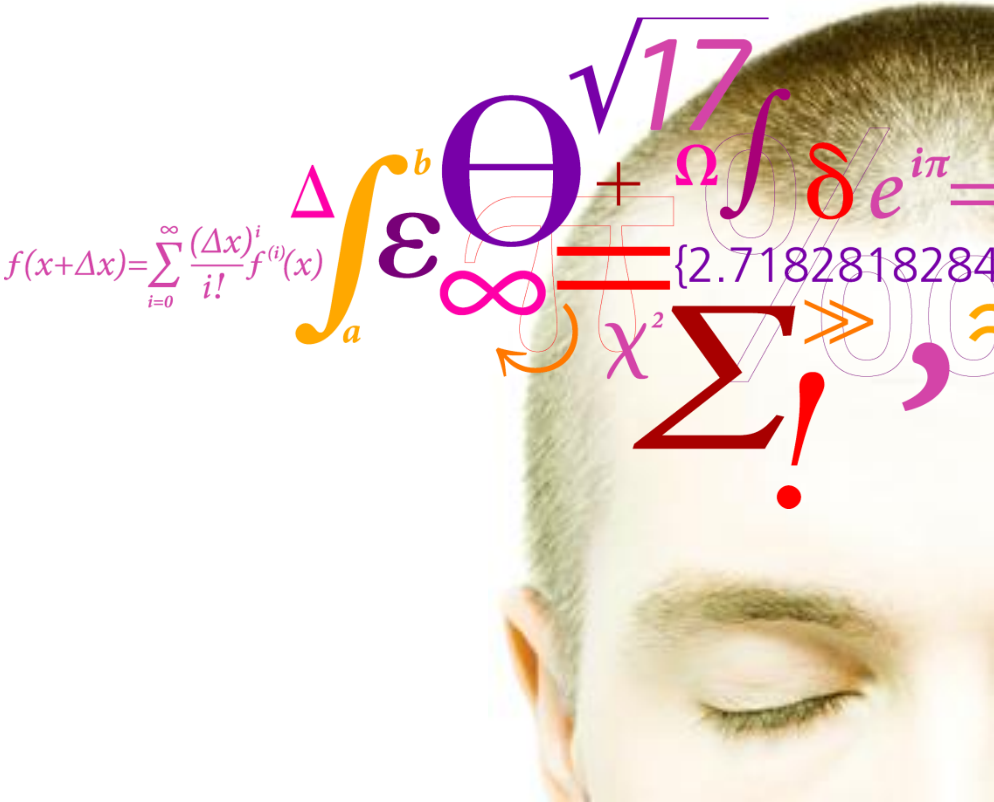
# Vandkunsten og DTU Byg ved

Thomas Nybo Rasmussen, Vandkunsten
Lotte Bjerregaard Jensen, DTU Byg
Lærke Philipsen, DTU Byg



# Vandkunsten Architects
# X
# DTU Civil

Involved in this Wise Project

Thomas Nybo Rasmussen, Partner at Vandkunsten Architects

Lotte Bjerregaard Jensen, Associate Professor at DTU Civil Engineering

Lærke Philipsen, Researcher at DTU BYG (Now WISE Research Assistant)

# Digital Tools for Landscape Architects: A Case Study of *Digital Tools* Used for *Analyzing And Screening* of *Climate Adaptation Challenges* in the *Early Design Phase*

- Which digital tools are relevant for architects, landscape architects, and planners to use when handling of rain water of different intensity?

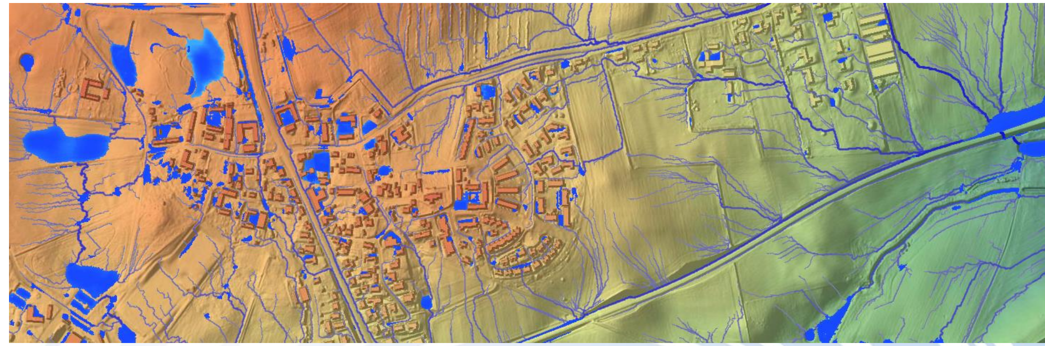
- How can these tools establish a better foundation of design decisions in the early design phase?

- What features are the existing tools lacking?

- And how should such a tool operate in an optimal perspective?

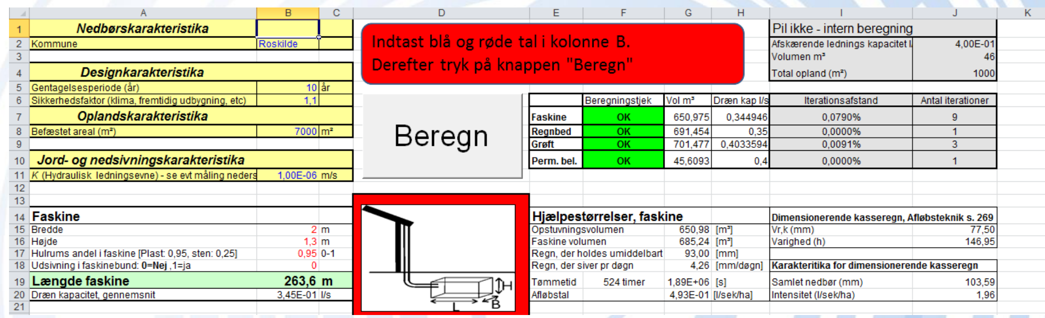
Tools

## SCALGO Live



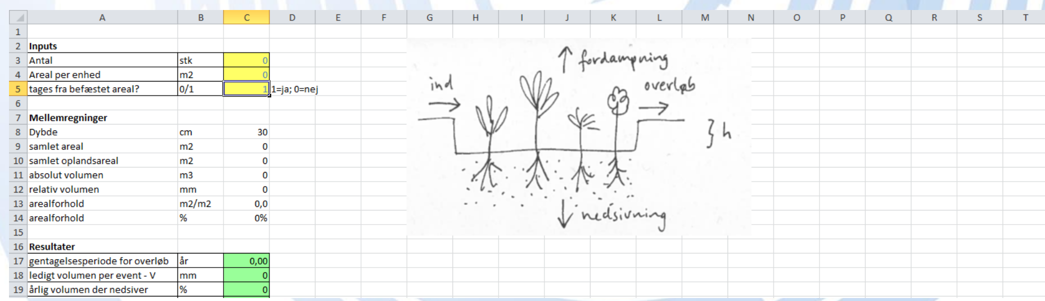
## The LAR-dimensioning Tool

by The Water Pollution Committee




## LAR-Potential

A spreadsheet tool developed by DTU Environment



## Case Example: Skæring Bæk

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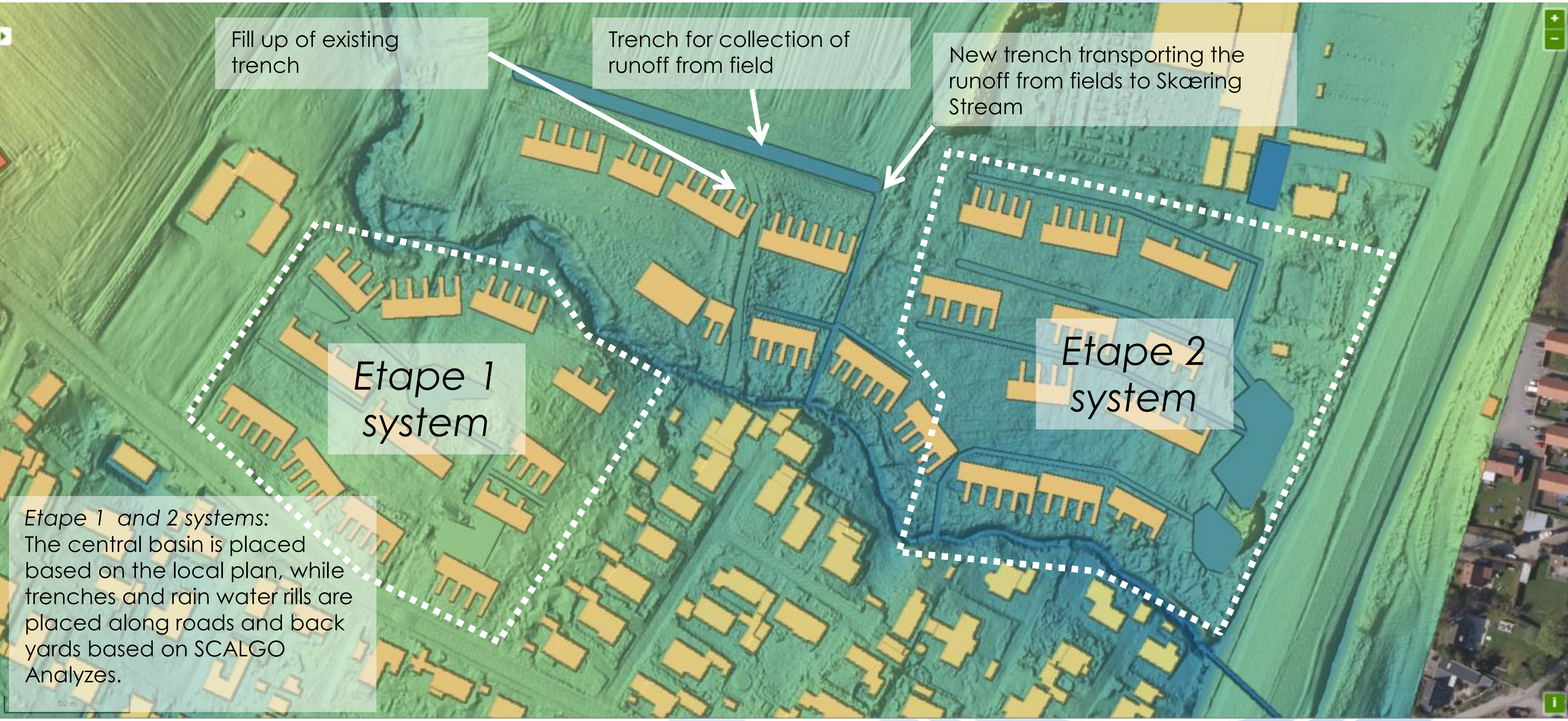
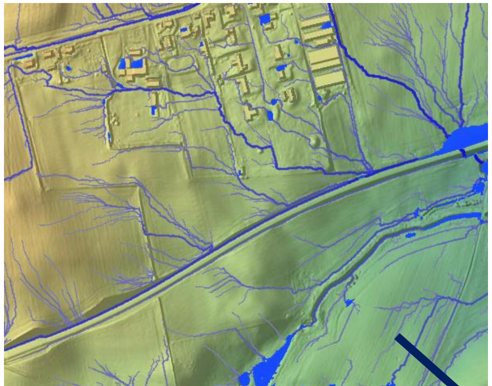
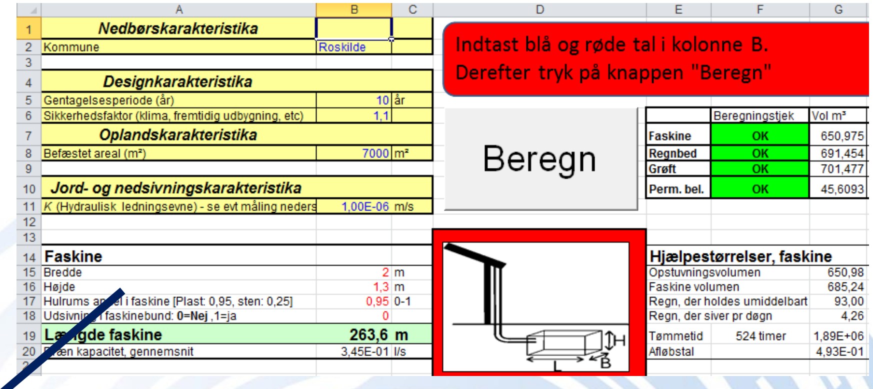


## Case Example: Skæring Bæk

## The Need for a New Tool



Flow paths
Terrain model
Graphical interface
Quick and intuitive



| | A | B | C |
|---|---|---|---|
| 1 | **Nedbørskarakteristika** | | |
| 2 | Kommune | Roskilde | |
| 3 | | | |
| 4 | **Designkarakteristika** | | |
| 5 | Gentagelsesperiode (år) | 10 | år |
| 6 | Sikkerhedsfaktor (klima, fremtidig udbygning, etc) | 1,1 | |
| 7 | **Oplandskarakteristika** | | |
| 8 | Befæstet areal (m²) | 7000 | m² |
| 9 | | | |
| 10 | **Jord- og nedsivningskarakteristika** | | |
| 11 | K (Hydraulisk ledningsevne) - se evt måling neders | 1,00E-06 | m/s |
| 12 | | | |
| 13 | | | |
| 14 | **Faskine** | | |
| 15 | Bredde | 2 | m |
| 16 | Højde | 1,3 | m |
| 17 | Hulrums andel i faskine [Plast: 0,95, sten: 0,25] | 0,95 | 0-1 |
| 18 | Udsivning i faskinebund: **0=Nej** ,1=ja | 0 | |
| 19 | **Længde faskine** | **263,6** | **m** |
| 20 | Dræn kapacitet, gennemsnit | 3,45E-01 | l/s |

Indtast blå og røde tal i kolonne B.
Derefter tryk på knappen "Beregn"

Beregn

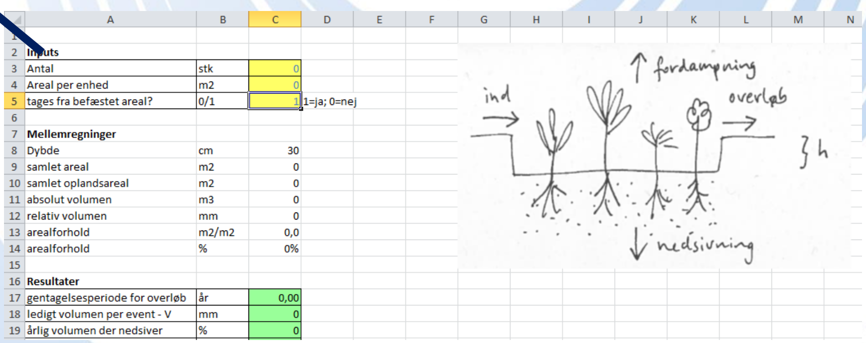
| | Beregningstjek | Vol m³ |
|---|---|---|
| **Faskine** | OK | 650,975 |
| **Regnbed** | OK | 691,454 |
| **Grøft** | OK | 701,477 |
| **Perm. bel.** | OK | 45,6093 |

| **Hjælpestørrelser, faskine** | | |
|---|---|---|
| Opstuvningsvolumen | | 650,98 |
| Faskine volumen | | 685,24 |
| Regn, der holdes umiddelbart | | 93,00 |
| Regn, der siver pr døgn | | 4,26 |
| Tømmetid | 524 timer | 1,89E+06 |
| Afløbstal | | 4,93E-01 |



Specific volumes
Few data inputs

# Future Tool

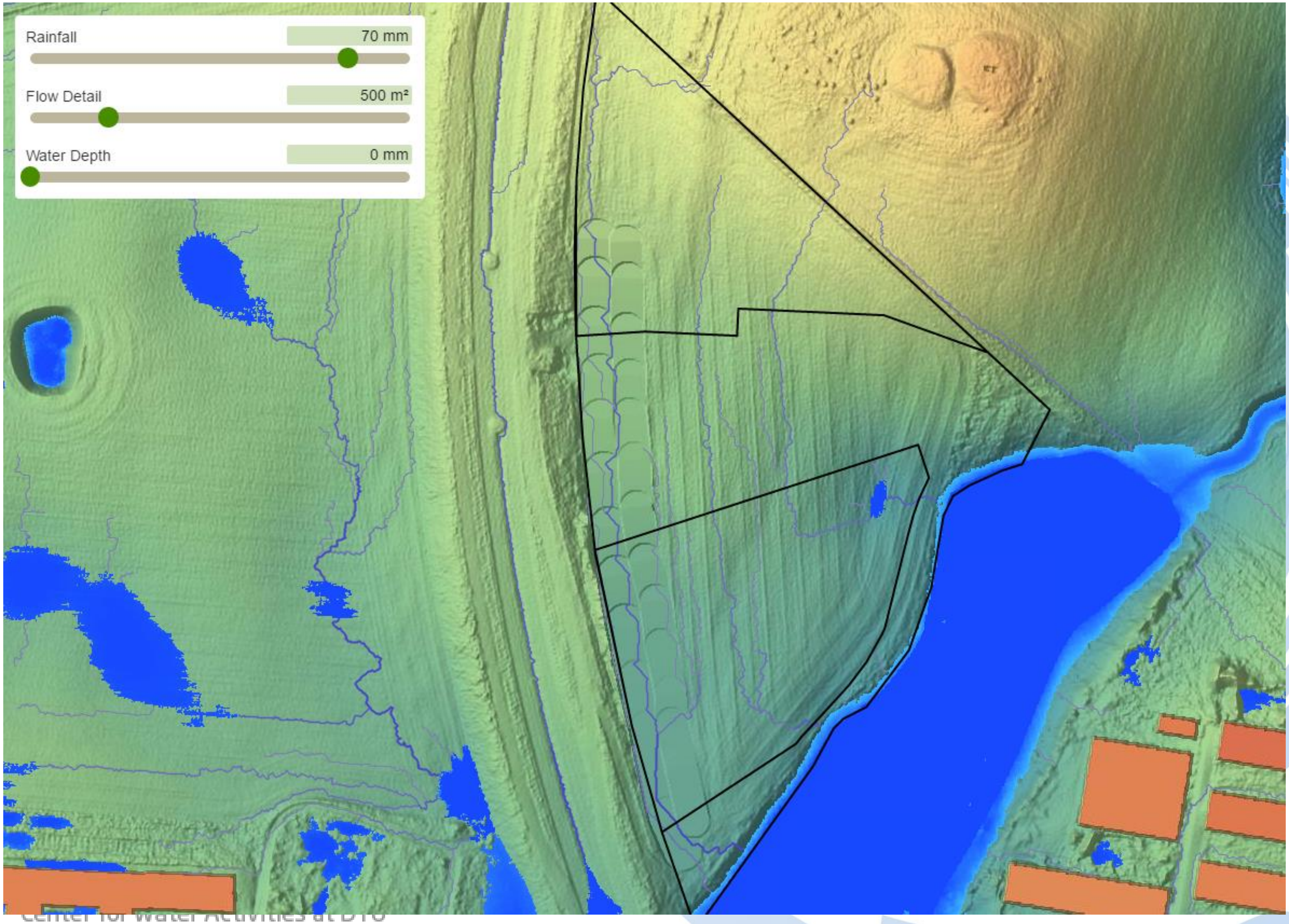


| | A | B | C | D |
|---|---|---|---|---|
| 1 | | | | |
| 2 | **Inputs** | | | |
| 3 | Antal | stk | 0 | |
| 4 | Areal per enhed | m2 | 0 | |
| 5 | tages fra befæstet areal? | 0/1 | 1 | 1=ja; 0=nej |
| 6 | | | | |
| 7 | **Mellemregninger** | | | |
| 8 | Dybde | cm | 30 | |
| 9 | samlet areal | m2 | 0 | |
| 10 | samlet oplandsareal | m2 | 0 | |
| 11 | absolut volumen | m3 | 0 | |
| 12 | relativ volumen | mm | 0 | |
| 13 | arealforhold | m2/m2 | 0,0 | |
| 14 | arealforhold | % | 0% | |
| 15 | | | | |
| 16 | **Resultater** | | | |
| 17 | gentagelsesperiode for overløb | år | 0,00 | |
| 18 | ledigt volumen per event - V | mm | 0 | |
| 19 | årlig volumen der nedsiver | % | 0 | |

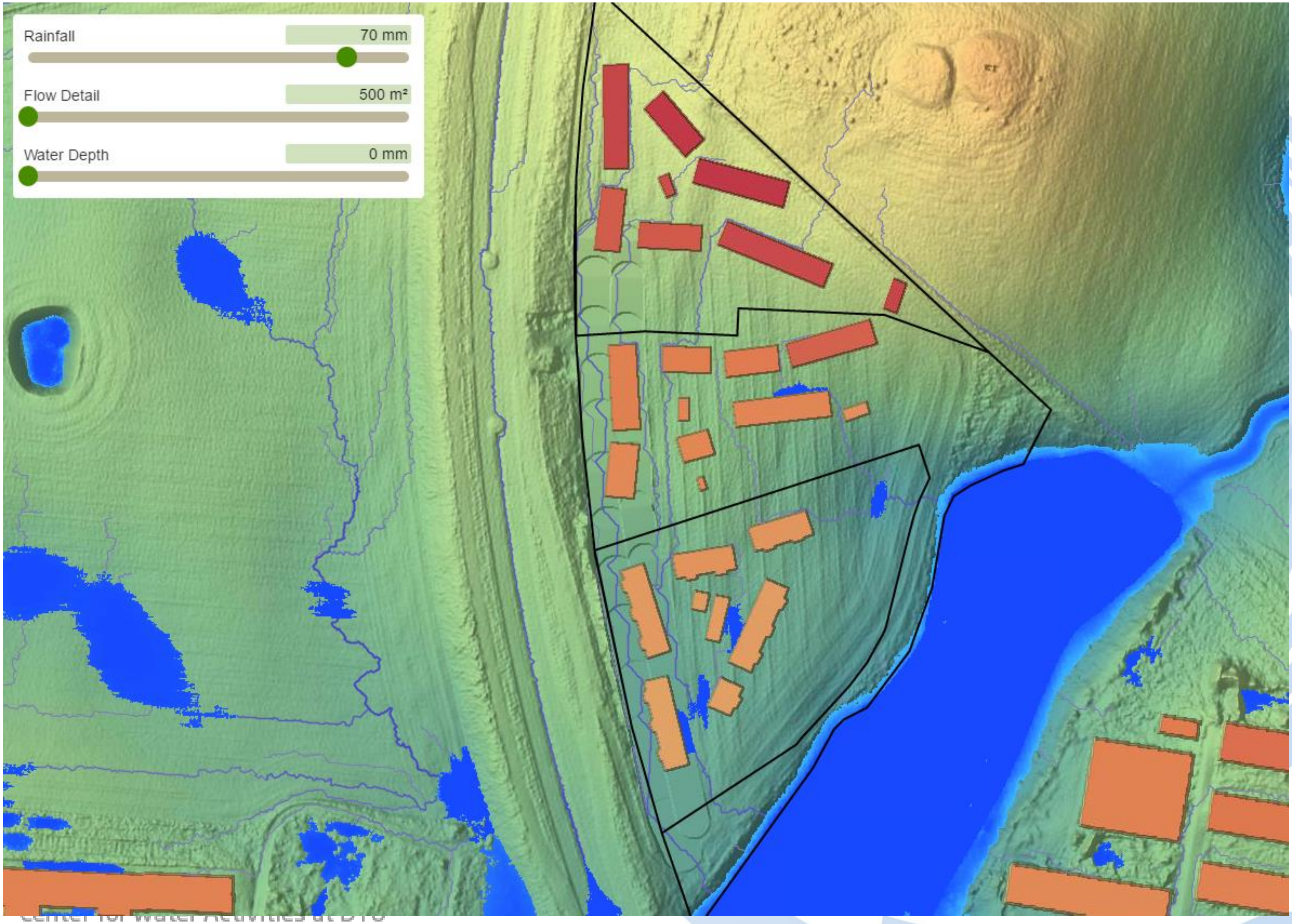


Calculates on systems
Focus on the area available

# Trekroner



Trekroner



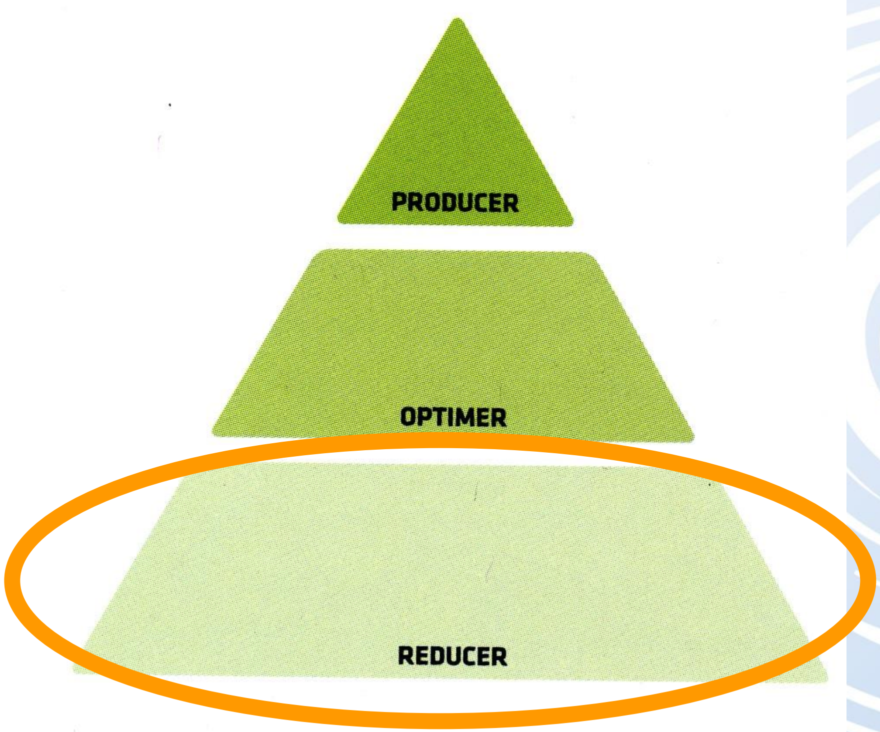
# Application Process

- Background –
the project came from a colloaboration with Vandkunsten in the building scale
and a collaboration with a collaboration with DTU Environment on how to integrate knowledge of water flows in early design phases.
It evolved naturally into the VIS project.

-the application process was very simple.

By means of Karsten Arnbjergs research we were able to outline the CO2 emission reduction potential of the project.

# Engineering knowledge from first Design day
# HISTORY OF VIS PROJECT





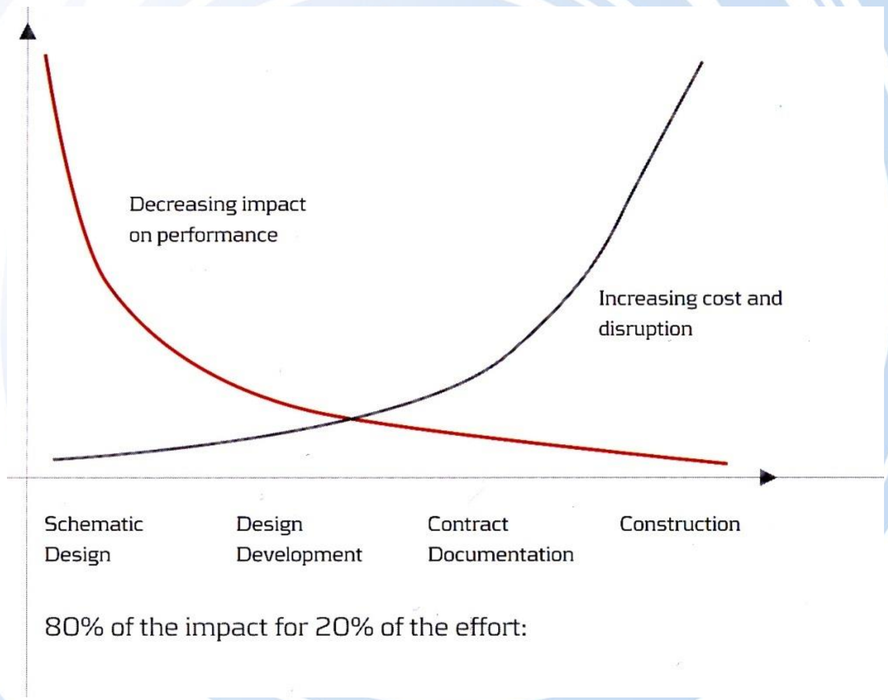
HLA model

# Engineering knowledge from first Design day

A decade of experience with integrated design.

Task 23

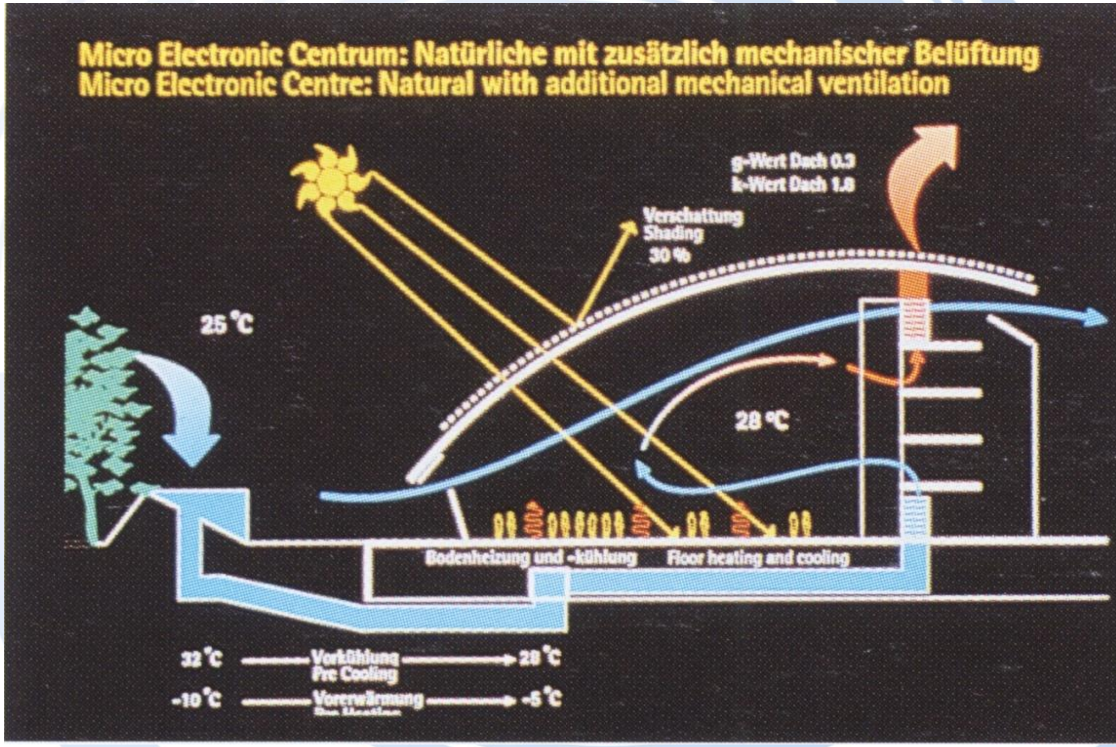
4 industrial PhD’s – civil engineers at architectural studios



# Engineering knowledge from first Design day

Reducing the energy consumption for the operation of buildings:
Daylight instead of electric light.
Passive Solar heating – without overtemperature
Natural ventilation instead of mechanical ventilation.

DO THE SAME IN URBAN DESIGN



# Tools for building physics

Preliminary design

iDBuild

Be06

ENERGY-10

Integrated

BSim

IES VE

RIUSKA

IDA ICE

TRNSYS

EnergyPlus

ECOTECT

DOE

ESP-r

DEROB-LTH

Specialized

WUFI

Radiance

MATCH

SIMBAD

HEAT2

http://apps1.eere.energy.gov/buildings/tools_directory/

# Tools for cities

Preliminary design

Vasari

Miljø Gis

Scalgo?

Integrated

Vissim

Small wind tunnel

TRNSYS

ECOTECT

Specialized

Large windtunnel

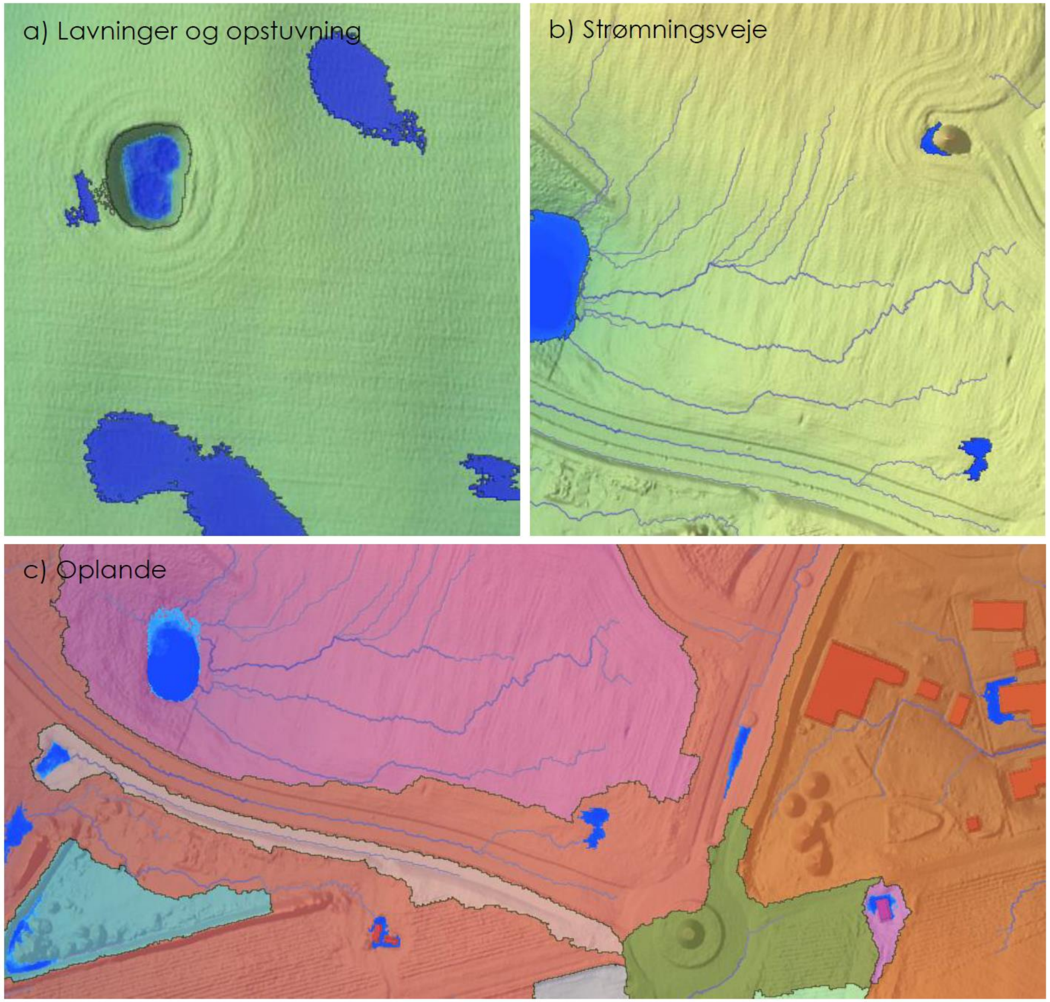
MikeUrbanFlood

Flood-2D

WHY? Outdoor spaces with sun and lee are more attractive to human beeings.
+ Water, Snow, Traffic prediction

Criteria for the simulation tools:

Speed – 'real time'
Accuracy
Interface with popular drawing software in the industry.
Visual display of results




*Figur 5: Tre figurer som viser resultater fra SCALGO. På a) ses indtegning af lavninger (sort ramme) og opstuvning af regnvand ved 70 mm (blå figurer). På b) ses et kort med indtegnede strømningsveje (blå linjer), som samler sig i en lokal lavning. På c) er oplandene til lavningerne indtegnet med en nedbør på 5 mm. Ved større vandmængder vil oplandene blive større, da de enkelte lavninger vil flyde over til de næste. Baggrundskortet er den digitale højdemodel, som viser højderne i terrænet.*

2016/2017
EU regional
VIS project
Using simulation
Tools in real
projects
at architectural
Office
Vandkunsten