

Urban Water – London case

Too much, too little, too late?

Ab Veldhuizen (Alterra)
26 October 2011



Too much



Too much



Too much



Too much



Too little



Too little



Too little



Too little



Too late?

Too late?



Urban water management

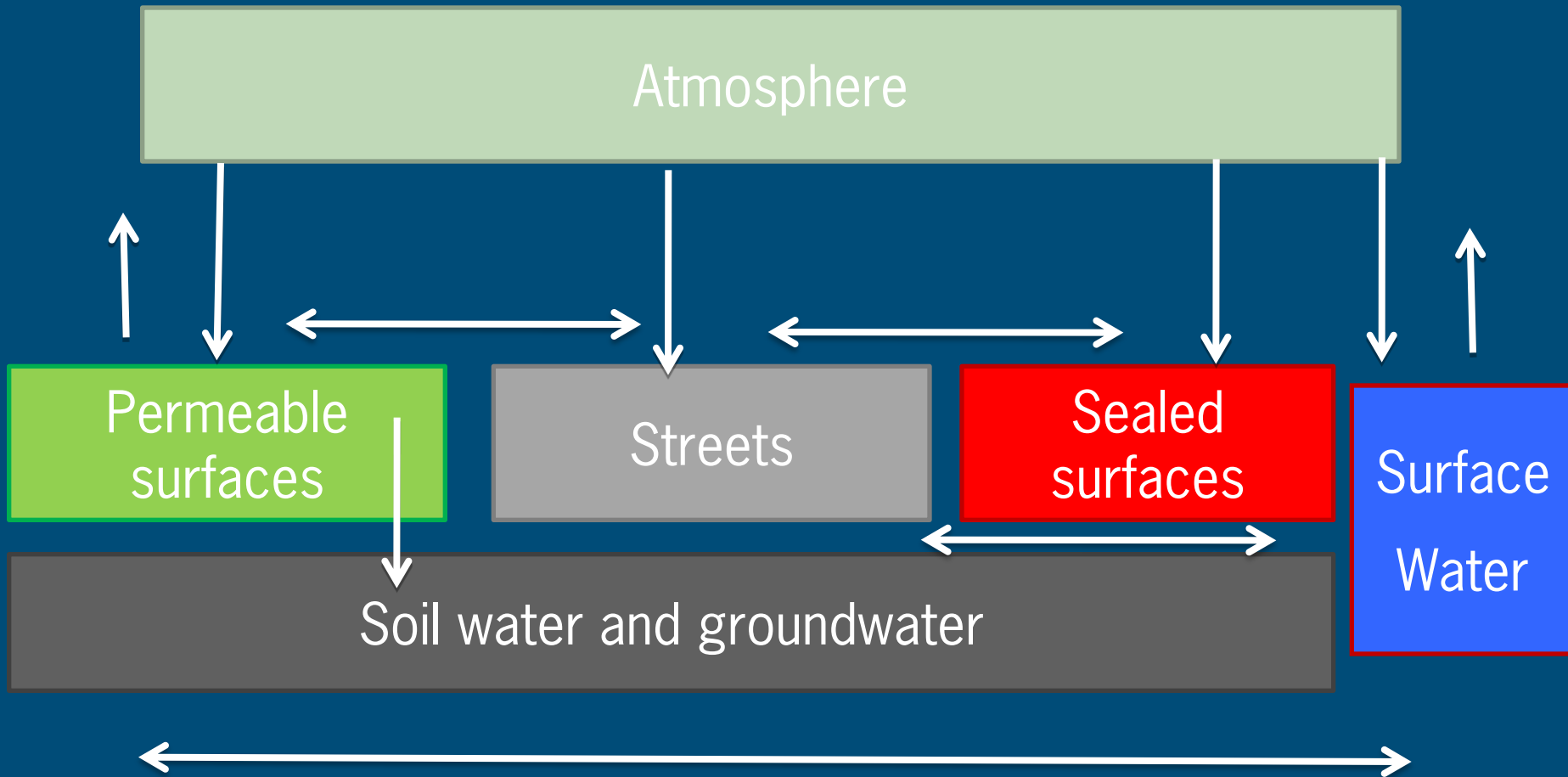
- Safety first
 - Economy second
 - Safety third
 - Economy 4th
-
- Quality of life is next
 - Most of the urban water cycle is not visible
 - Surface water is used for drainage and storage
 - Visibility of water can be an amenity

Urban water management

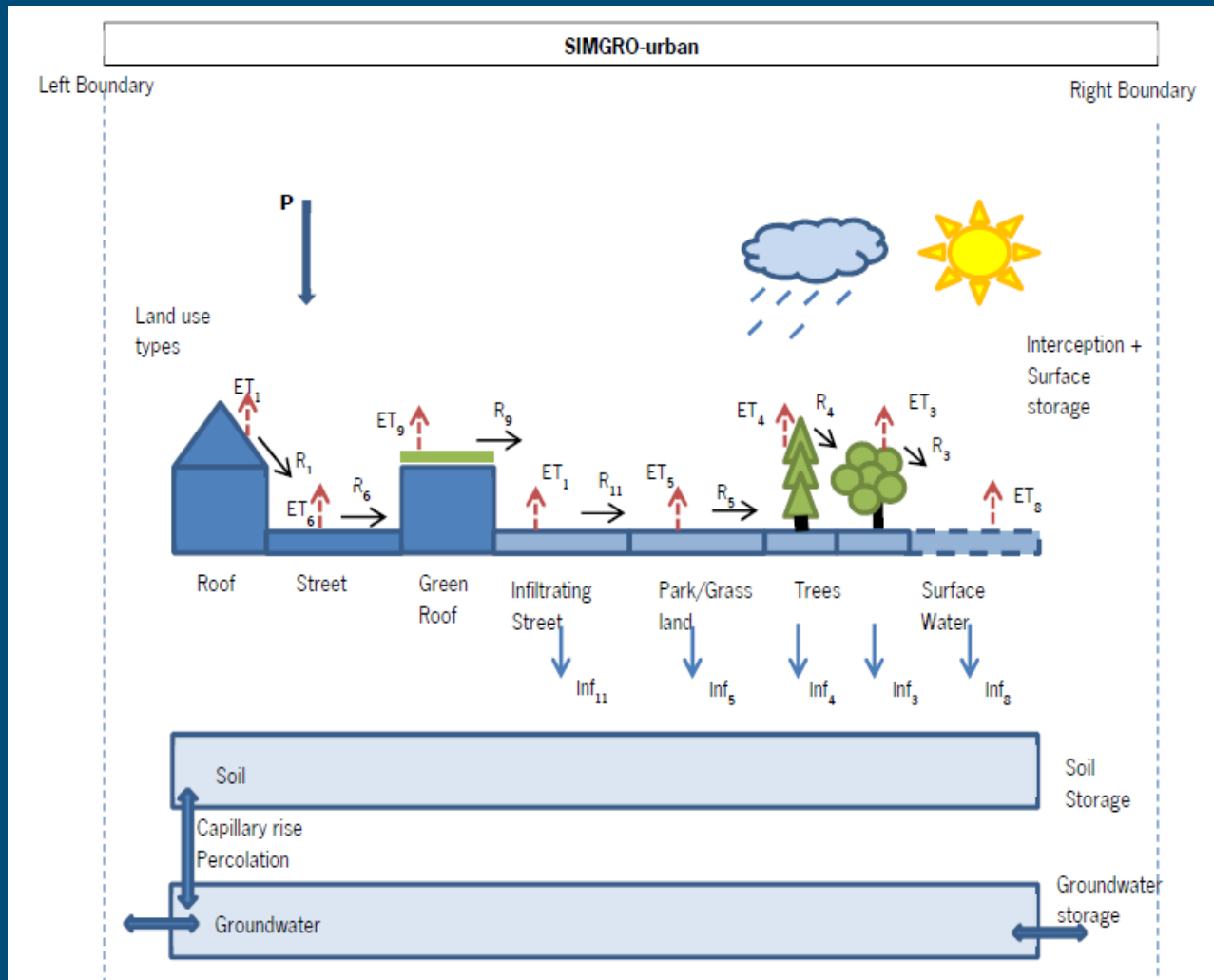
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Urban hydrology features

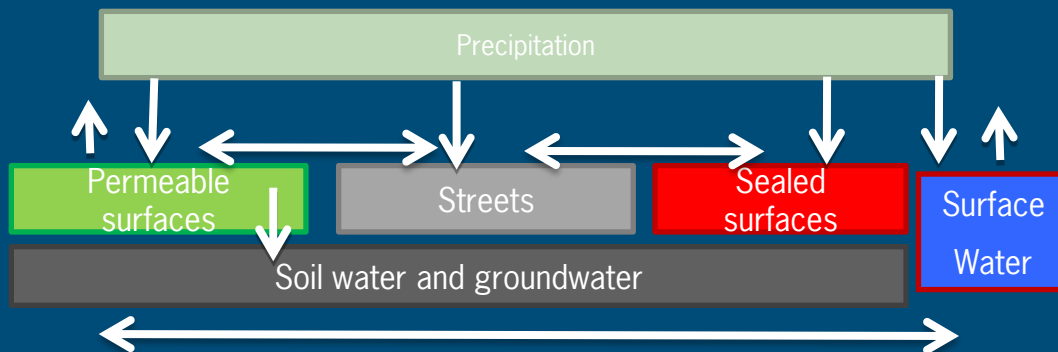


The ways of the water



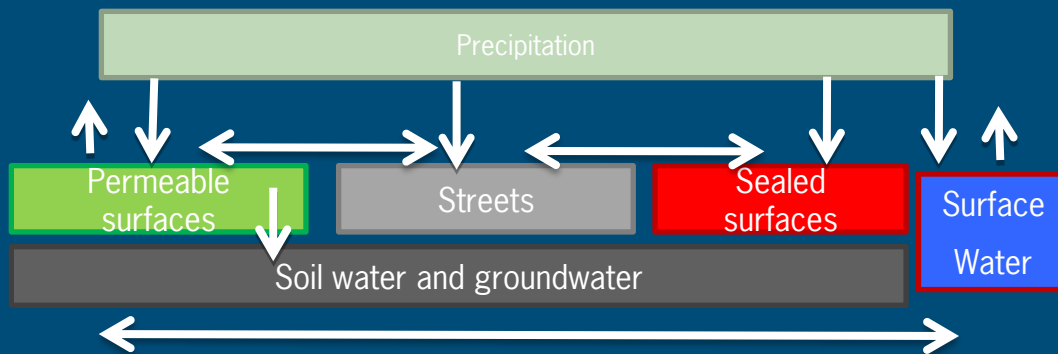
Movement of water

■ Precipitation



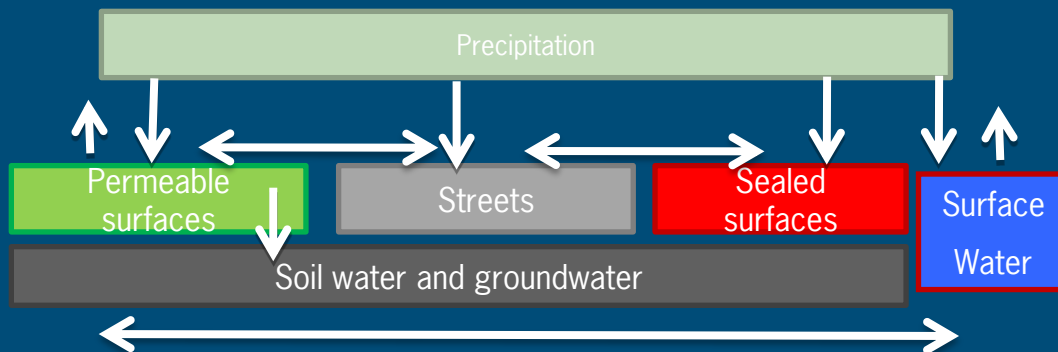
Movement of water

- Precipitation
- Evapotranspiration



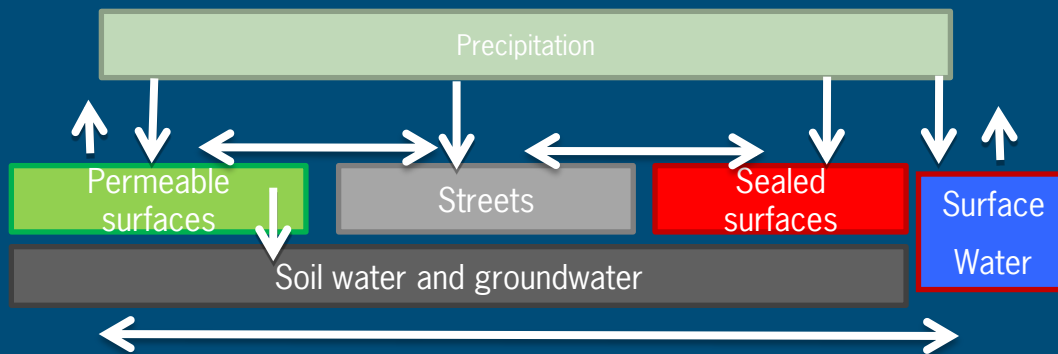
Movement of water

- Precipitation
- Evapotranspiration
- Runoff



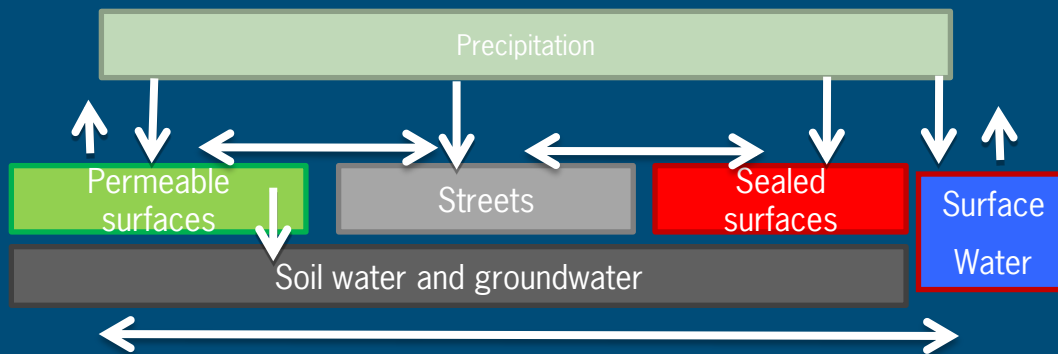
Movement of water

- Precipitation
- Evapotranspiration
- Runoff
- Infiltration



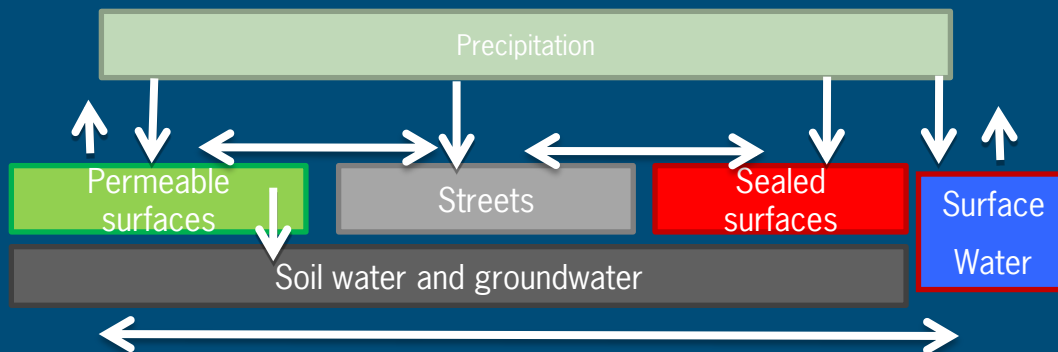
Movement of water

- Precipitation
- Evapotranspiration
- Runoff
- Infiltration
- Groundwater flow



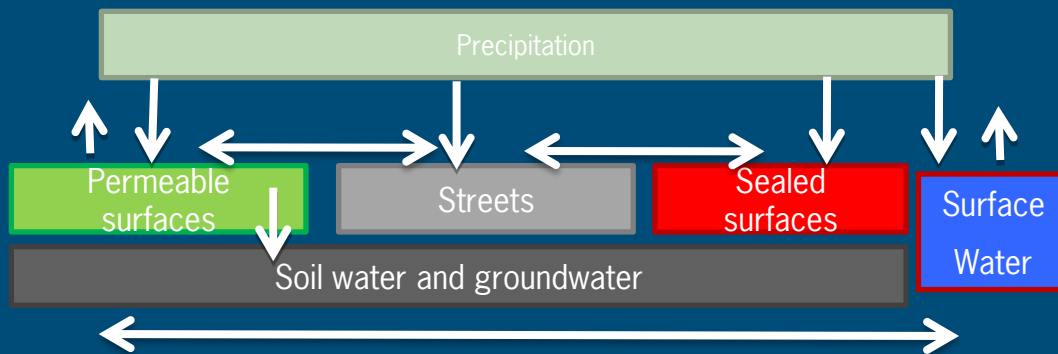
Movement of water

- Precipitation
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- Infiltration
- Groundwater flow
- Surface water flow



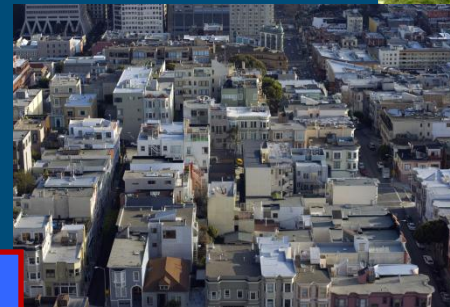
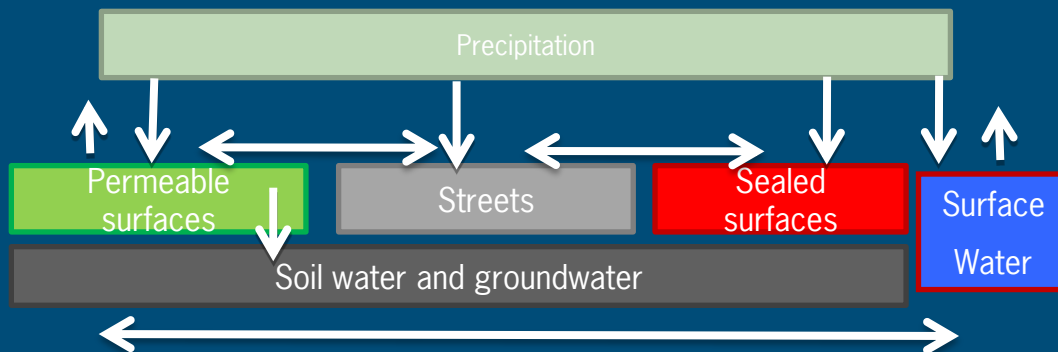
Storage of water

- Surface water



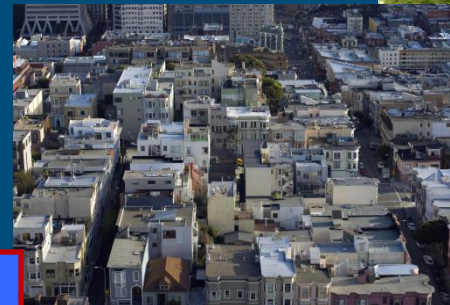
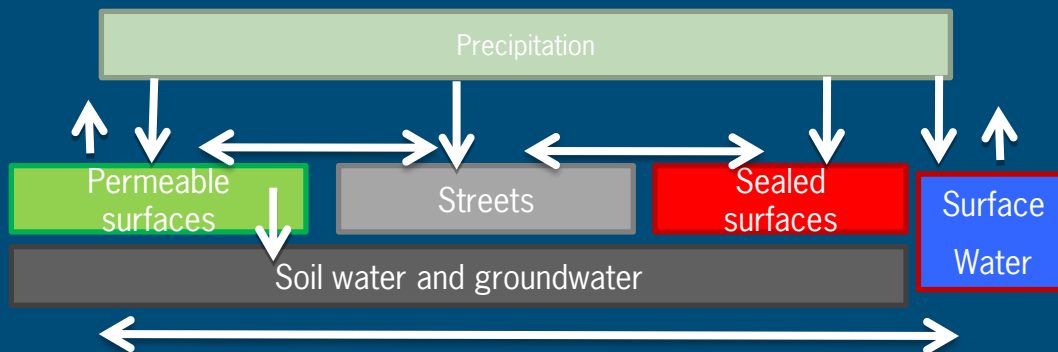
Storage of water

- Surface water
- Roofs



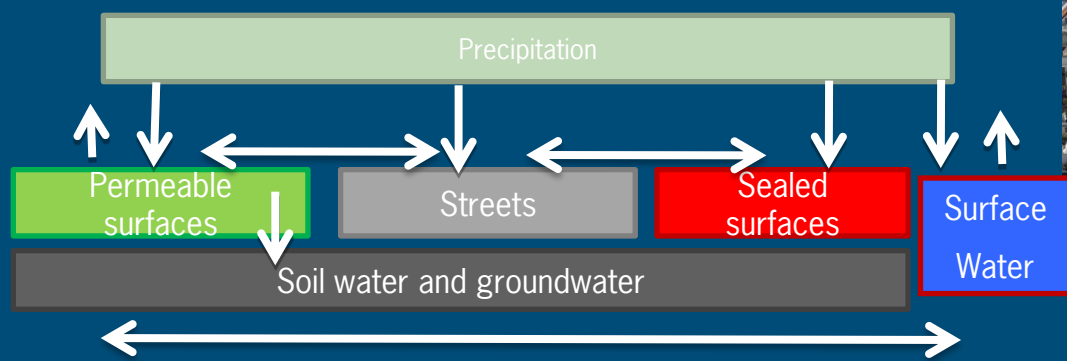
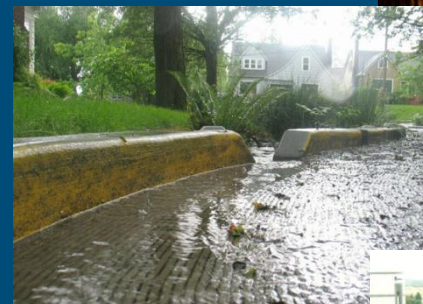
Storage of water

- Surface water
- Roofs
- Permeable surfaces



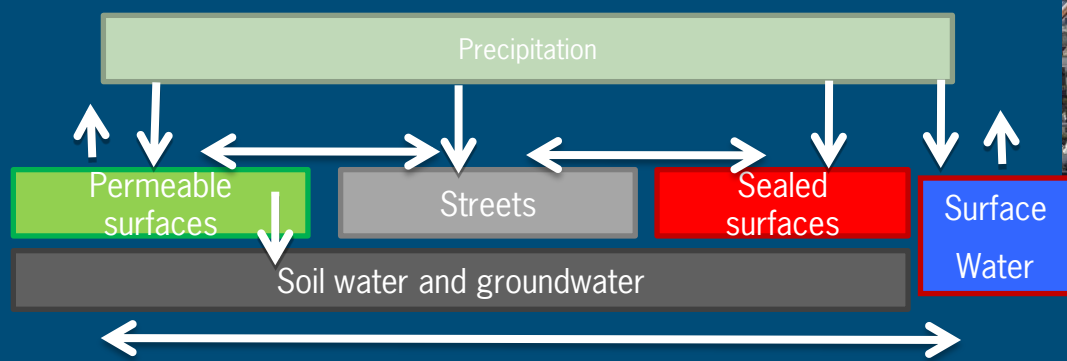
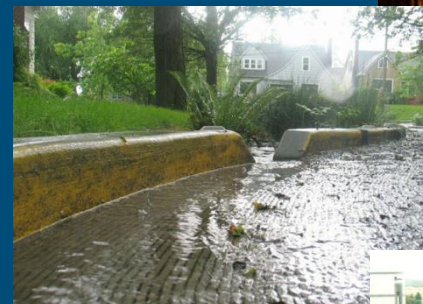
Storage of water

- Surface water
- Roofs
- Permeable surfaces
- Streets



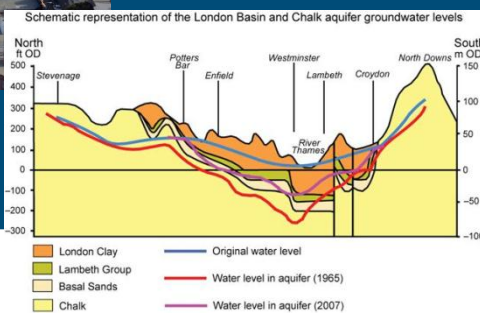
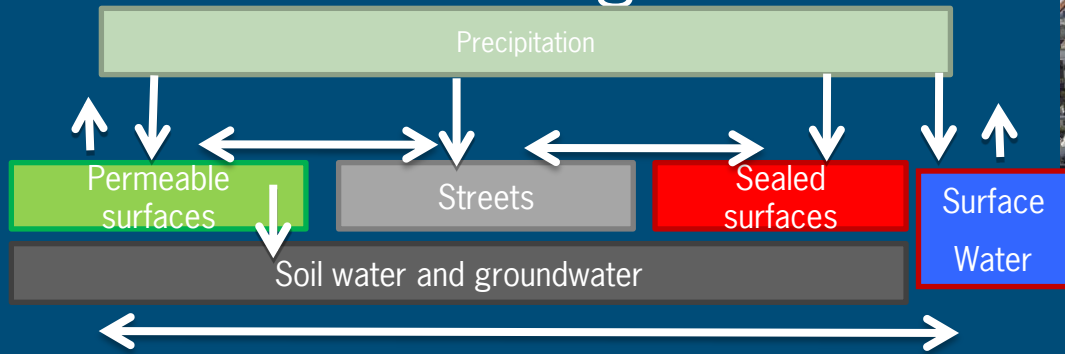
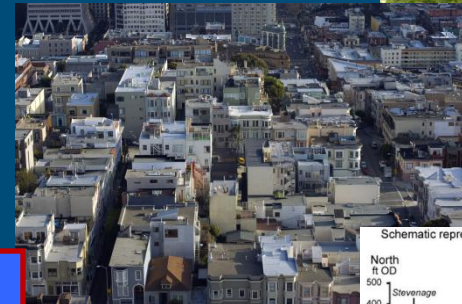
Storage of water

- Surface water
- Roofs
- Permeable surfaces
- Streets
- Sealed surfaces



Storage of water

- Surface water
- Roofs
- Permeable surfaces
- Streets
- Sealed surfaces
- Soil water and groundwater



Adaptation to climate change

- If you consider the “right” time frame there is no too much too little
- Nevertheless London experiences both shortages and excess
- This may increase as a result of climate change
- Solution?
- The key is in the storages

Storage of water

- Storage is needed to mitigate problems because excess rainfall
- Storage is needed to bridge periods of drought
- “win-win” combines both types of storage
- A few more wins may include improvement of the “quality of life”

The importance of being earnest about storage

Which storages can be considered serious?

- 1 Pavement?

Not really



The importance of being earnest about storage

Which storages can be considered serious?

- 1 Pavement?

Not really

- 2 Surface water?

Maybe



The importance of being earnest about storage

Which storages can be considered serious?

- 1 Pavement?

Not really

- 2 Surface water?

Maybe

- 3 Soil?

Yes



The importance of being earnest about storage

Which storages can be considered serious?

- 1 Pavement?

Not really

- 2 Surface water?

Maybe

- 3 Soil?

Yes

- 4 Roofs?

Yes, if...



The importance of being earnest about storage

Which storages can be considered serious?

- 1 Pavement?

Not really

- 2 Surface water?

Maybe

- 3 Soil?

Yes

- 4 Roofs?

Yes, if...

- 5 Streets?

Maybe



So what we need?

- We have to respect that water needs storage and that storage needs space
- To manage urban water requires spatial planning
- So spatial planning should involve water
- The DSS should therefore link spatial planning and water
- For that, we have developed several UMT's to model the relation between land use and water

Input of the model

UMT index	Name of UMT
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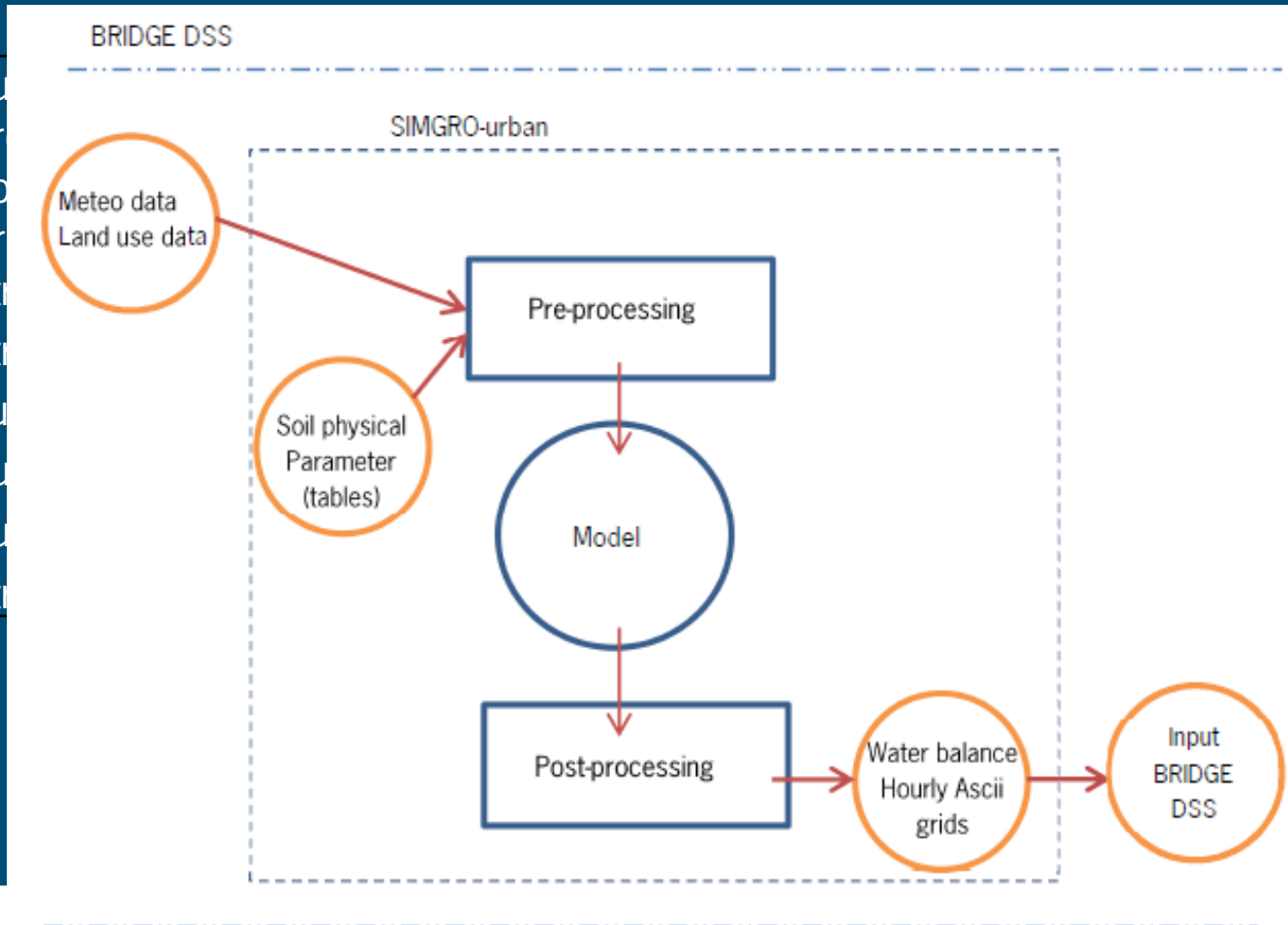
UMT= Urban Morphological Type

1	building
3	broadleaved
4	conifer
5	grassland
6	street
7	street with vegetation
8	surface water
9	building Green roof
10	building gravel roof
11	street with infiltration

Input of the model

UMT
index Name of UMT

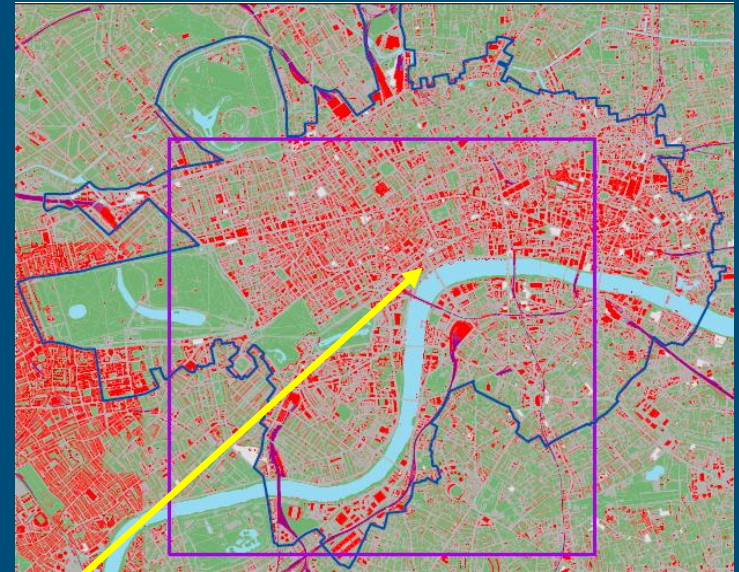
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system

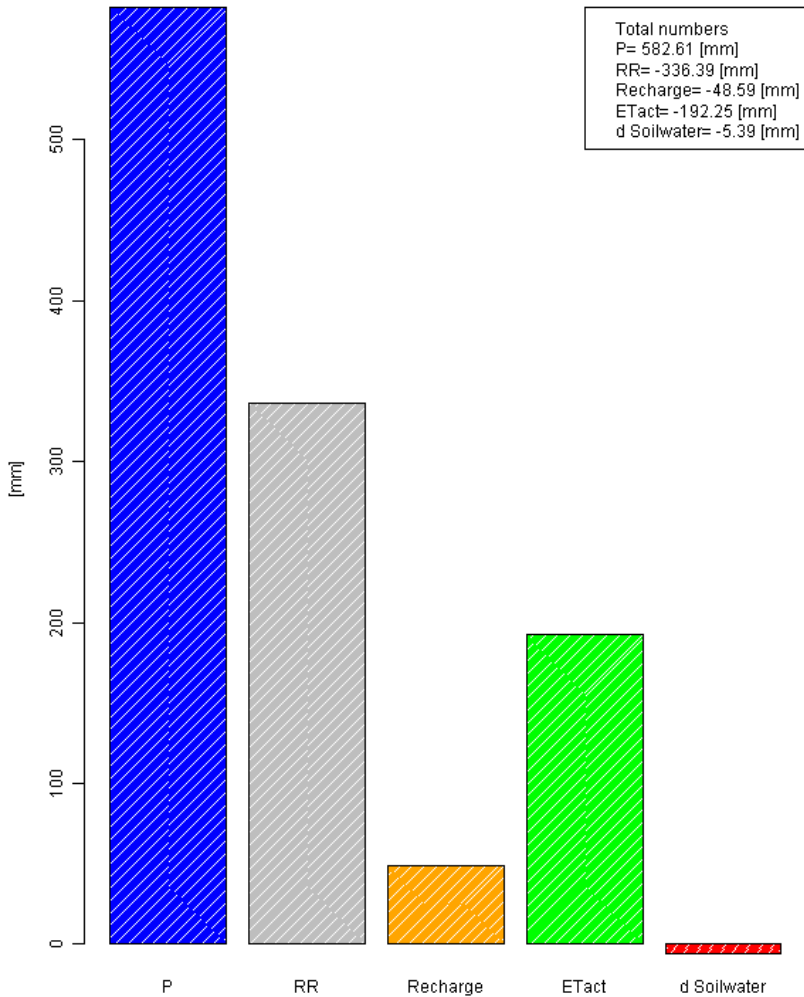
Case study London

- Meteorological Input: KCL 2009
 - Precipitation
 - Incoming shortwave radiation
 - Temperature
 - 1 Meteo station
- Land use
 - 200m*200m, 27*27 cells

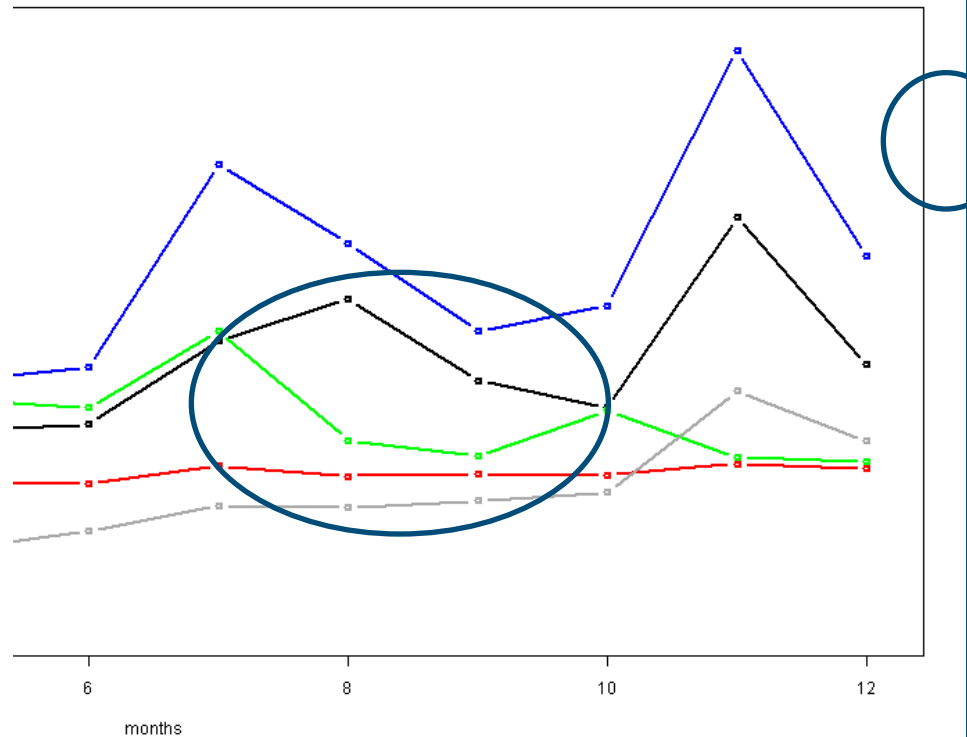


No problem in London?

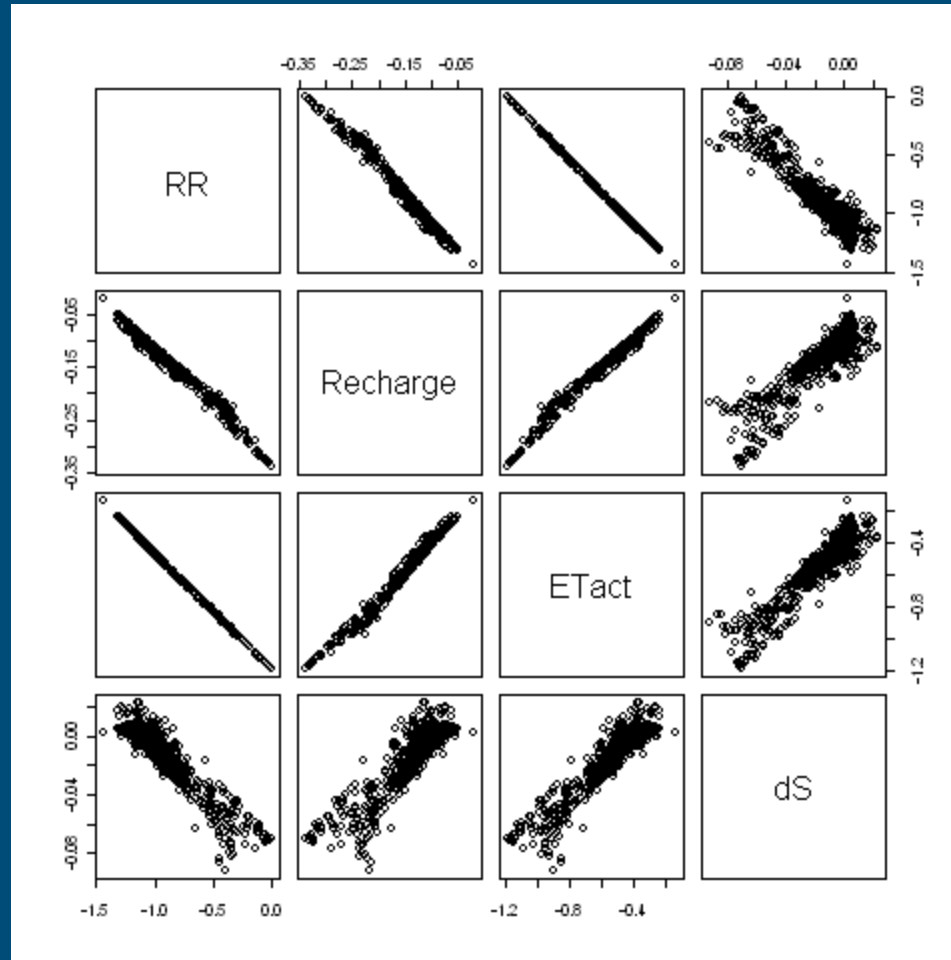
Waterbalance London2



Monthly Waterbalance London



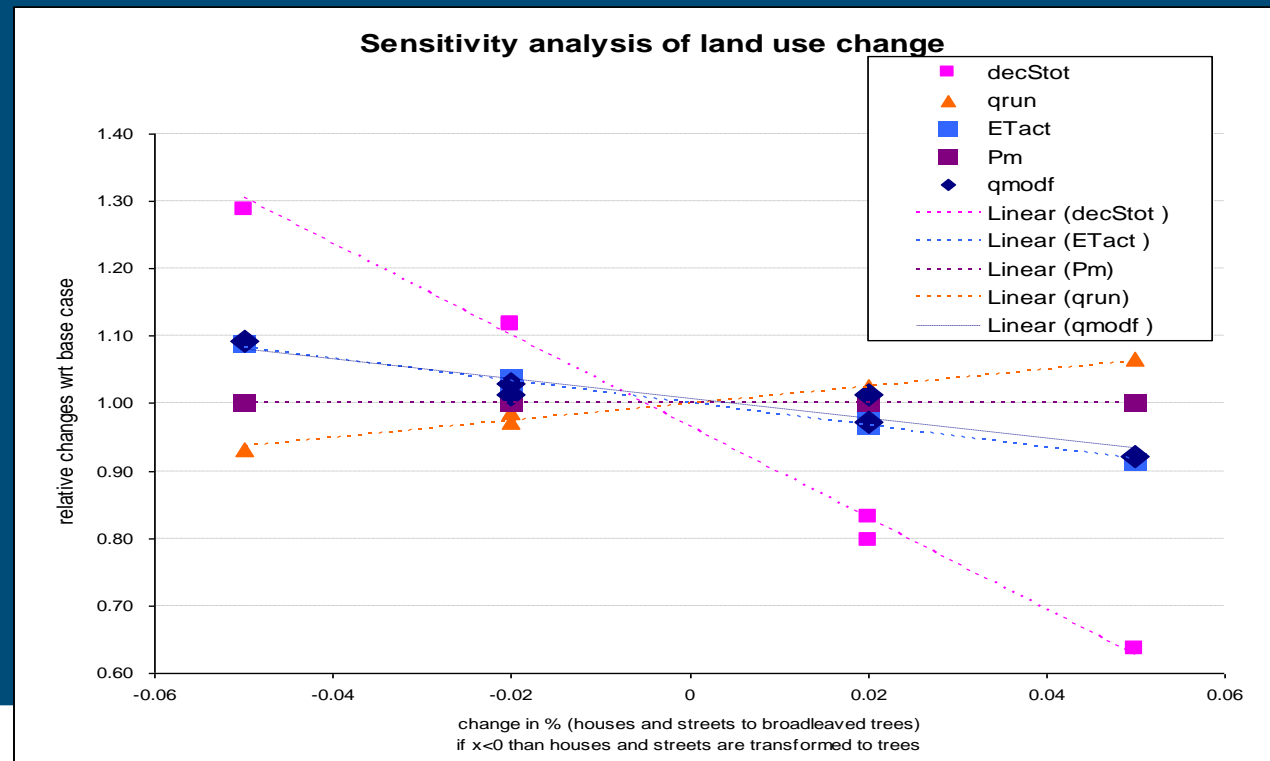
The DSS and hydrology go together well



Impact of land use change

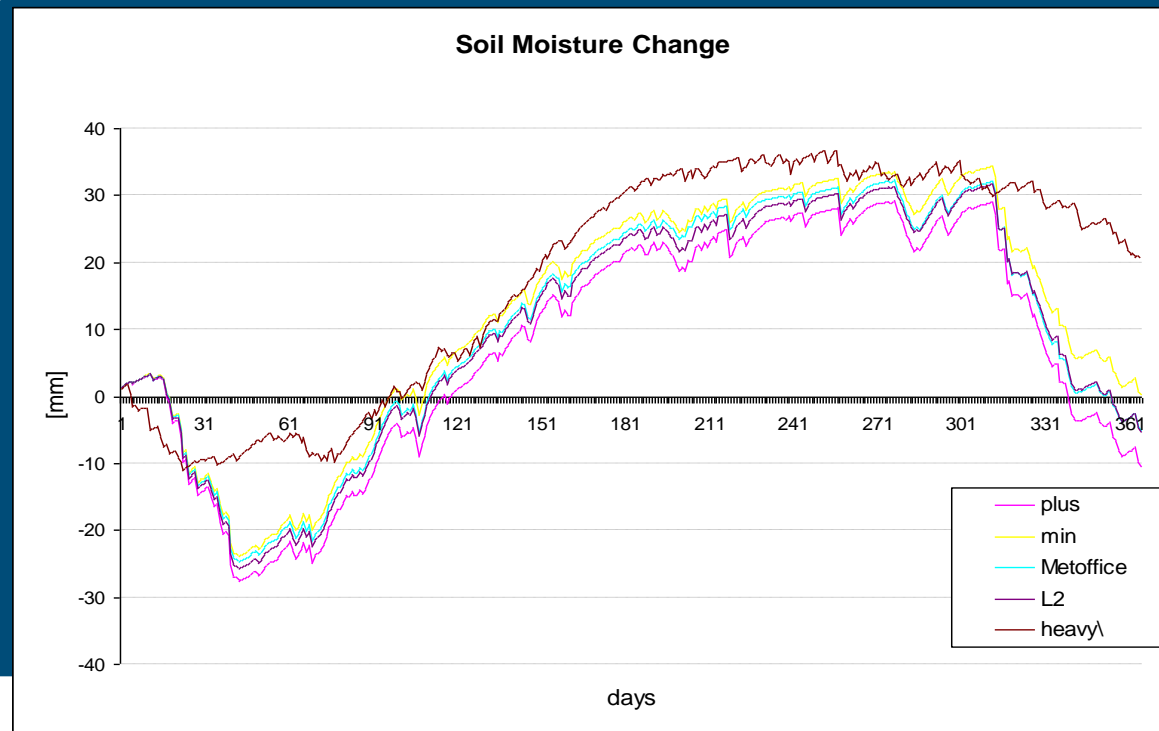
- Change Buildings and streets to green areas
 - Different ratio's (+/- 2%, +/- 5%)

- Linearity

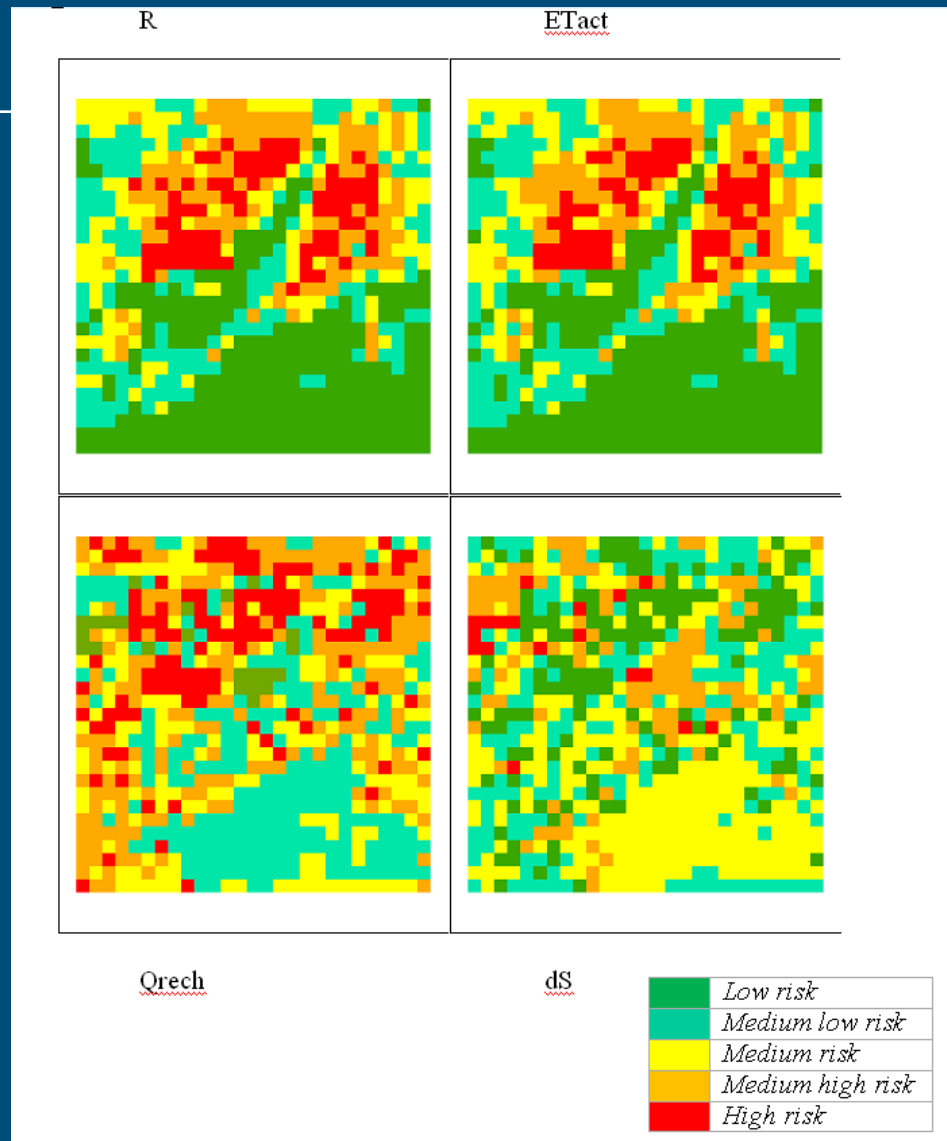


Climate change

- Climate change impacts (more rain in spring, less in summer)
- Increase with 10%
- Decrease with 10%
- Synthetic series



Spatial result



Concluding remarks

- Too much, too little: it is a fact of life
- Storage of water is of the essence to solve water related problems
- Because storage requires space, water issues can only be solved with spatial planning
- Therefore in the DSS the relation between land use and water has been established
- In other words: a user has only to change land use to see the effect on hydrological indicators