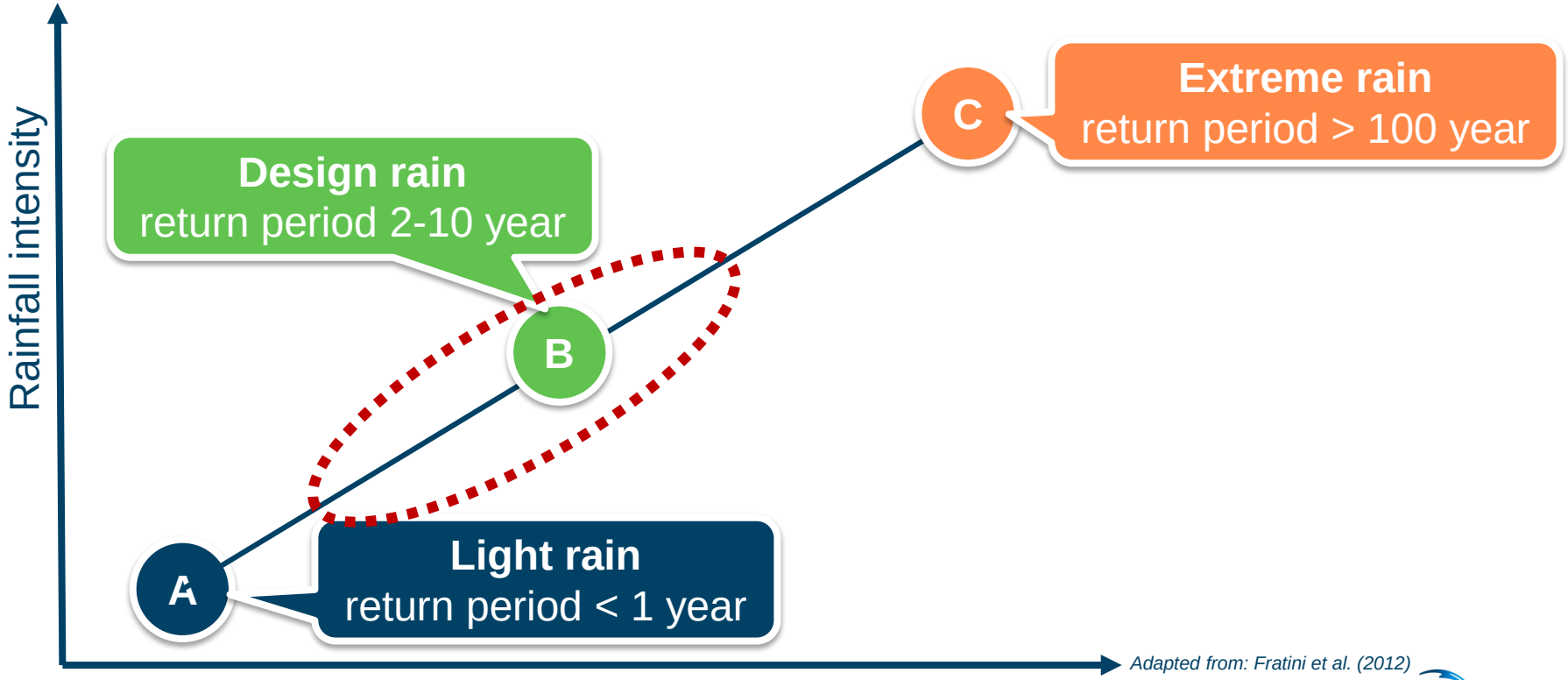


Solution - 50 mill. EUR project 2009-2013

- Infrastructure investment
  - 9 retention basins
  - Disinfection at WWTPs and basin
  - Increased hydraulic capacity at WWTPs
- Optimized control System
  - Integrated real time modelling/control (sewer system/WWTP)
  - Early Warning System



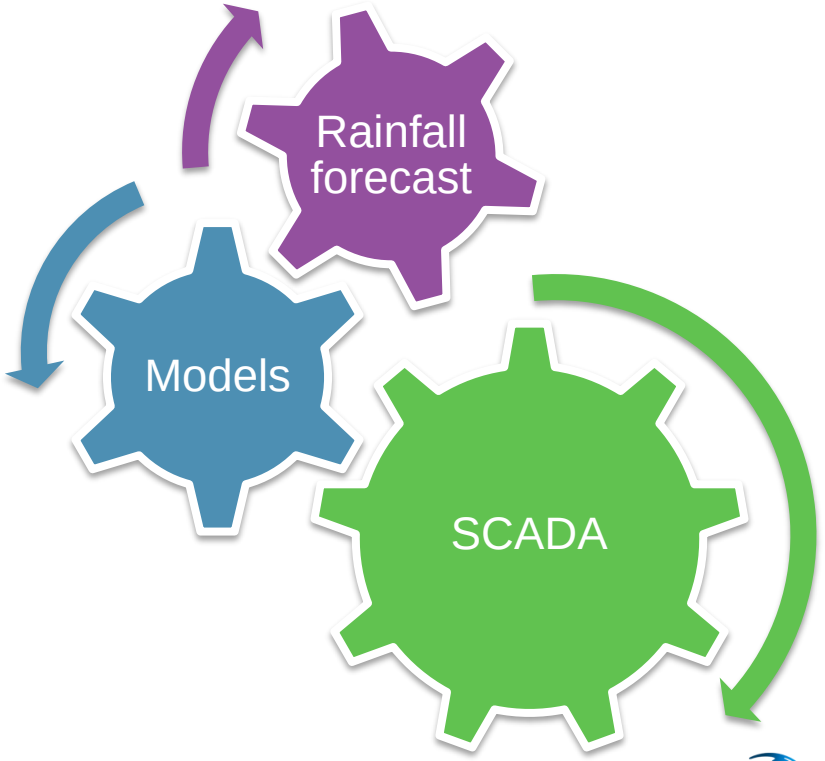
Domain of urban control



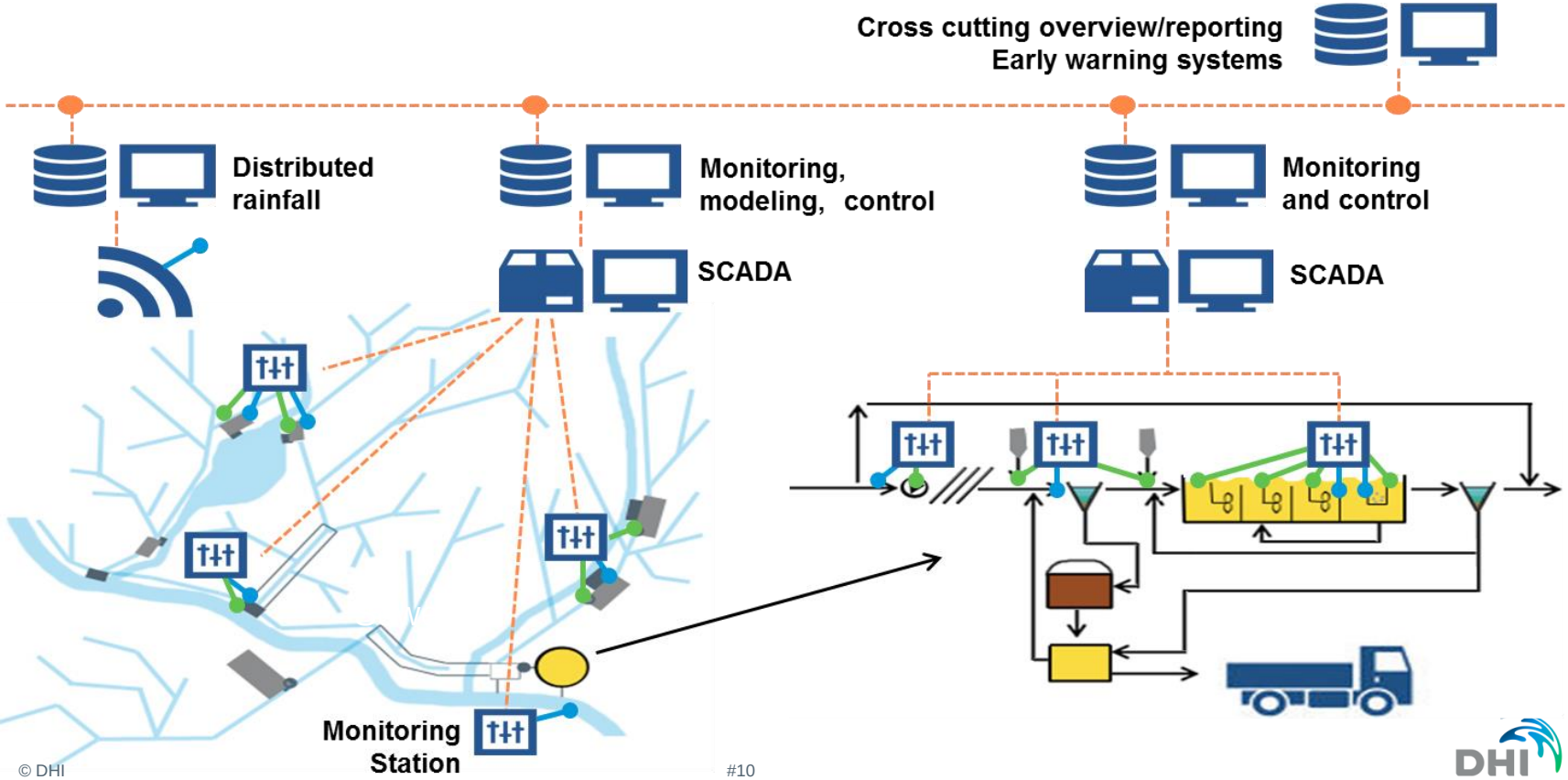
Adapted from: Fratini et al. (2012)

Integrated Real Time Control System

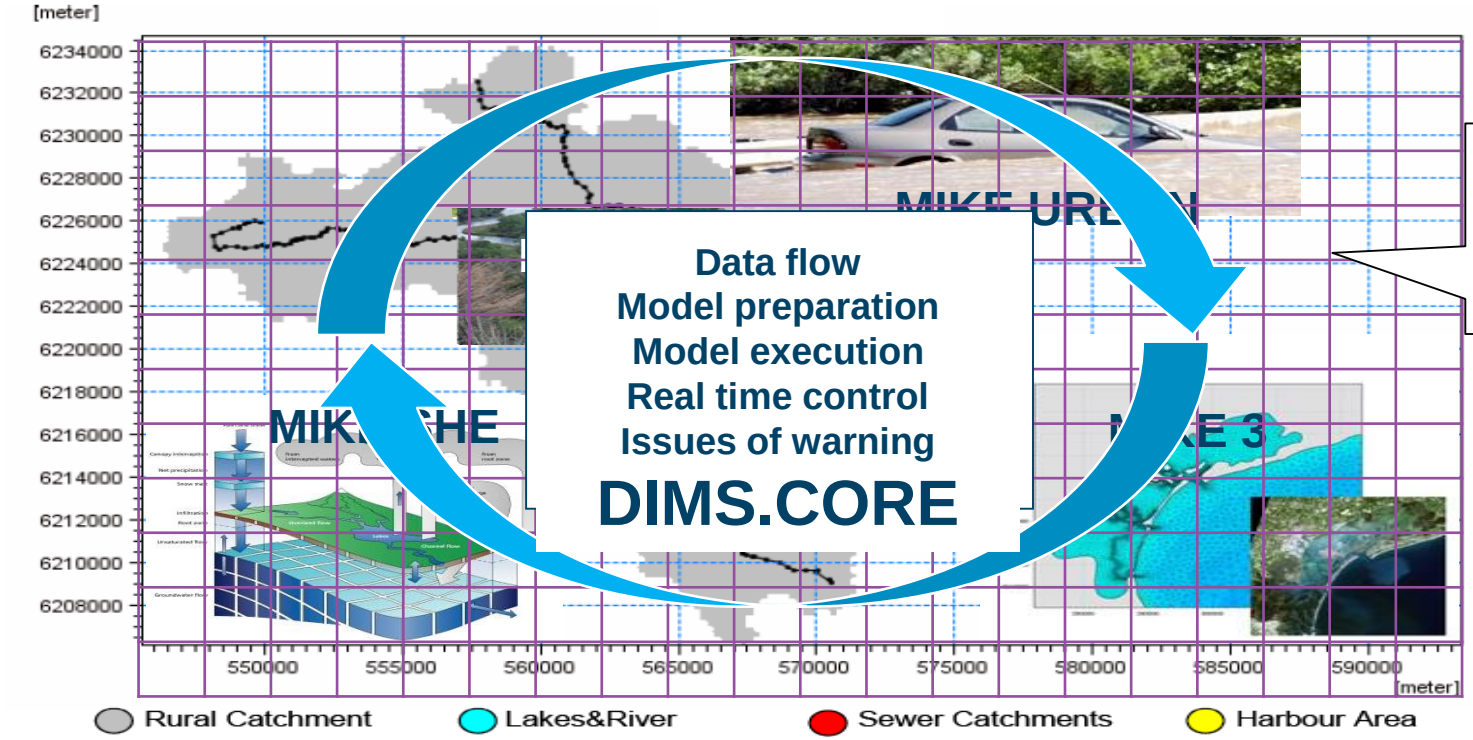
- Automated operation of:
  - Data collection
  - Data processing
  - Model execution
  - Finding the optimal solution
  - Control of structures
  - Issue warnings



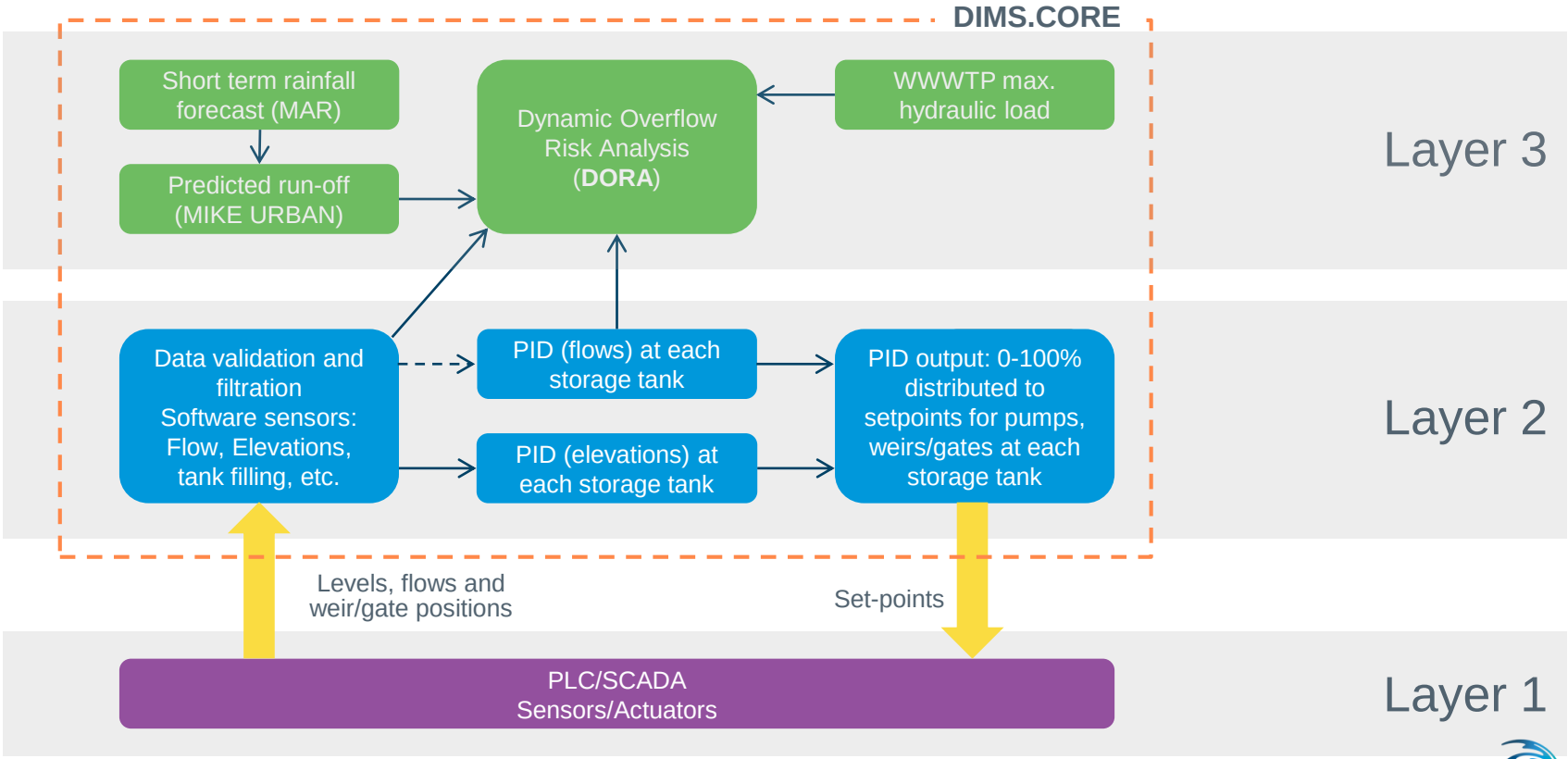
Integrated real-time control of urban waters



Automated Integrated Modelling

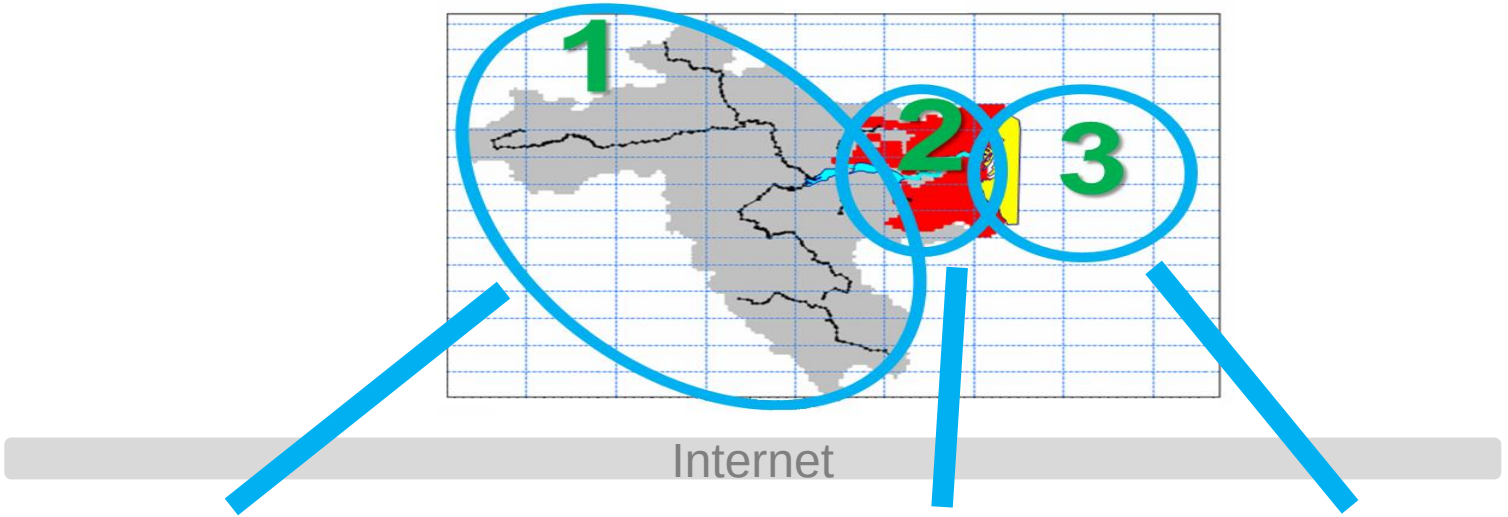


Real-Time Integrated Control



One warning system -

Integrating data from multiple organizations and authorities



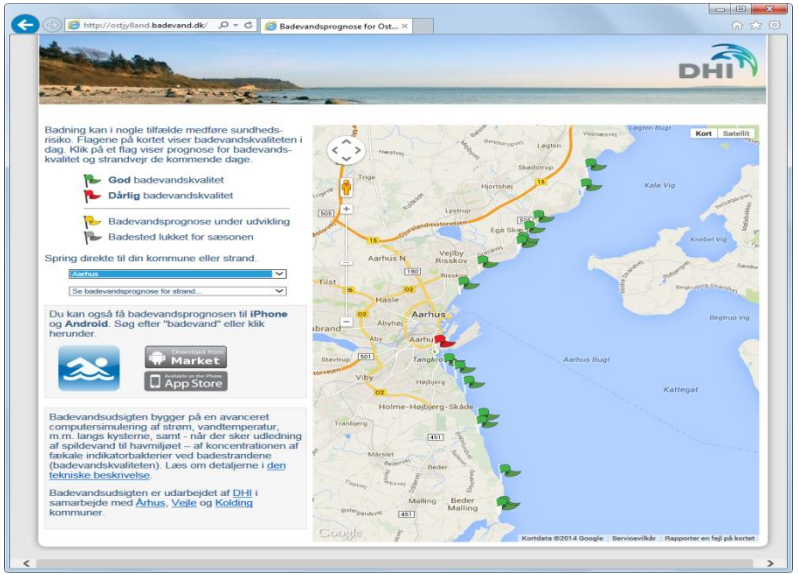
Environmental Section
Aarhus Municipality

Aarhus Water
Utility company

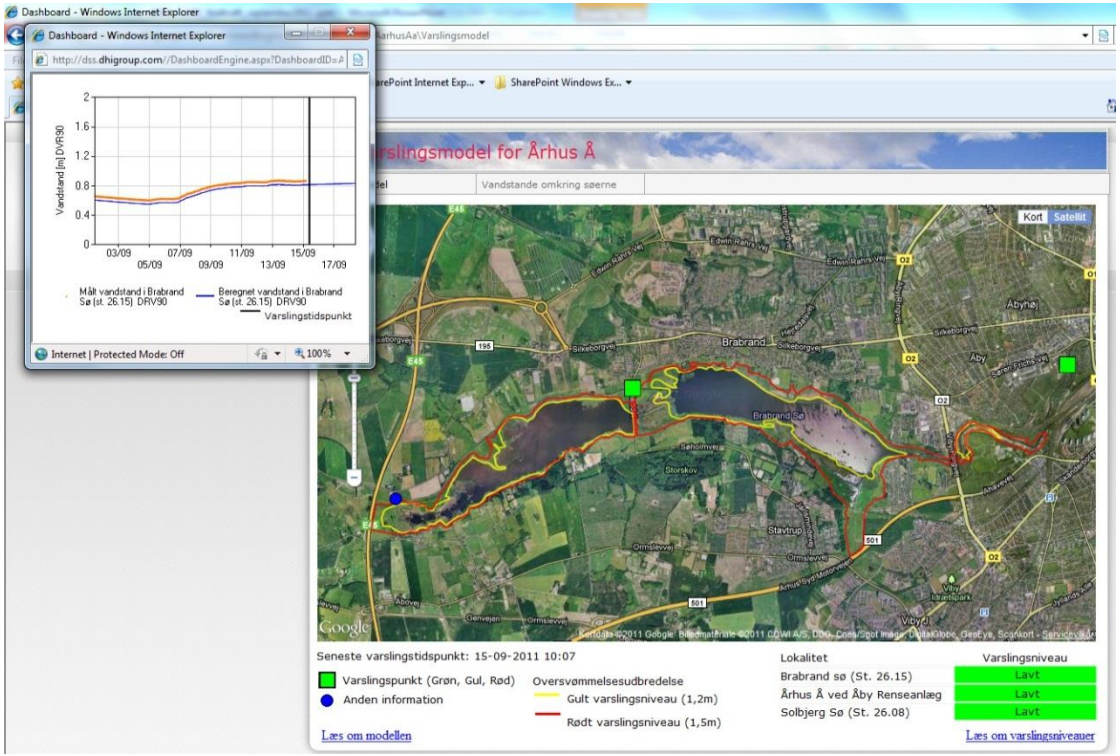
Waterforecast
Operated by DHI

Public information on bathing water quality

- App and web based public warning system



Public web site



Aarhus, Denmark

http://aarhus.dhigroup.com

Saving in investment

• Ordinary and larger retention basins	79 million EUR
• Controllable and smaller retention basins	45,6 million EUR
• Automation and control system	1,7 million EUR
• Total	47,3 million EUR
• Saving	32 million EUR
	40 %

Thank you

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