A change in the climate requires a change in our professional paradigm

Søren Gabriel sgab@orbicon.dk

Heavier every day rain







Cloudburst







Adaption to the new climate is all about reducing risk

	Hver dag	S			RIS	ыко
	Hver måned	A N D _{Ove}	rsvømmelse	r		
	Hvertår	S Y dyrk Iang N	af ånære dyrkningsarealer langs Værebro Å Oversvømmelser af boliger i Jyllinge Nordmark			
	H∨ert10.år	L I G H				
	H∨ert100. år	E D	кол	SEKV	ENS	
ENNESKER		Ubetydelige skader	Mindre kvæstelser, få personer	Mere end fem kvæstede	Fålivsfarligt kvæstede ellerdøde	Flere døde eller mange kvæstede
VÆRDIER		< 10.000 kr.	< 100.000 kr.	< 1 mio. kr.	< 10 mio. kr.	>10 mio. kr
MILJØ		Ubetydelig påvirkning	Større påvirkning	Risiko for varige skader	Mindre varige skader	Større varig skader
SAMFUND		ingen eller mindre forstyrrelser. Forsinkelse på drift< 1 dag	Kortere forstyrrelser. Forsinkelse på drift på < 1 uge	Betydelige forstyrrelser Forsinkelse på drift på > 1 måned, fyring af medarbejdere	Alvorlige forstyrrelser. Forsinkelse på drift på > 3 måneder, tab af kunder.	Kritisk for opretholdels af funktion Ophøraf virksomheds drift.

M

Risk = Probability x Consequences

REDUCE PROBABILITY

REDUCE CONCEQUENCES

- Raising flooding levels
- Restrict use of area
- Optimize sewer system incl.
 SUDS
- Optimizing and using the terrain

- Robust to flooding
- Remove things of value
- Change use of area
- Contingency

• Contingency

Prioritize your activities

- Before next cloudburst: Contingency
- Over the next few years: Adapting buildings etc.
- In the future: Multifunctionel adaption of sewer system and landscape incl. SUDS



Contingency



Adaption of buildings



2012



Adaption of sewer system and landscape



LAR, SUDS, WSUD, LID

- or whatever you call it

- Evaporation
- Infiltration
 - Infiltration trenches
 - Pervasive paving
 - Infiltration through a green surface
- Local discharge
- Reuse
- Synergy with exsisting sewer
- Detention and transport on the surface
- Cleaning
- Draining groundwater
- Adaption of buildings





The association game for engineers





SUDS involves more than just engineers



Infiltration – how hard can it be?

S.

















Cloudburst – more water than you can handle



SØNDER BOULEVARD

8

Plan over Sønder Boulevard

Ved tørvejer kan boulevarden anvendes til et grønt rekreativt parkstrøg.

LADEGÅRDS Å, FREDERIKSBERG ØST OG VESTERBRO







Vandet ned til drænlag hvorefter hvor overstydende regn ledes væk

Ved hverdagsregn siver overflade-

Q

Ved skybrud kan de store mængder regn ledes på overfladen.

Konceptskitse arbejdes med

present product interest

Konceptskitser der illustrerer hvordan der kan arbejdes med terrænet.



















Rainwater management at Nærheden



Infiltration capacity defined by raising groundwater table



Infiltration



Discharge to streams



Infiltration – effect on groundwater

- 0% paved (undisturbed land)
 - 800 mm precipitation
 - 600 mm evapotranspiration
 - 200 mm "clean water" to ground water and streams
- 40 % paved (domestic area), combined sewer
 - 800 mm precipitation
 - 360 mm evapotranspiration
 - 320 mm to sewer
 - 120 mm "clean water" to ground water and streams
- 40 % paved (domestic area), infiltration
 - 800 mm precipitation
 - 400 mm evapotranspiration
 - 400 mm "polluted water" to groundwater, streams (and sewer)





Breaking news: Train station flooded by infiltrated rain water!











721500 721550 721600 721650 721700 721750 721800 721850 721900 721950 722000 722050 722100 722150 722200

Infiltration in combination with the sewer system







Environmental problems related to infiltration og rain water



www.separatvand.dk

- Sources of pollution
 - Deposition
 - Surface acticities
 - Erosion of surface
- Amounts and concentrations

- Rain water quality and risk assessment
- BAT for infiltration facilities
- Regulation of infiltration



Rain water infiltration map Municipality of Allerød



Sustainable adaption for the new climate – what does it take

- Every day rain, cloudburst rising ground water table
- Economy
- Nature and environment
- Integration in the urban space
- Resilience
- Innovation and diversity
- Public participation and cross disciplinary approach



Adapting for the new climate is a great chance – not a problem



Magasinering indenfor byggefelter

Grå elementer (urbanscape)















Transport indenfor byggefelter

Grå elementer (urbanscape)

















Magasinering i vejprofil og fællesrum

Grå elementer (urbanscape)









Transport i vejprofil og fællesrum

Grå elementer (urbanscape)







