“Water Management”

key to sustainable well-being in times of

urbanization and increased ***flooding***

Ron den Hertog MSc
Director KWT Group

About KWT Group

1989

Business: controle de nivel

Products:

Comportas,
Valvulas de retencao,
Valvulas basculante

40 tons Stainless Steel per month

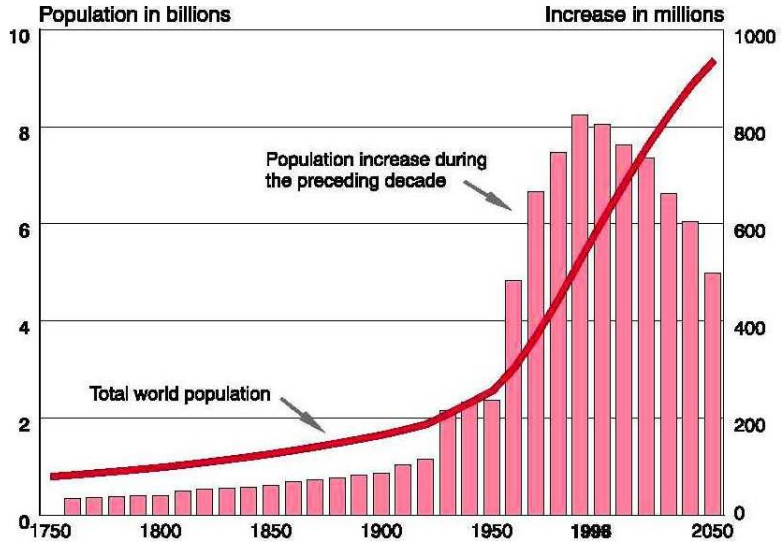
2 production sites

35 countries through offices, distributors and agents

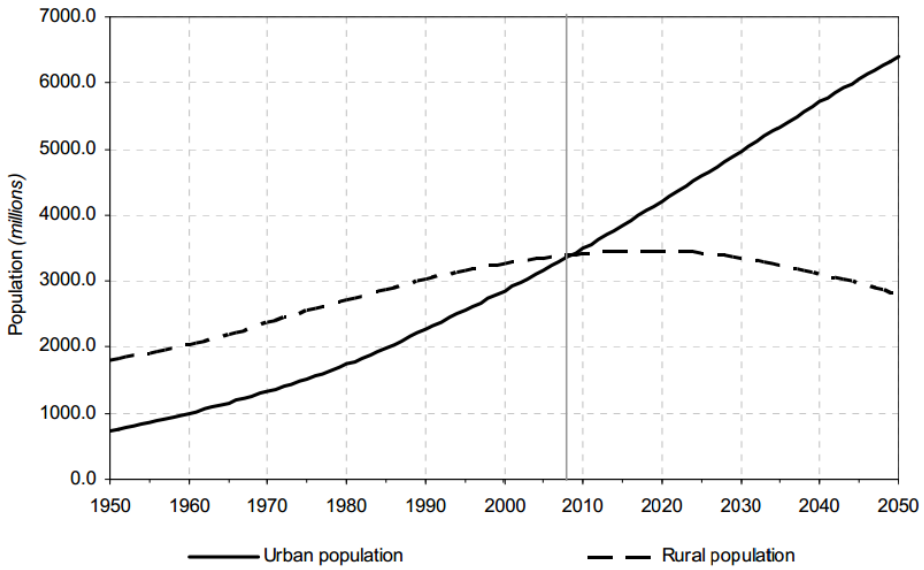
10% standard, 90% bespoke

Urbanization

- Population growth
- Increased urbanization

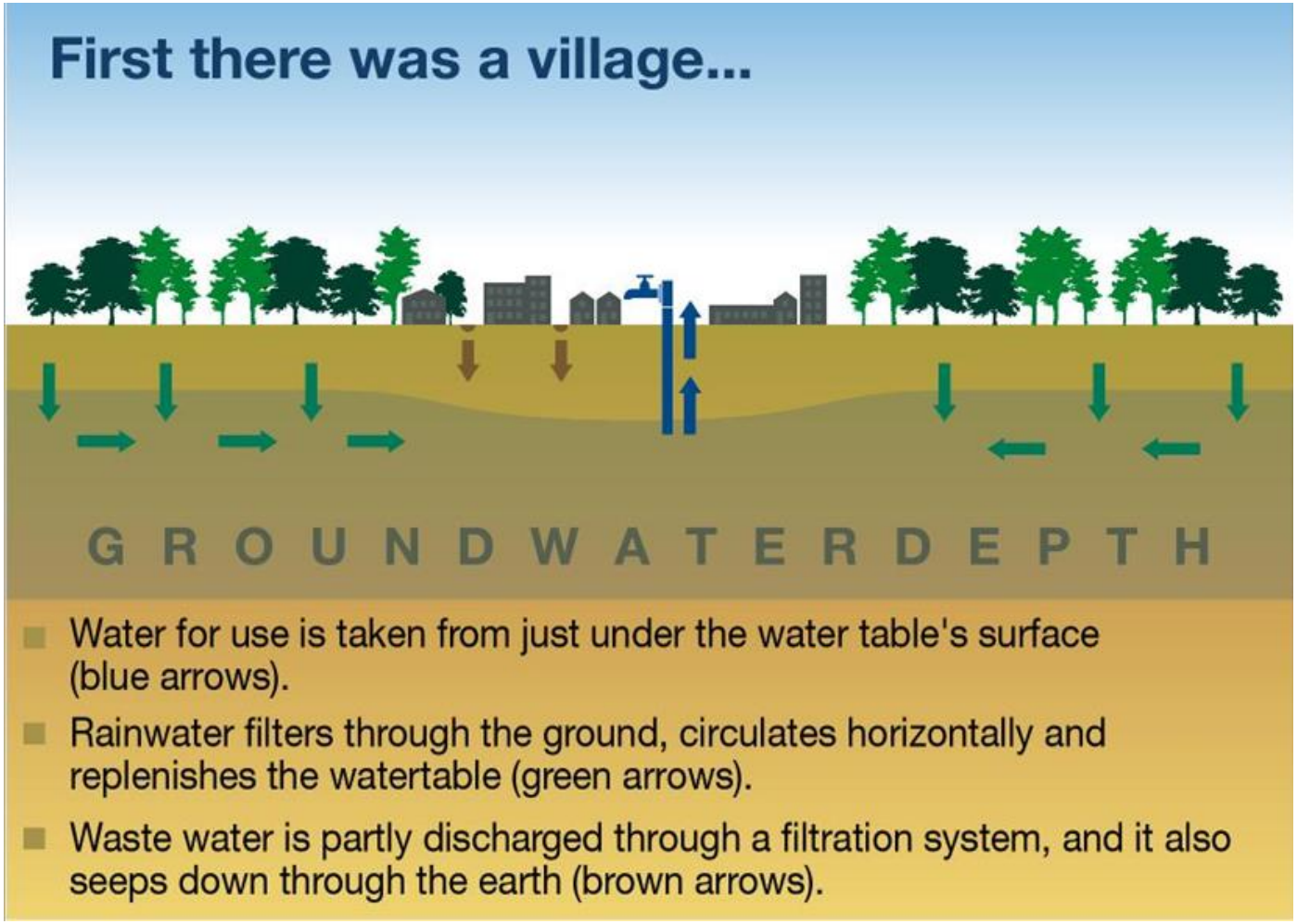


Source: UCSC 2013

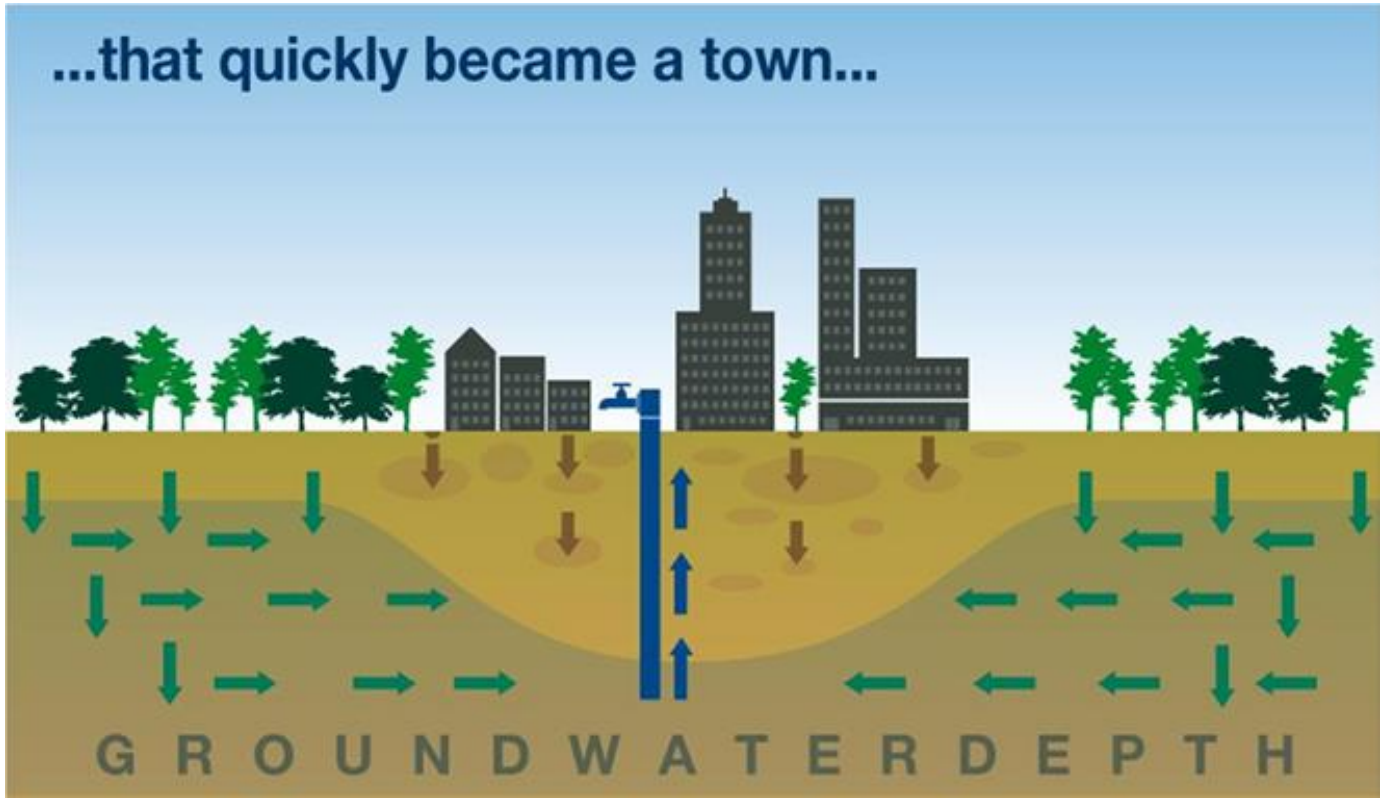


Source: United Nations Department of Economic and Social Affairs/Population Division 5. World Urbanization Prospects: The 2007 Revision.

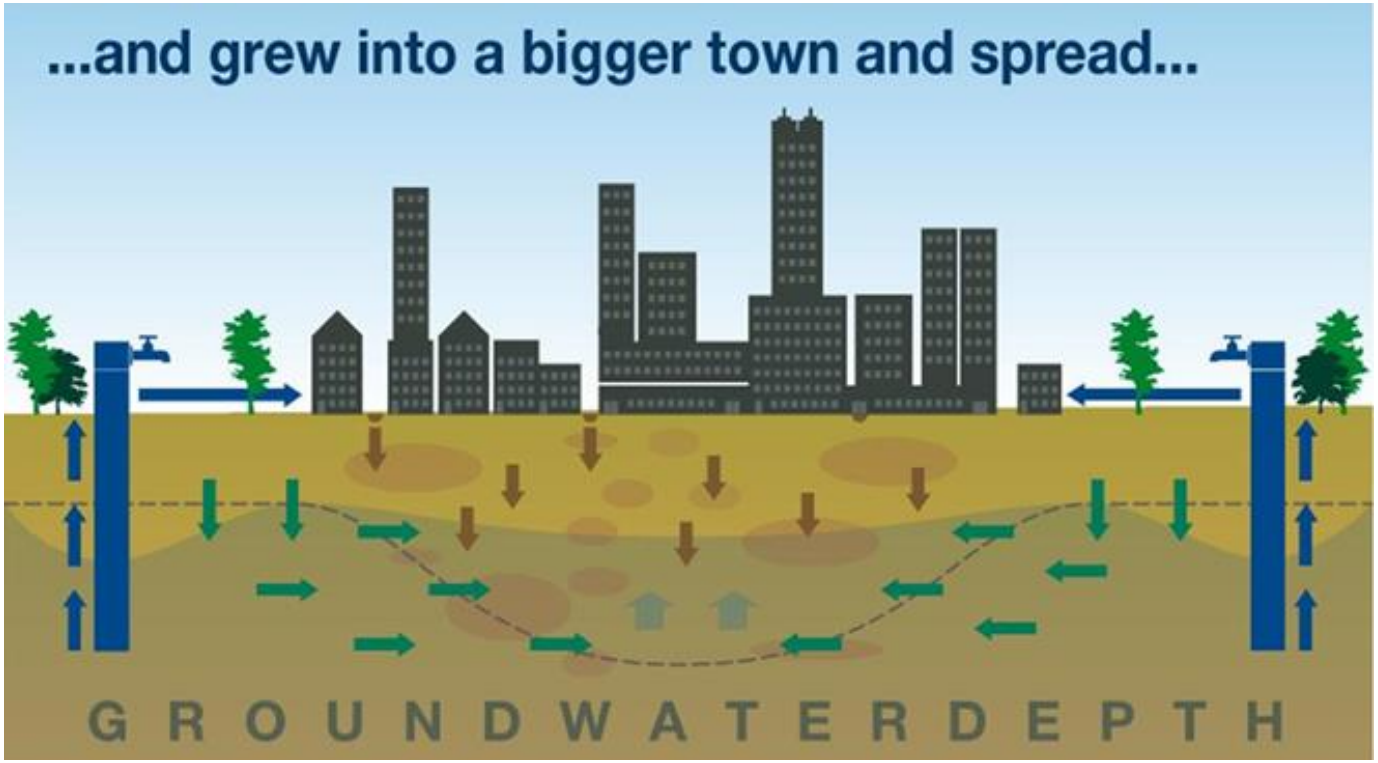
Urbanization



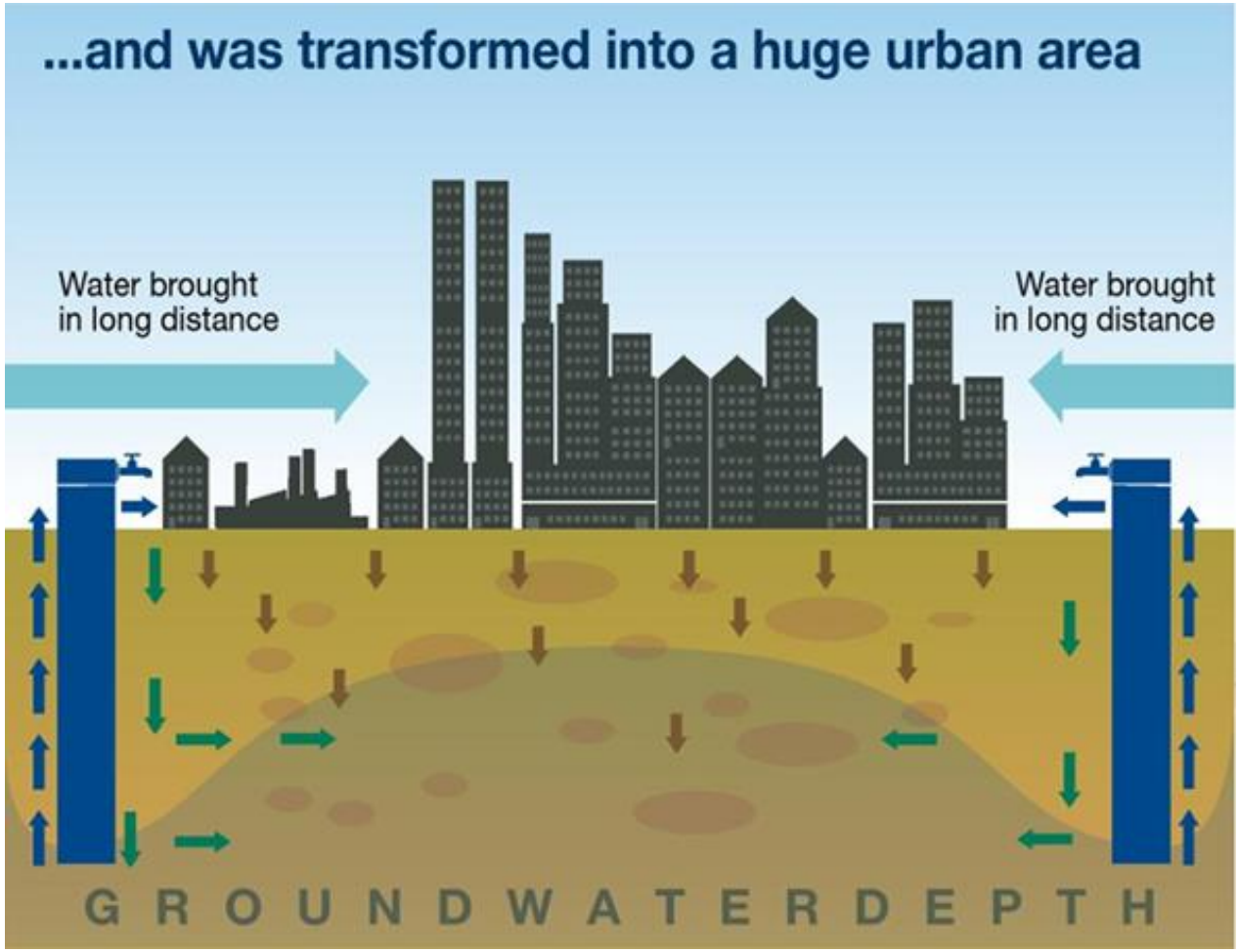
Urbanization



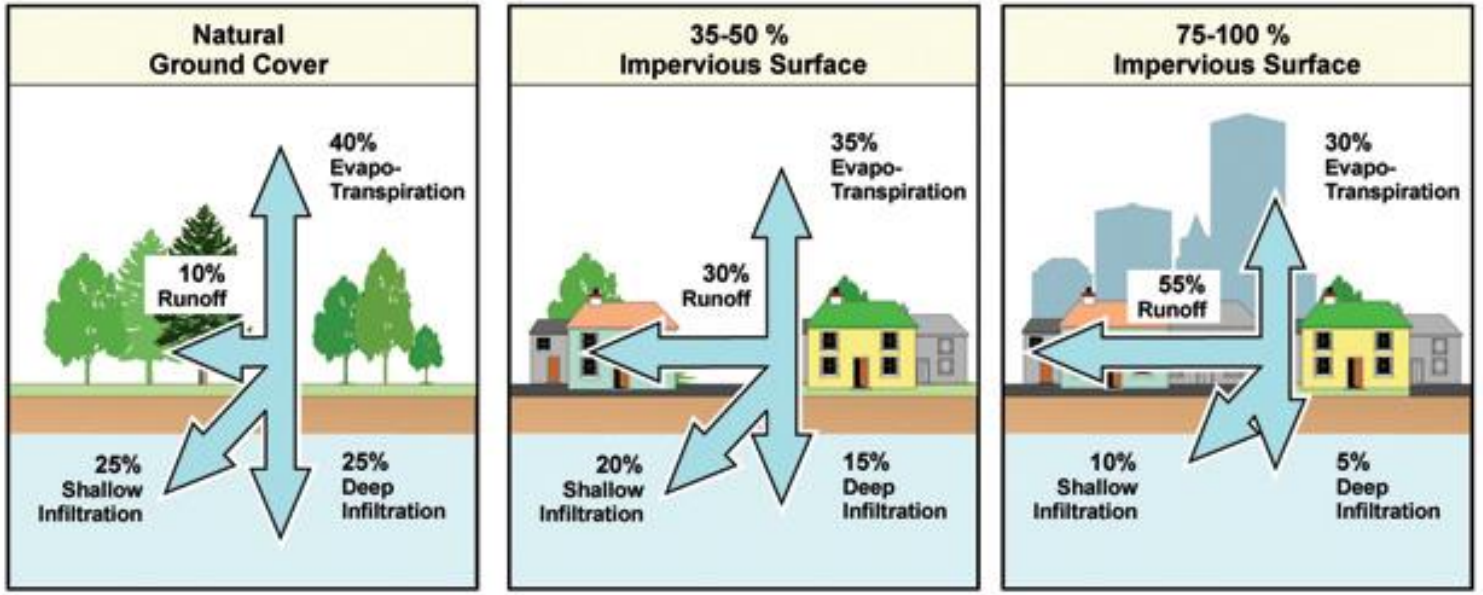
Urbanization



Urbanization



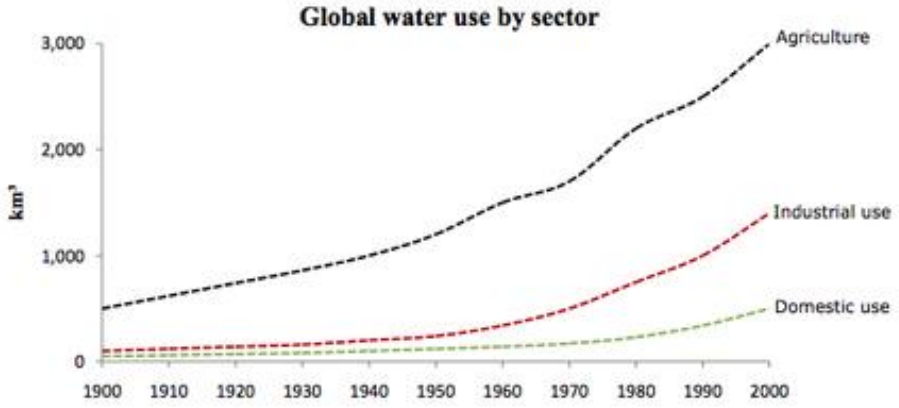
Urbanization



Urbanization: increased surface runoff of rainwater up to **55%**

Urbanization

Annual release of polluted water in Brazil: **32 bln m3**
(excl Agricultural use)



Water consumption in Brazil and Congo in 2000

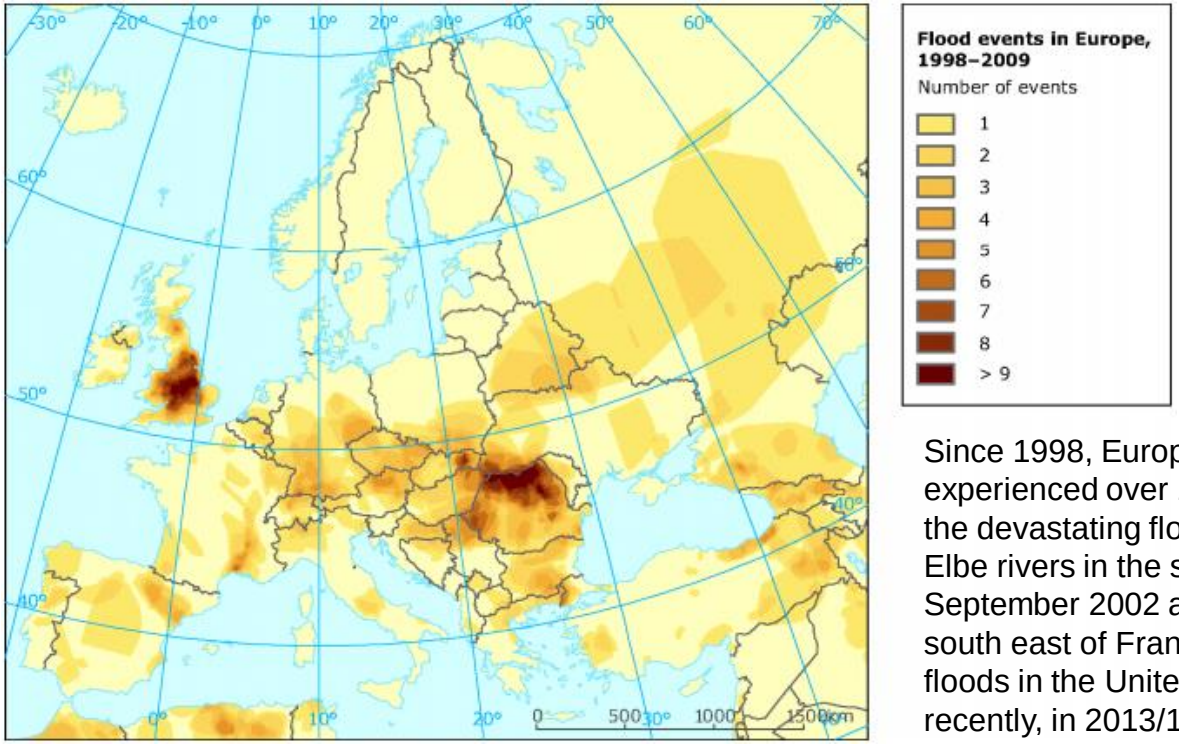
Country	Population	Irrigated land	Water consumption per person
Brazil	176 million	26,500 km²	359 m³
Democratic Republic of Congo	5.2 million	100 km²	8 m³

Source: Testbig March 2015

Flooding

Climatic changes

- Increased precipitation
- Frequence of precipitation
- Soil subsidence



Since 1998, European countries have experienced over 100 major floods, including the devastating floods along the Danube and Elbe rivers in the summer of 2002, the September 2002 and December 2003 floods in south east of France and the autumn 2000 floods in the United Kingdom (UK). More recently, in 2013/14 dramatic flooding occurred in Somerset UK and Serbia.

Source: Climate Service Center 2013

Urbanization and Flooding

It causes:

- Contaminated ground water, lower water table
- Lack of fresh, clean water
- Reduced absorption cause increased downstream flooding
- Pickup soil contaminants cause contaminated waterways (heavy metals)
- Causing contaminated agricultural fields, and fish waters
- Erosion of waterways
- Endangering health
- Economical damage, flooded property and infrastructure
- Overloaded sewer systems; drainage into rivers

Cost implications next 20 years (per year) - example

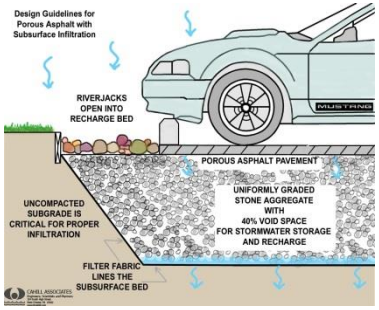
- ✓ USA: 5 bn US$
- ✓ India: 30 bn US$
- ✓ China: 20 bn US$
- ✓ Brazil?

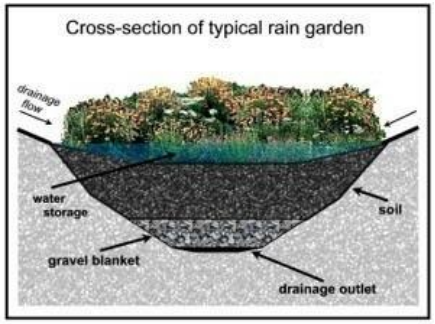
Methods of mitigation:

Green engineering Reduction estimation 20-30%

Mainly "developed" countries

- Reduce run-off and groundwater discharge
- Porous pavements
- Rain gardens and tree planting using green area ratio's (Berlin) / chargeability
- Living roofs (Green Roof policy Stuttgart)
- Bioswales / natural water run-off
- Wetland construction
- *Sustainable* urban drainage systems (Pitt Review, UK)
- Improve soil infiltration and evaprotranspiration





Methods of mitigation:

Hard engineering Reduction estimation 70 – 80%.

Upstream

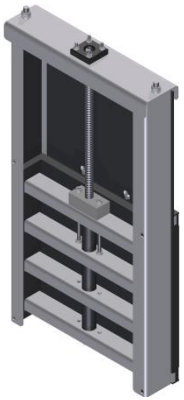
- Vortex flow control i.c.w. dam and river basin (e.g. Wigan, UK)
- Hydropower dam or weir construction that incorporate fish passes
- Stormwater reservoir / basins

Downstream

- Local vortex flow control
- Expand CSO's with temporary (underground) storage tanks (Germany)
- Room for the river (Netherlands); River flow control
- Catchment plans: reservoirs, retention ponds, pumping stations, drainage tunnels, Rainwater harvesting (W-Europe, Singapore, Australia, USA)
- Upgrade urban drainage systems
- Increase sewage treatment capacity

Vortex flow control

KWT penstocks
Model **KSA-MD**



Stormwater reservoirs

Hydropower dams

KWT penstocks
Model **KSA-HD**

For example...Morpeth UK

Previous flooding events occurred in 1863, 1876, 1877, 1878, 1881, 1886, 1898, 1900, 1903, 1924, 1963, 1968 and 1992. In 1992, a record peak water level of 3.19 metres was recorded in the river channel.
The 2008 flood level recorded 4.0 metres. Flood 1962 destroyed 1000 medieval houses from 14th century