

Big data og data assimilering i hydrologisk modellering

Henrik Madsen
DHI

Hydrologidag 2019, Odense, 22. oktober 2019



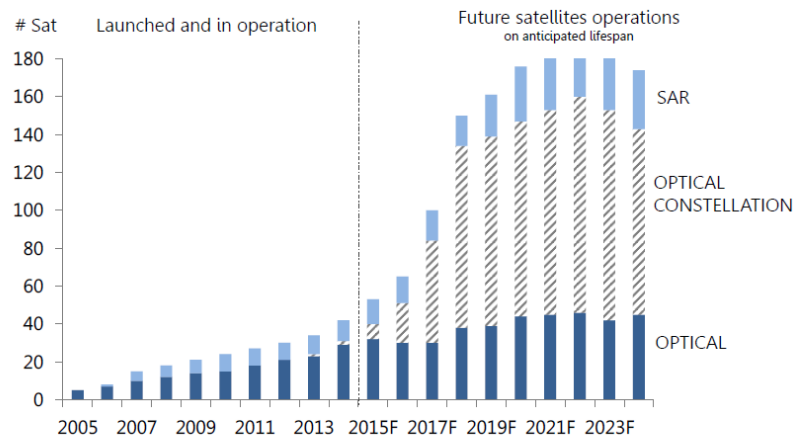
Transforming data into operational decisions

Only 5-10% of data collected in a typical utility are utilised for actionable information

(Global Water Intelligence, 2016)

Data is getting bigger

HR Commercial Earth Observation satellites to 2024 (>50kg)
 (Optical res <2.5m, SAR res <5m)



Source: Euroconsult 'Satellite-Based Earth Observation, Market Forecast to 2024' report, 2015 edition

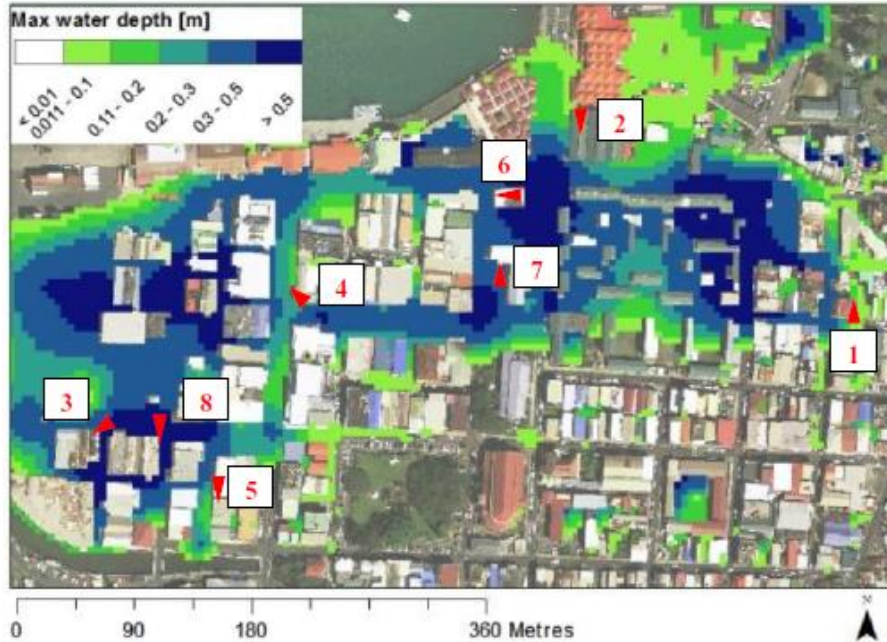
180

Satellites* launched
(2005-2014)

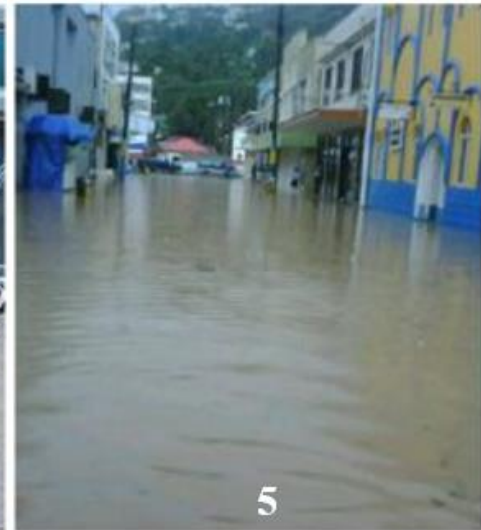
~1,700

Satellites* expected
(2015-2024)

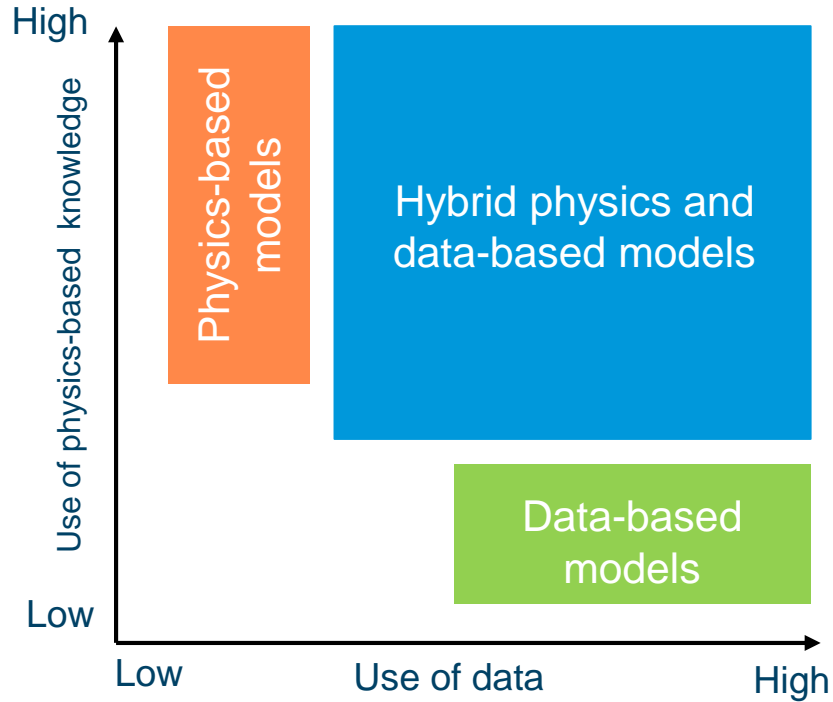
And more diverse



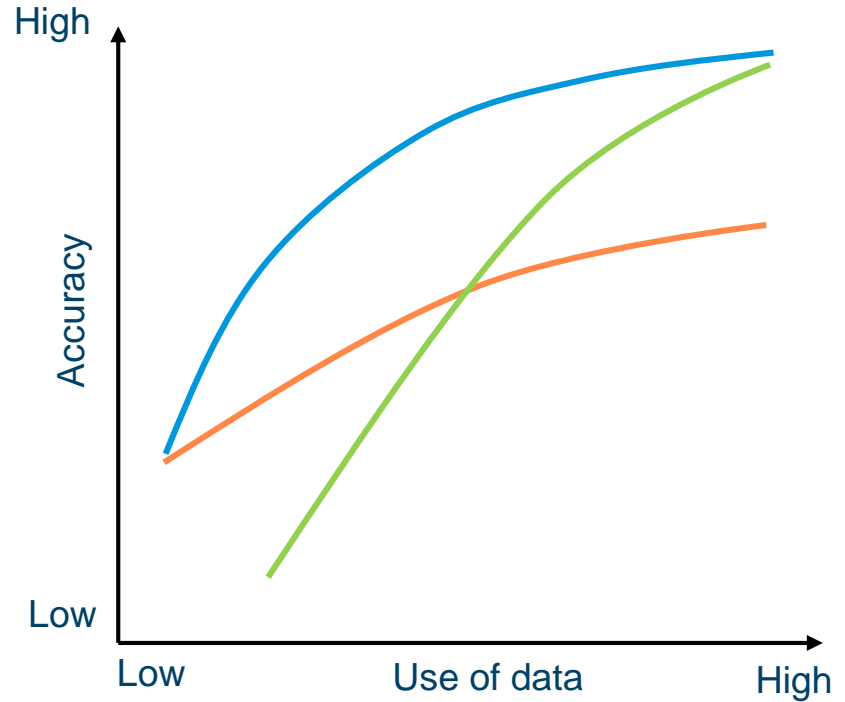
René et al. (2015)



Predictive models

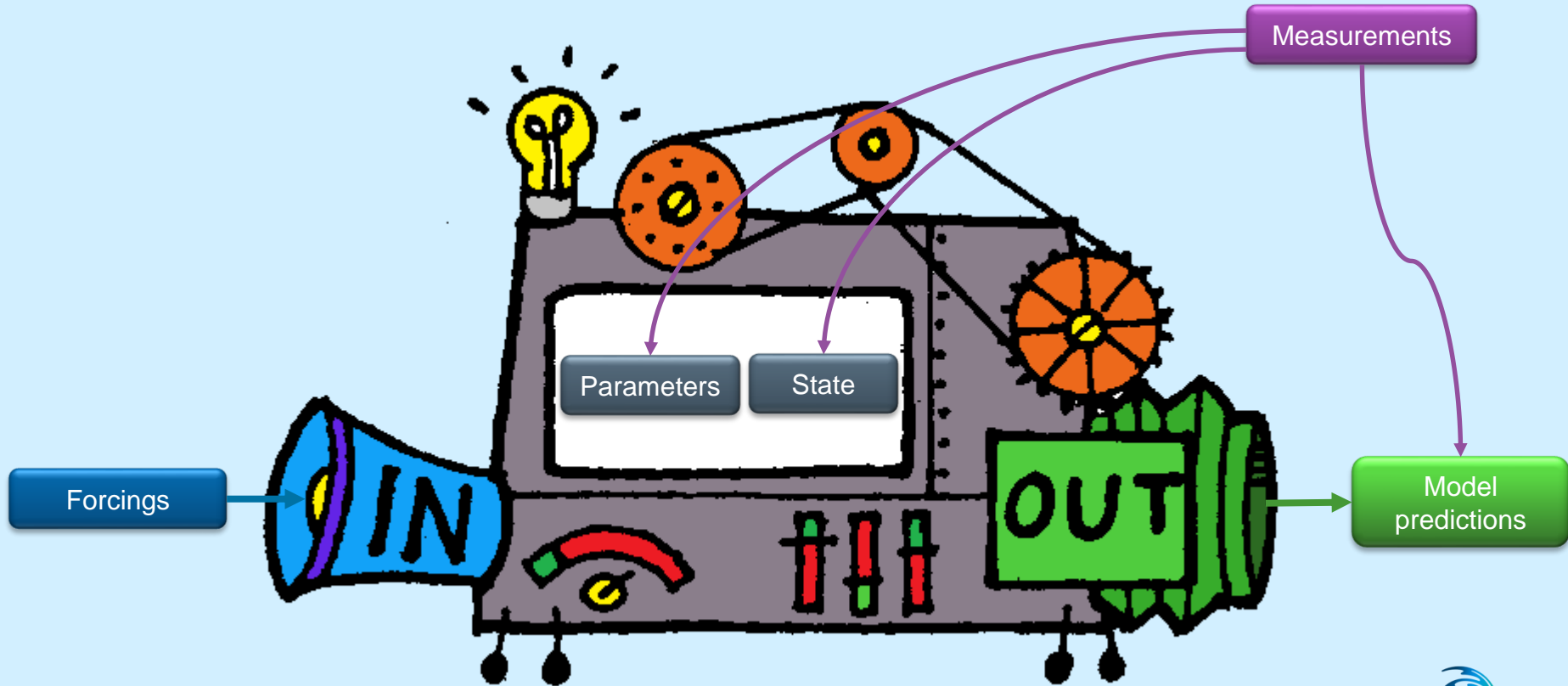


Adapted from Karpatne et al. (2017)



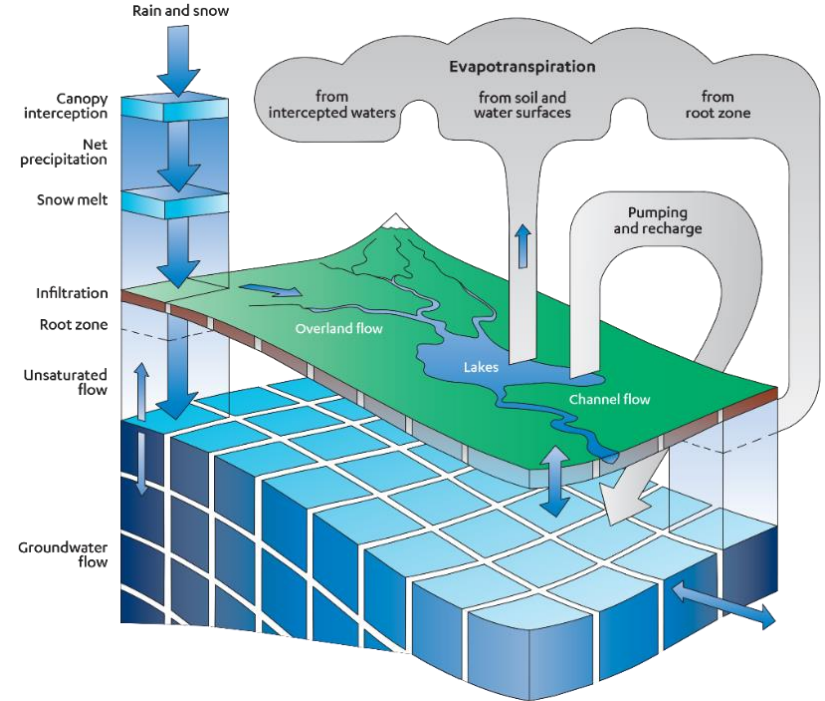
Adapted from Read and Kumar (2019)

Data assimilation



Big Data challenges

- Data sources represent
 - Different temporal dynamics
 - Different spatial resolution (supporting scale)
 - Different measurement uncertainties and representation errors

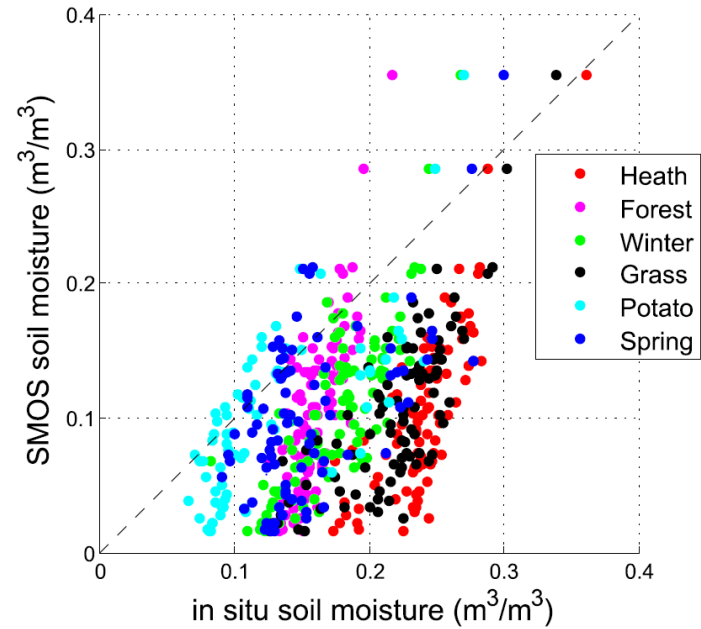


Challenges – SMOS soil moisture

Coarse resolution (~44 km)

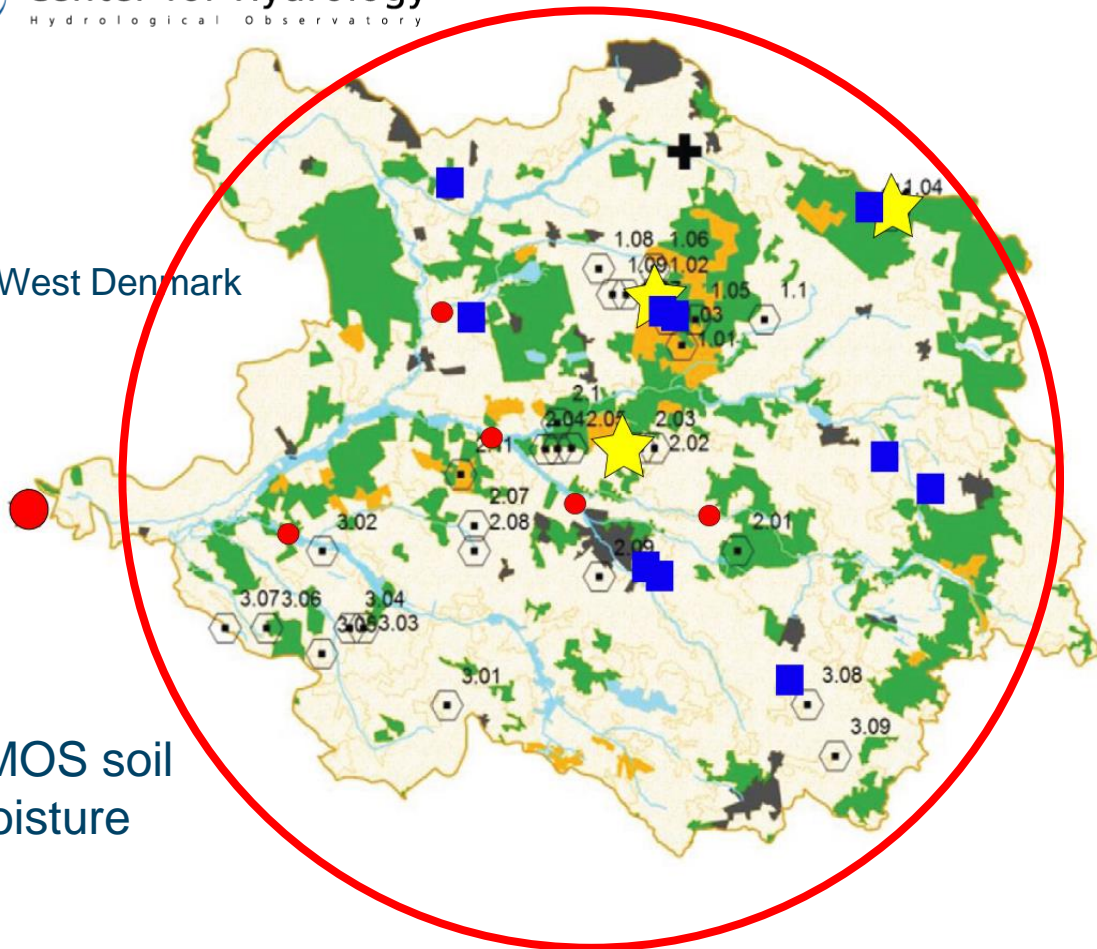






Bias (0.02 – 0.23 m³/m³)








Ahlergaarde, West Denmark
1055 km²

SMOS soil
moisture



-  Cosmic Ray
-  Hydraulic Head
-  Soil Moisture (3 depths)
-  River Discharge

-  Urban areas
 -  Agriculture
 -  Forest
 -  Heath
 -  Streams
- 0 2.5 5 10 Km

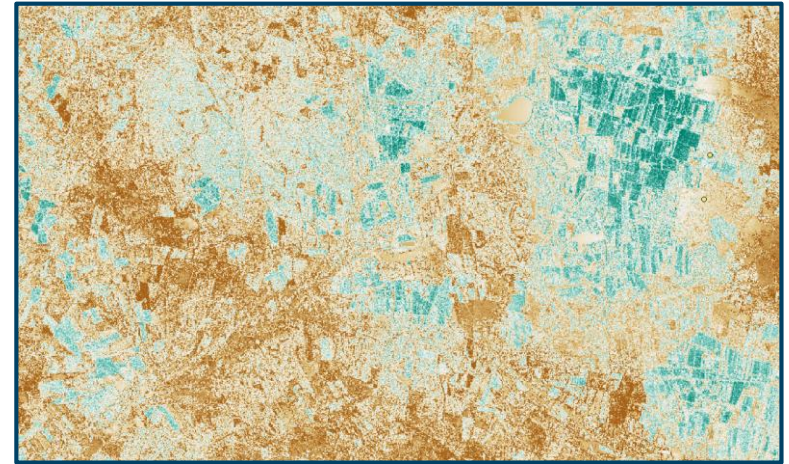


High-resolution soil moisture product based on Sentinel-1

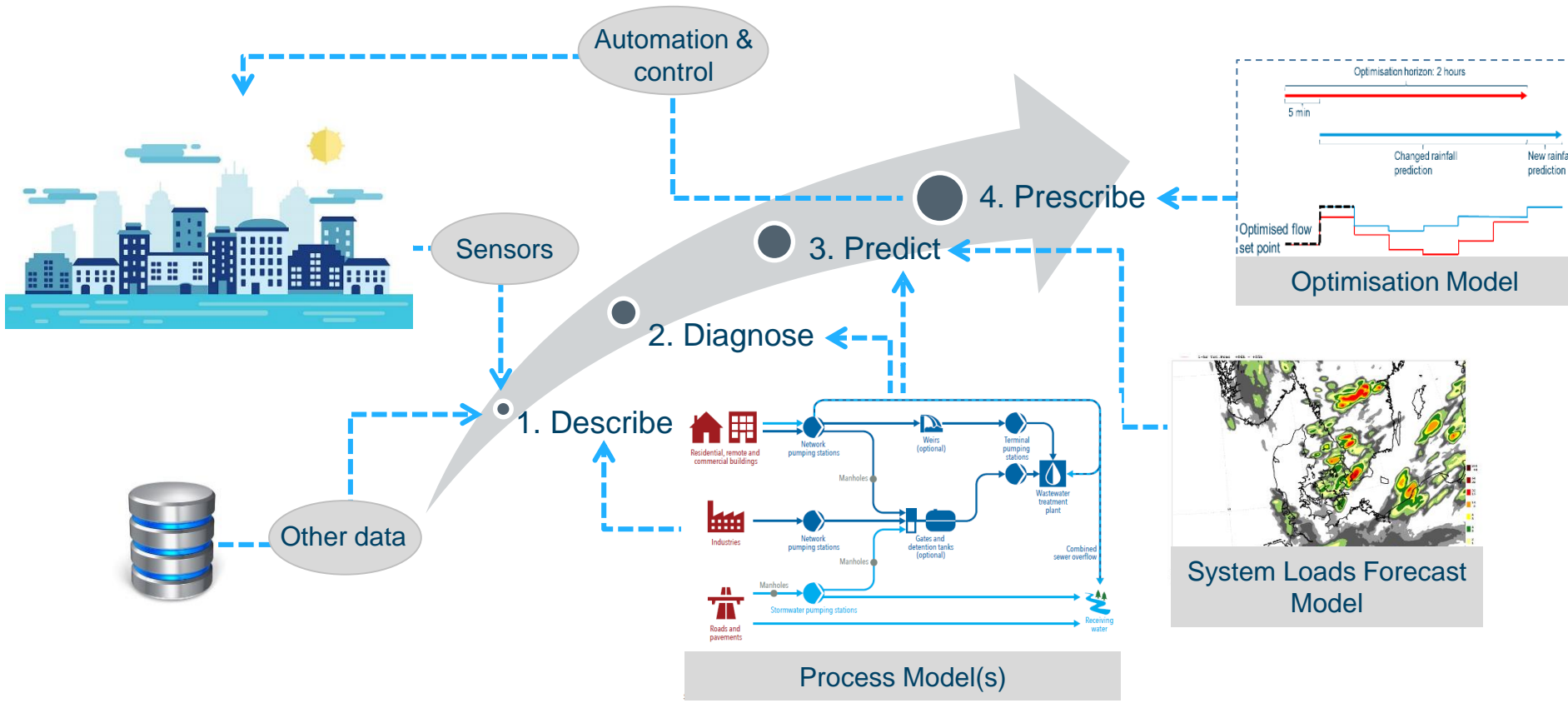
1 km



10 m



Physical System



Digital Twin

Thank you

Henrik Madsen
hem@dhigroup.com

