National Institute for Public Health and the Environment

Ministry of Infrastructure and the Environment

Impacto das Novas Diretrizes de Gestão de Solo e Água Subterraneas na Saúde e no Bem-estar

Impact of new soil and groundwater standards on health and well-being

The soil-water system as basis for a climate proof and healthy urban environment

Piet Otte

National Institute for Public Health and the Environment

Ministry of Infrastructure and the Environment

Content

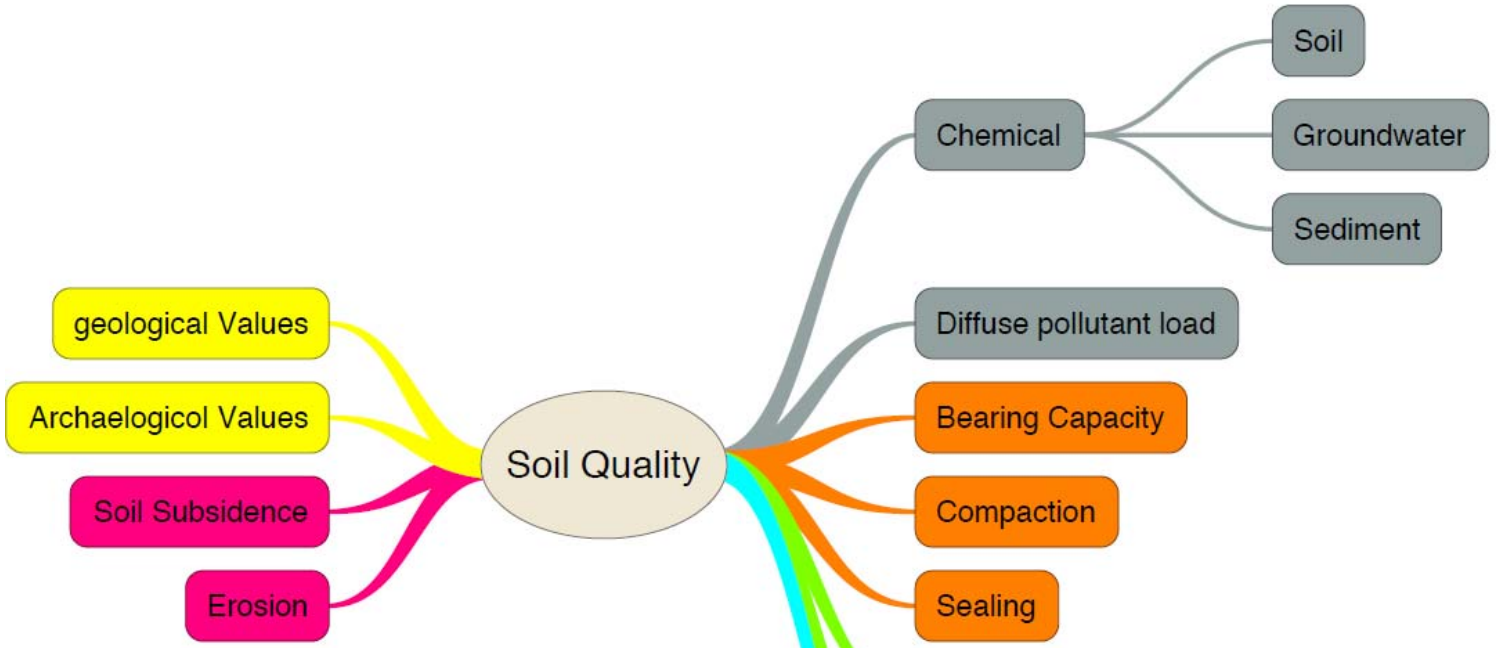
1. Introduction
2. Standards and soil qualities
3. Societal Challenges
4. Measures and Impacts
5. Health and green space
6. Conclusions

- Chemical quality soil and groundwater:
  - Intervention values → health and ecosystem
  - Remediation objectives → health and ecosystem
  - Food quality standards → health
  - Drinking water standards → health

- Other soil and groundwater qualities
  - Fertility ⇢ food production
  - Bearing capacity ⇢ safety
  - Biodiversity ⇢ soil's 'health'

Would environmental standards alone guarantee us a healthy environment?

Which soil qualities can be identified?



How to deal with different:

- Goals?
- Interests of different stakeholders?
- Trade-offs?

Societal challenges of today

- Demographic changes,
- Economic growth and decline, ageing of populations
- Climate change
- Urbanization
- Shortage of resources

Climate change and urbanization

- Effects of climate change are most apparent in cities.
- How create Healthy Urban Living
- Innovative solutions and smart design
- The importance of the soil-water system

Climate Change is a Fact

Quotes:

- Climate scientists agree: climate change is happening here and now.
- We are at risk of pushing our climate system toward abrupt, unpredictable, and potentially irreversible changes with highly damaging impacts
- The sooner we act, the lower the risk and cost. And there is much we can do.

Can we develop and implement a policy for sustainable use of soil and subsoil and deal with the impact of climate change?

Societal challenges

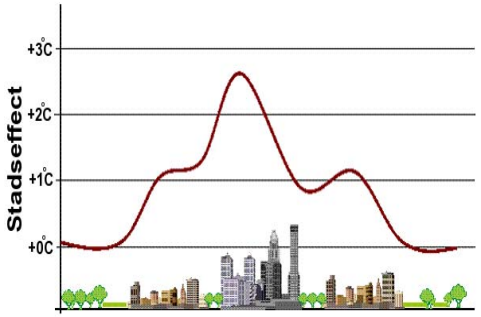
Healthy Urban Living

- Urban Green
  - Public Parks
  - Gardens
  - Urban Family Gardening
- Potential Impacs
  - Health (stress reduction, physical activity, lifestyle, noise)
  - Urban Water Management
  - Urban Climate
  - Economical impact
  - Biodiversity

Can we develop and implement a policy for sustainable use of soil and subsoil and contribute to a healthy urban environment?

Societal task: Climate change adaptation

Increase of intensive rainfall and floodings



Increase of dry periods and heat
→ Heat Island effect

Theorem: the better use of the natural soil-water system can produce many benefits

Increase water storage and water purification capacity

Urban soils as the carrier of greenery

Policy development in The Netherlands

- **Delta Programme and Delta Decisions**

Aim: The aim of the Dutch Delta Programme is to ensure that current and future generations are protected against flooding and that we have enough fresh water over the next century.

1. Water safety (flood protection)
2. Freshwater Strategy
3. Water level management IJsselmeer area
4. Rhine-Meuse delta
5. **Spatial adaptation (e.g. climate proof cities)**
   - **looks at the way in which towns and villages should and can take the soil-water system into account in spatial developments whilst linking up with economic and ecological developments, e.g. for climate proof cities**

Measures and Impacts

measures \ impacts	Biodiversity	Water storage	Water purification	Carrier of greenery	Cooling	Recreation	Health	Air quality
Parks	x	x	x	x	x	x	x	x
Town gardens	x	x	x	x	x			
Vegetable gardens / allotments	x	x	x	x	x	x	x	x
Green roof and walls	x	x		x	x			x
Creation of wadis	x	x	x	x	x			
Profiling of surface level	x	x	x	x	x			
Infiltration system / underground water storage		x						
Flexible level management		x						
'Water squares'		x				x		
Permeable surface		x						
Separate sewer system		x	x					

Municipal tools and measures regarding climate change adaptation

- Focus on 'no regrets' measures
- Increase water storage capacity
  - Unsealed soil or permeable surface
  - Green roofs
  - Link ambitions for soil with water policies
- Mitigation of heat (cooling)
  - Increase green spaces and air corridors
- Health
  - Relation between green spaces and health

Contribution of unsealed soil for climate resistance

Indicative numbers. Numbers are highly dependent on local environmental characteristics

- Germany: Leipzig (*Haasse et al., 2009)*
  Soil sealing 40-60% → increase surface runoff 200 mm / year

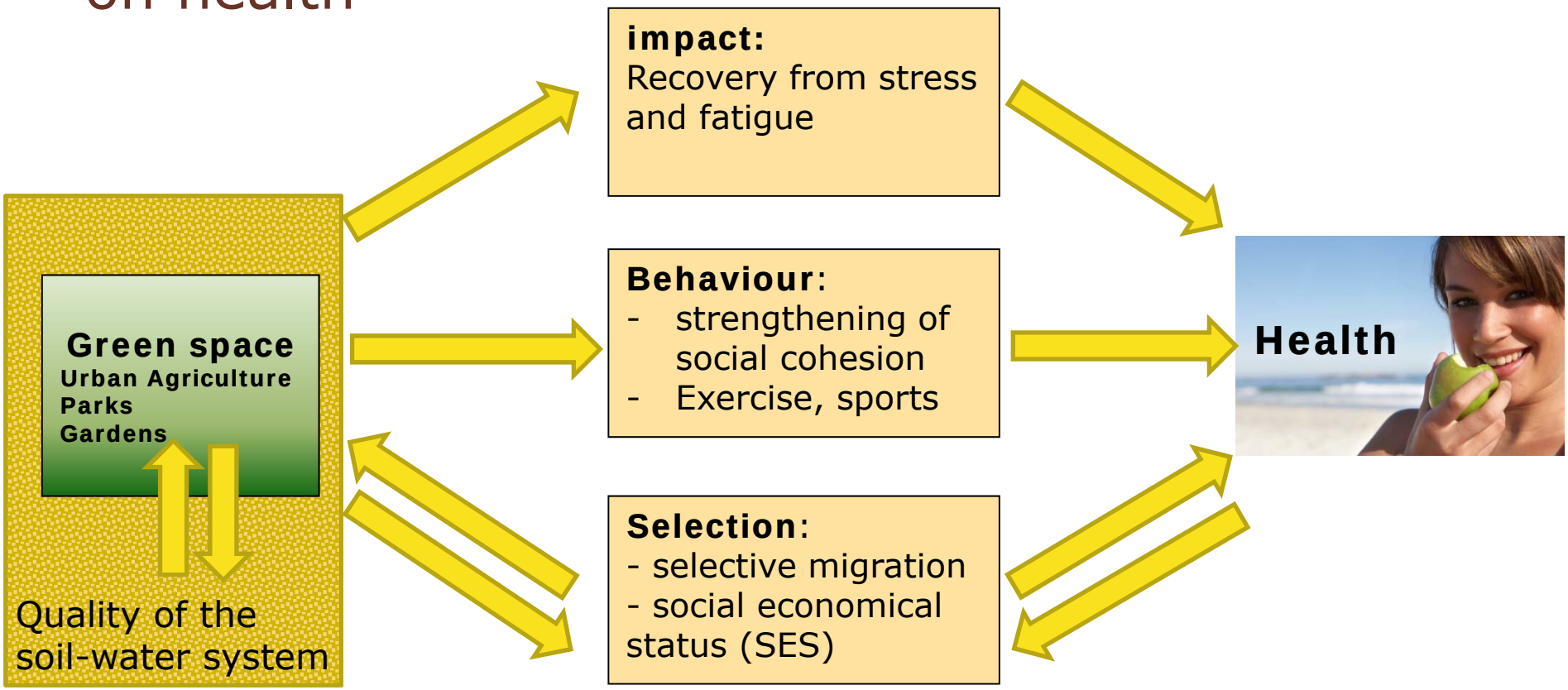
- Austria (*Kleidorfer et al., 2009)*
  20% increase in intensity rainstorm same effect as an increase of 40% soil sealing

- The Netherlands, Rotterdam (Klok et al., 2010)
  10% increase unsealed soil surface → 1 º C temperature reduction

Potential benefits

- Energy saving
  - Isolation by green roofs 1.2% - 8 % depending climat zone and construction
- Economic value of climate measures
  - Increase value of real estate 4-8%
- Costs of water management charges
  - Less costs of sewer constructions (capacity) and maintenance
  - Lower water treatment costs
- Avoiding damage to buildings and infrastructure
- Increased wellbeing

The potential impact of the urban green space on health



Plausible relationships between the presence of green and (perceived) health

- Relationship between green and perceived health is demonstrated in several countries. In green surroundings, perceived health is a factor 1.5 higher (Maas et al., 2009)

- Evidence for a proven relationship between the availability of green space and increased physical activitiy of children is growing (Maas et al., 2009)

- Benefits difficult to express in generally applicable numbers

10 % more urban green saves 400 million on health care (min EZ)

Case study municipality of Hilversum

Accessibility of green

Green contributes to public health, environment and climate resilience

Questions:

1) Availability of green in different districts?

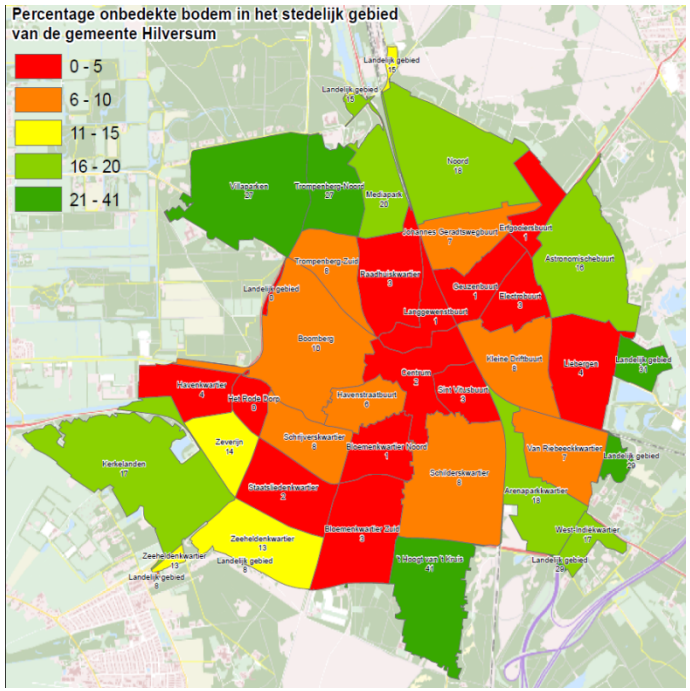
2) In which districts offer initiatives for green spaces and climate adaptation the most revenues?

3) Which approach and information enable us to underpin policies for health and climate proof cities?

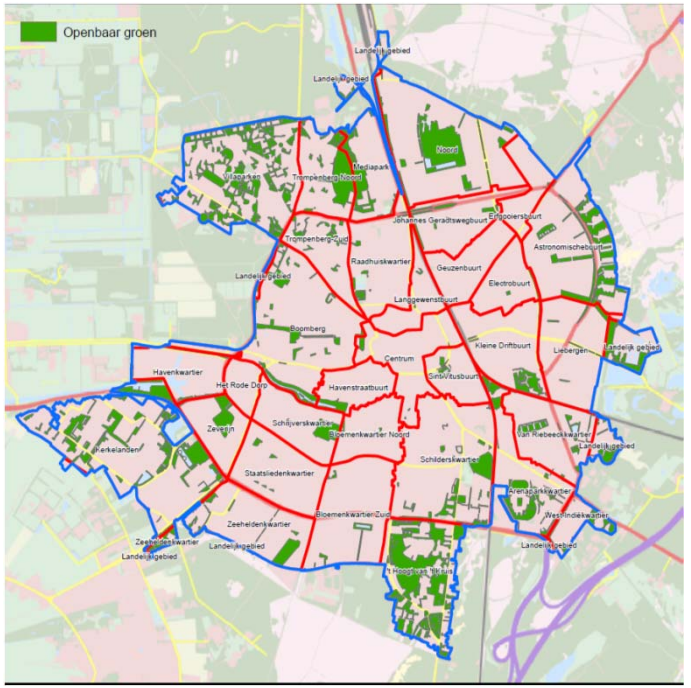
- *Development of Decision Support Tools*
- *Make visible the different spatial characteristics per neighborhood*
- *Inhabitants characteristics*
- *Link policy goals*

Accessibility of green in various districts and inhabitants characteristics

Percentage unsealed space (soil)



Public green space

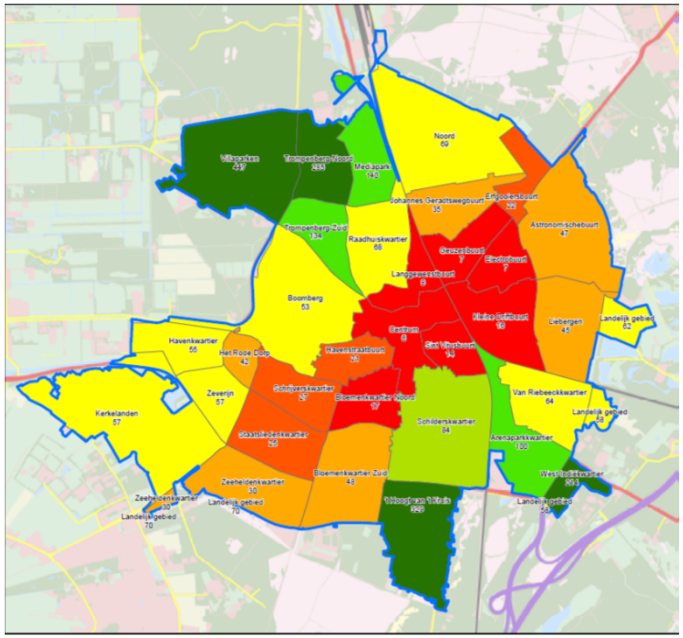


Figures: Unsealed soil: 13%; Green surface: 1,4 - 35%;

Green surface: 58,4 m^2 per home (target 75 m^2)

Green within 500m distance and % children

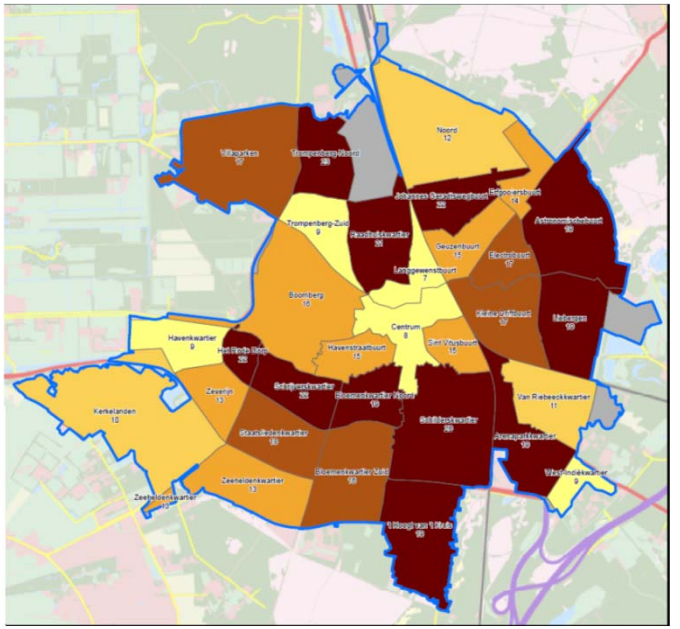
Public green within 500 m



m^2 per house

- < 20
- 20 - 30
- 30 - 50
- 50 - 75
- 75 - 100
- 100 - 150
- > 150

Population 0-14 year in %



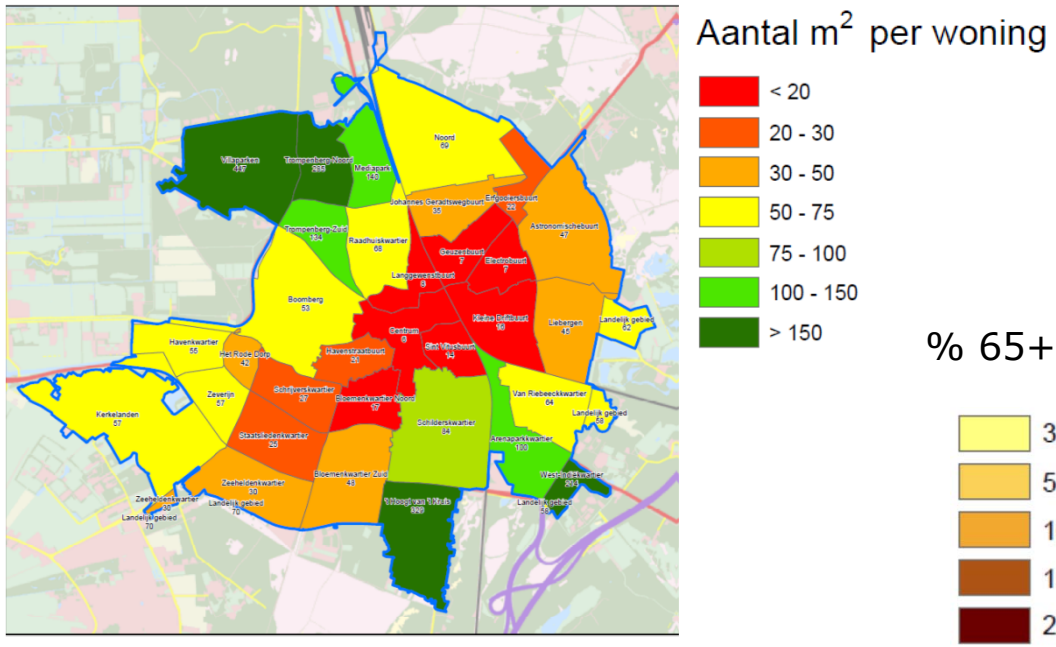
% 0-14 year

- 8 - 10
- 10 - 13
- 13 - 16
- 16 - 19
- 19 - 24

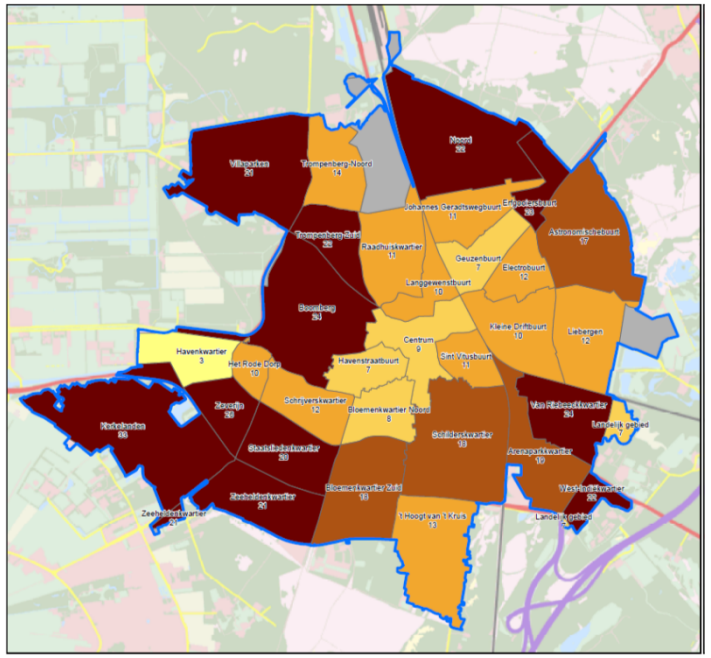
In downtown and surrounding neighborhoods limited access to green. In some of these neighborhoods are relatively many children.

Green within 500m distance and % elderly (65+)

Public green within 500 m



Population elderly in %



In some neighborhoods live relatively many elderly with limited access to green
→ To support health gains, green areas could be enlarged

Administrative dilemmas

- Urban adaptation still happens in an ad hoc manner and in 'isolation' (sectoral approach and dito measures)
- Responsibilities are not clearly assigned and dispersed (e.g. urban (groundwater, green, infrastructure, health etcetera)
- Financial aspects are vague as well as the distribution of costs and benefits among stakeholders

- Strengthening of '*multi-level governance*'
  - Support for climate adaptation from out common interests
  - Quantifying the benefits (e.g. green and health)
  - Linking policy themes (e.g. spatial planning, health, soil and climate adaptation)

Conclusions

- Space for water storage offers space for healthy environment
- Support climate adaptation by common interests
- Existing instruments and suggestions for emphasis on RO and water
- Linking spatial planning natural system (substrate)
- Knowledge building through best practice
- Opportunities in laws and regulations

Claessens J, Schram-Bijkerk D, Dirven-van Breemen L, Otte PF, Wijnen van H. The soil–water system as basis for a climate proof and healthy urban environment. Sci Total Environ (2014).

- One of the effects of climate change expected to take place in urban areas is an increase in periods of extreme heat and drought.
- How the soil can contribute to making cities more climate proof is often neglected.
- Unsealed soil and green spaces increase water storage capacity and can consequently prevent flooding.
- The planning of public or private green spaces can have a cooling effect and, in general, have a positive effect on how people perceive their health.

Knowledge development

- How to develop an effective policy for a climate proof and healthy city?
- How to optimize the functioning of the natural soil-water system
- How to strengthen governance
  - multi-level governance,
  - stakeholder participation,
  - government-citizen-business,
  - awareness

- Regarding the soil-watersystem
  - Effects of infiltration of rainwater on surface and groundwater quality
  - Water Purifying capacity of the soil
  - Water in the city; health and ecology
  - Green space, urban agriculture, food quality and healthy urban living




Thanks for your attention





Piet Otte | Frank Swartjes | Michiel Rutgers