Chinese-German Water Forum

Megacities: Interactions between Land Use & Water Management

Urban Units as an Analysis Tool for Mega-Urban Development. The Case of Guangzhou, China

Sun Yat-sen University, Guangzhou
2009-11-25

Ramona Strohschön
Klaus Baier, Rafig Azzam

Outline

- Introduction: Megacities and Water
- Land use change in megacity Guangzhou
- Urban effects on groundwater and surface water hydrology
- Differentiation of Guangzhou‘s cityscape
- Urban units
- Conclusion

Introduction: Megacities and Water Project

► Analysis of highly complex urbanization processes

Reduction of

settlements	–	humans	–	natural resources
⇩		⇩		⇩
built and open space	–	living conditions	–	water

and analysis of their dependencies and interactions.

PRD II 2007

Land use change in megacity Guangzhou

Guangzhou, 1990

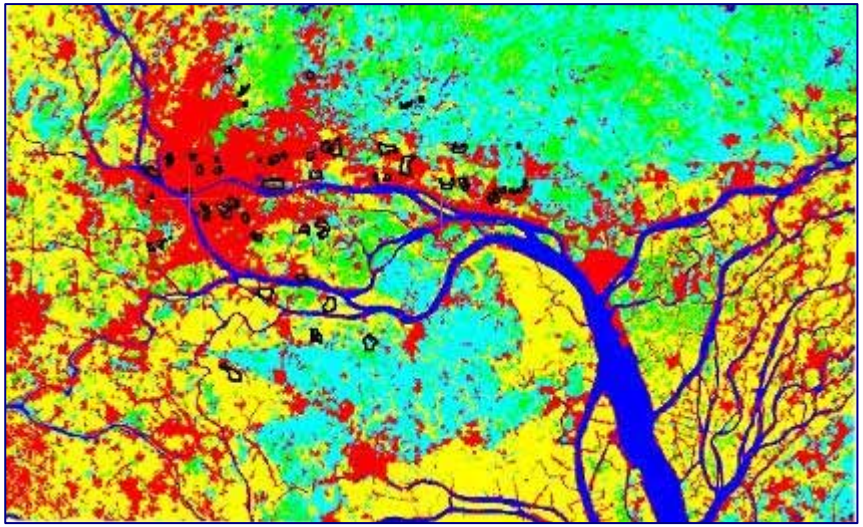
Landsat 7-ETM
Real color (channel 1: red; channel 2: green; channel 3: blue)

Guangzhou, 2005

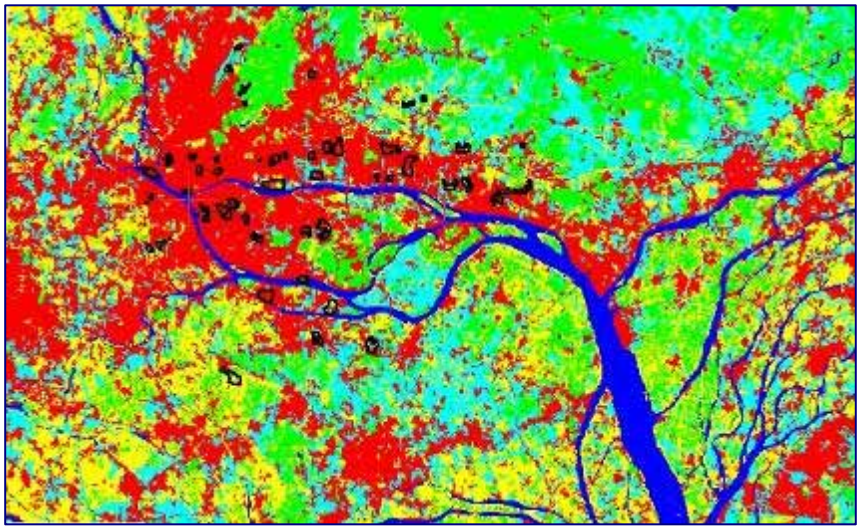
Landsat 5-TM
Real color (channel 1: red; channel 2: green; channel 3: blue)

Land use change in megacity Guangzhou

Guangzhou, 1990



Guangzhou, 2005



Water
Agriculture
Forest & green area
urban area - highly densified
urban area - lower densified
investigation area

0 20km

Lu 2009

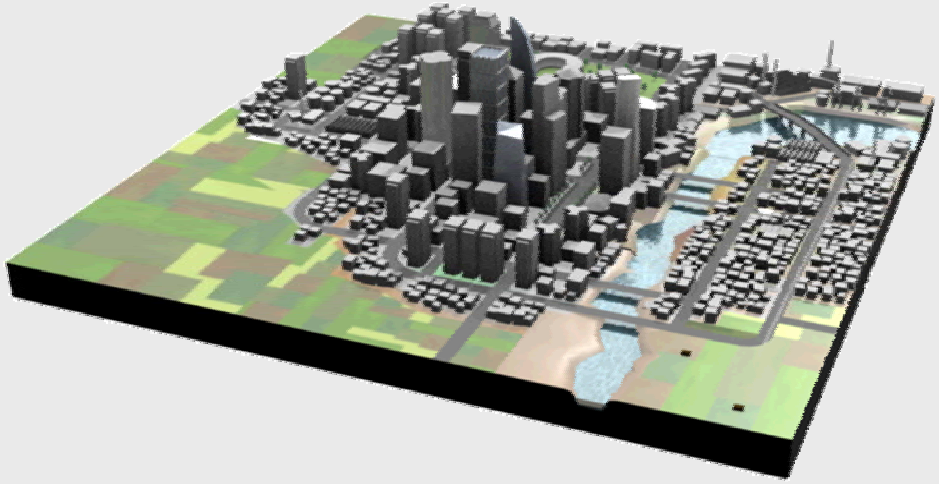
Land use change in megacity Guangzhou (1990-2005)

Land use types	1990		2000		2005		1990-2005	
	Area (km^2)	Area (%)	Area (km^2)	Area (%)	Area (km^2)	Area (%)	Land use change (km^2)	Land use change (%)
Water	155.65	7.46	162.34	7.78	131.24	6.29	-24.41	-15.68
Urban area, highly densified	522.98	25.08	890.70	42.71	891.50	42.75	368.52	70.47
Urban area, lower densified	466.21	22.35	180.08	8.63	465.20	22.31	-1.01	-0.22
Agriculture	685.95	32.89	560.46	26.87	376.22	18.04	-309.73	-45.15
Forest & green area	254.75	12.22	291.96	14.01	221.38	10.61	-33.37	-13.1
total	2085.54	100	2085.54	100	2085.54	100	0	----

Urban effects on groundwater and surface water hydrology

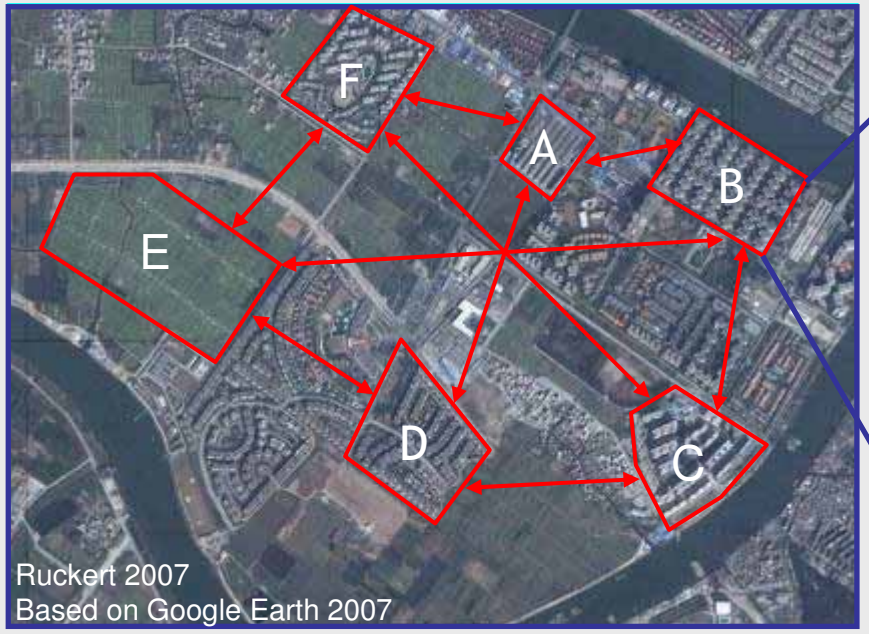
→ Land use analysis & assessment of water resource vulnerability

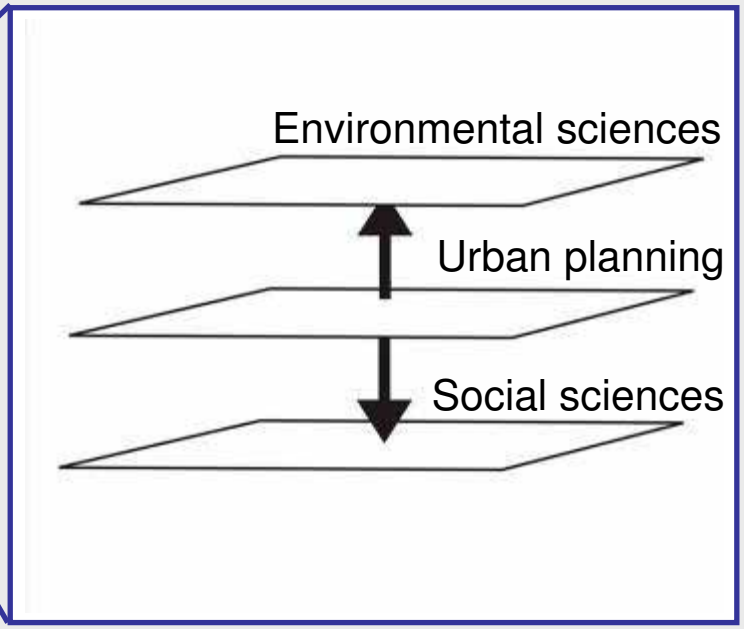
Differentiation of Guangzhou‘s cityscape



Graphic: RWTH Aachen University, Dept. of Engineering Geology and Hydrogeology 2009

Differentiation of Guangzhou's cityscape
Zoom 1 → macro level: city



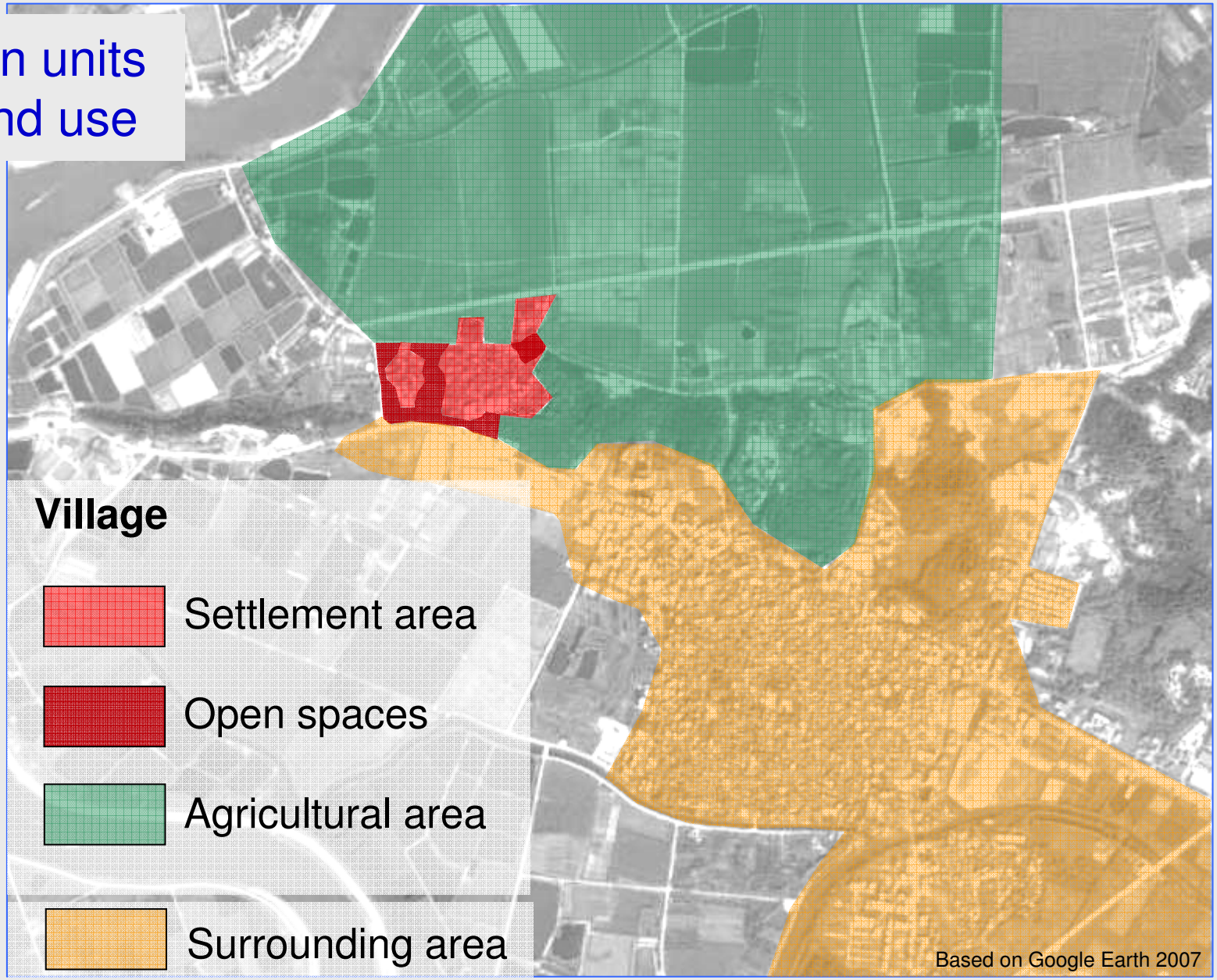


Differentiation of Guangzhou's cityscape
Zoom 2 → micro-level: urban units

Differentiation of Guangzhou's cityscape
Zoom 2 → micro-level: urban units

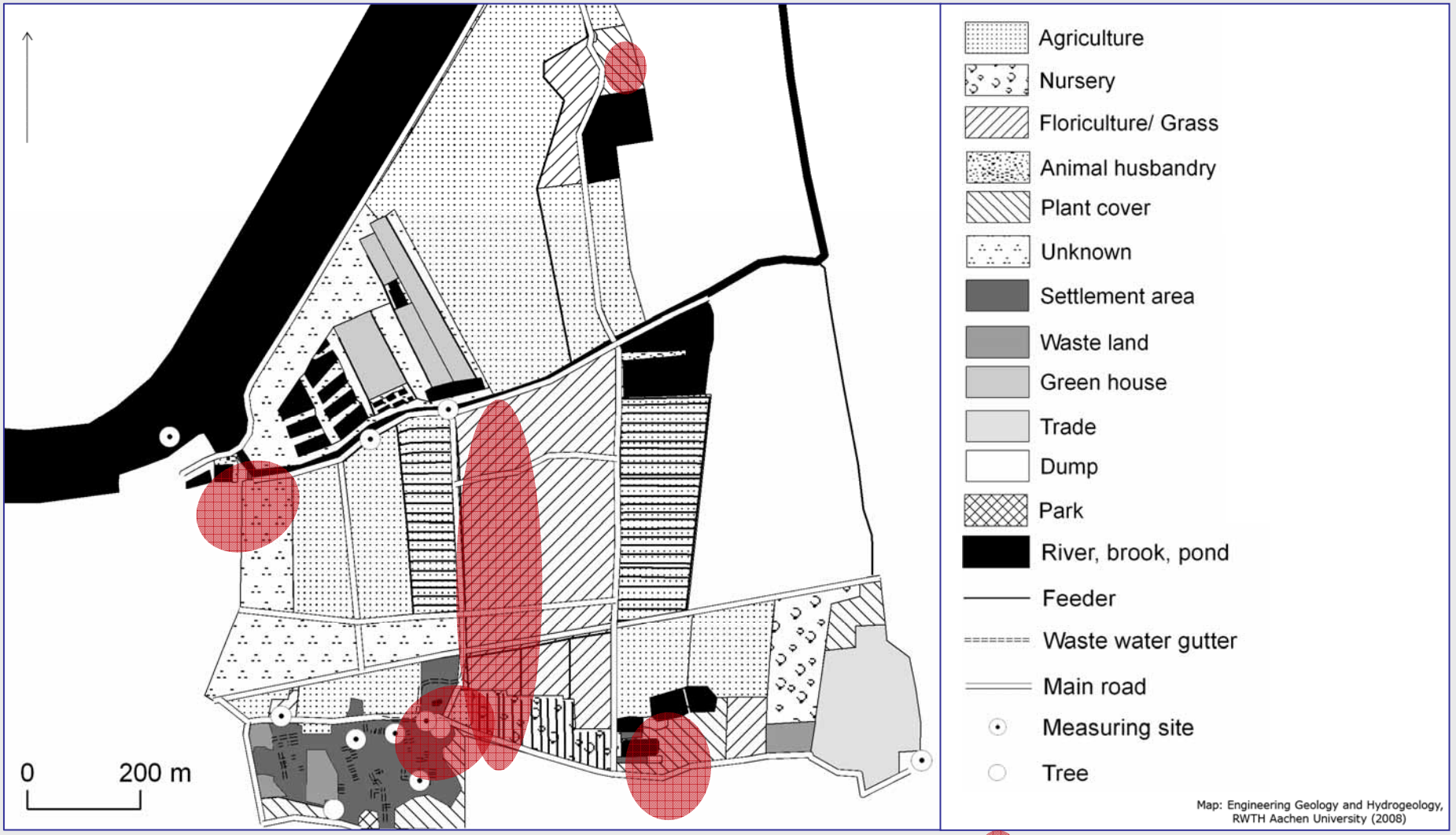
- Watercourses
- Land use structure
- Building structure
- Living standard
- Water supply
- Sewage disposal
- External influences
- Informal actions

Urban units
Land use



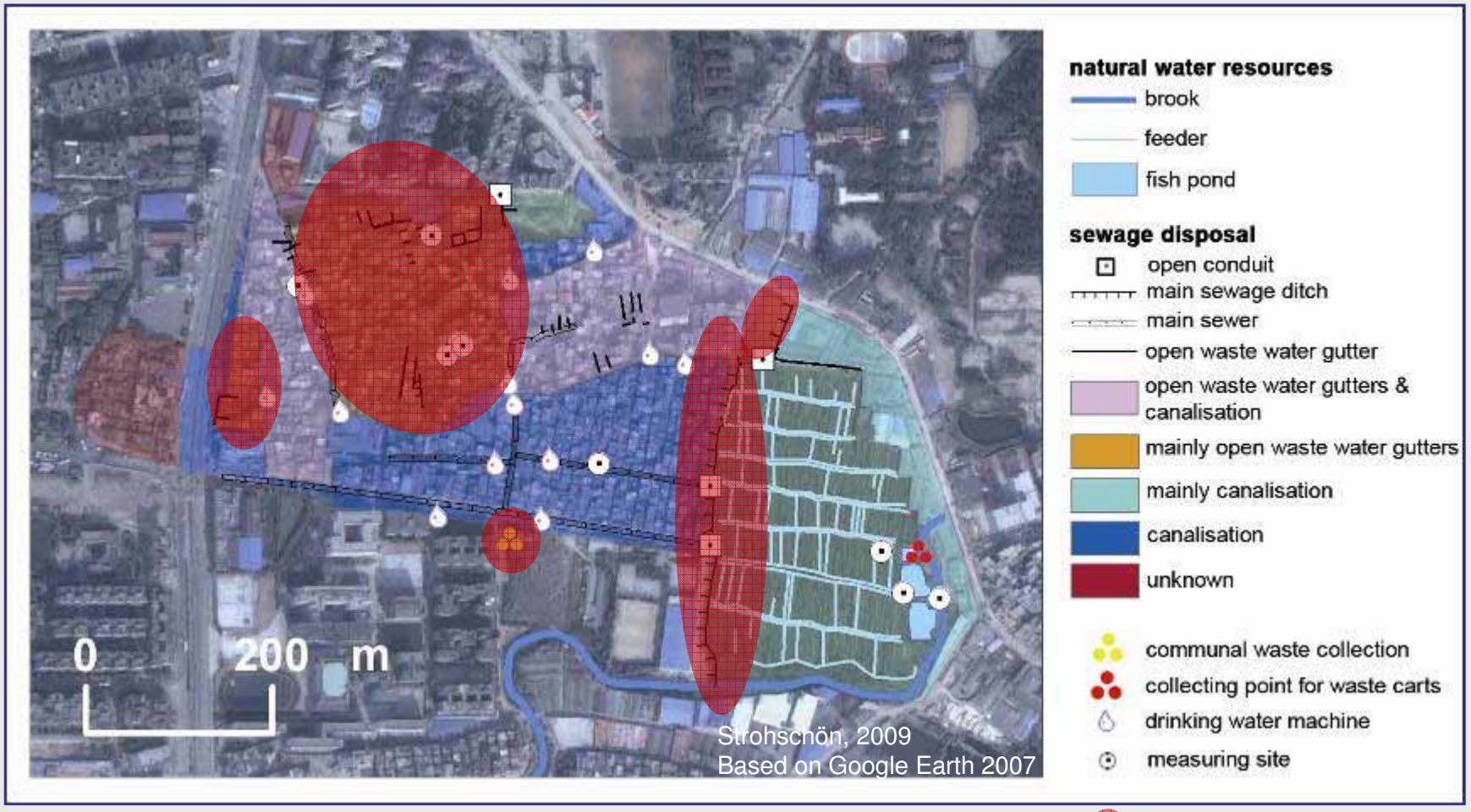
Urban units

Land use, sewage disposal and vulnerability



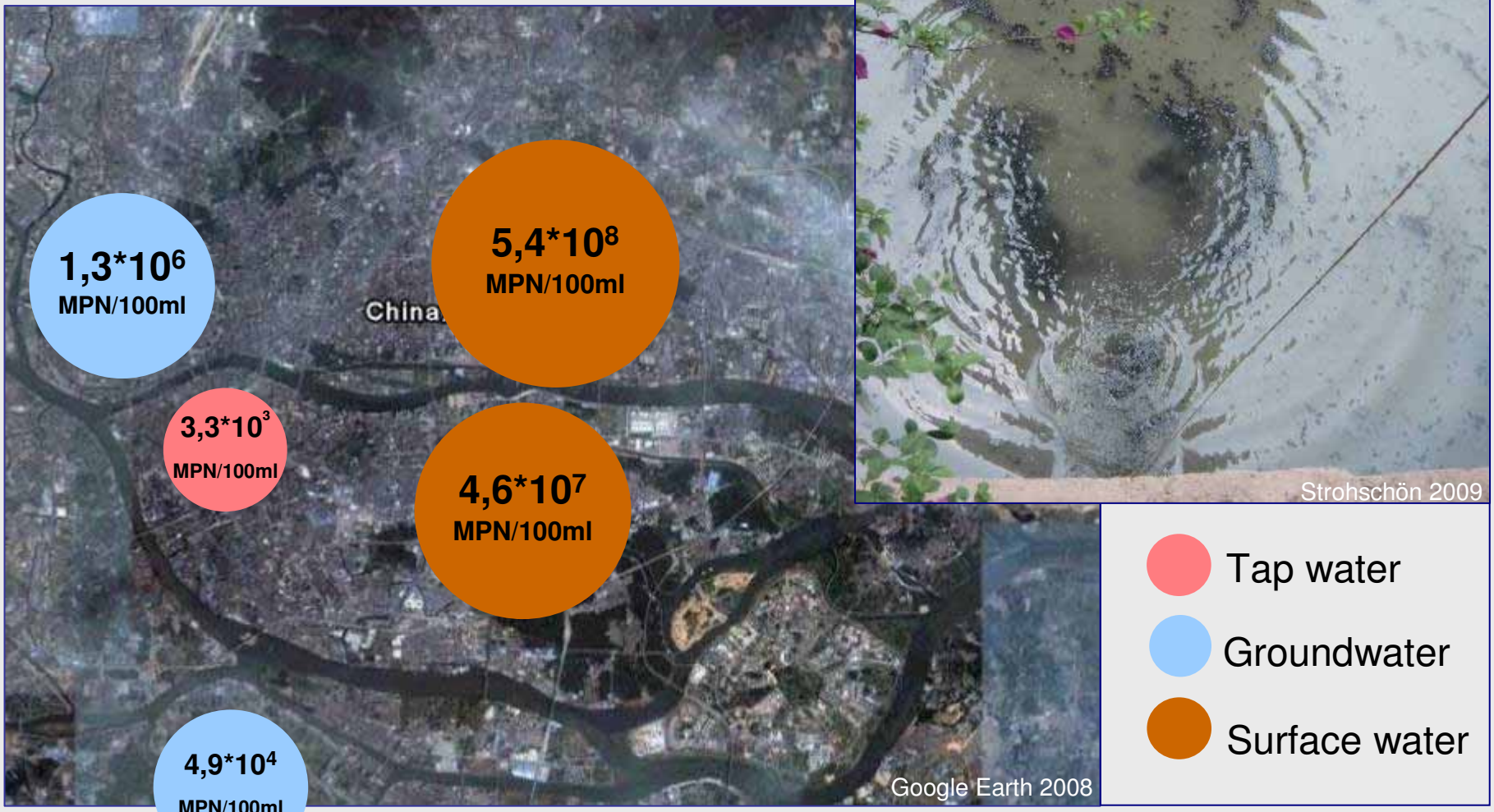
Urban units

Sewage disposal zones and vulnerable areas



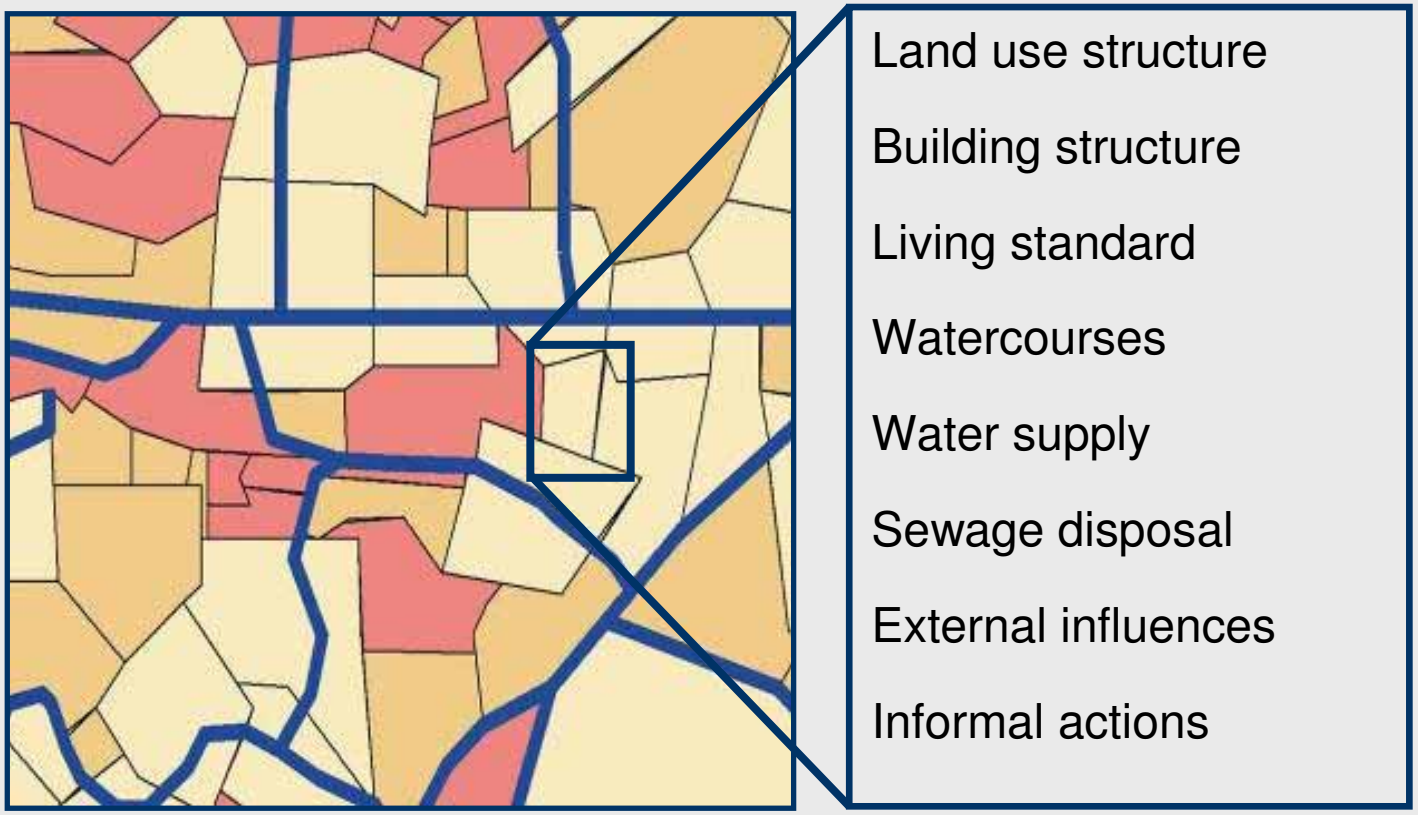
Urban units

Measuring results: coliform bacteria



Urban units

Entire characterization and classification



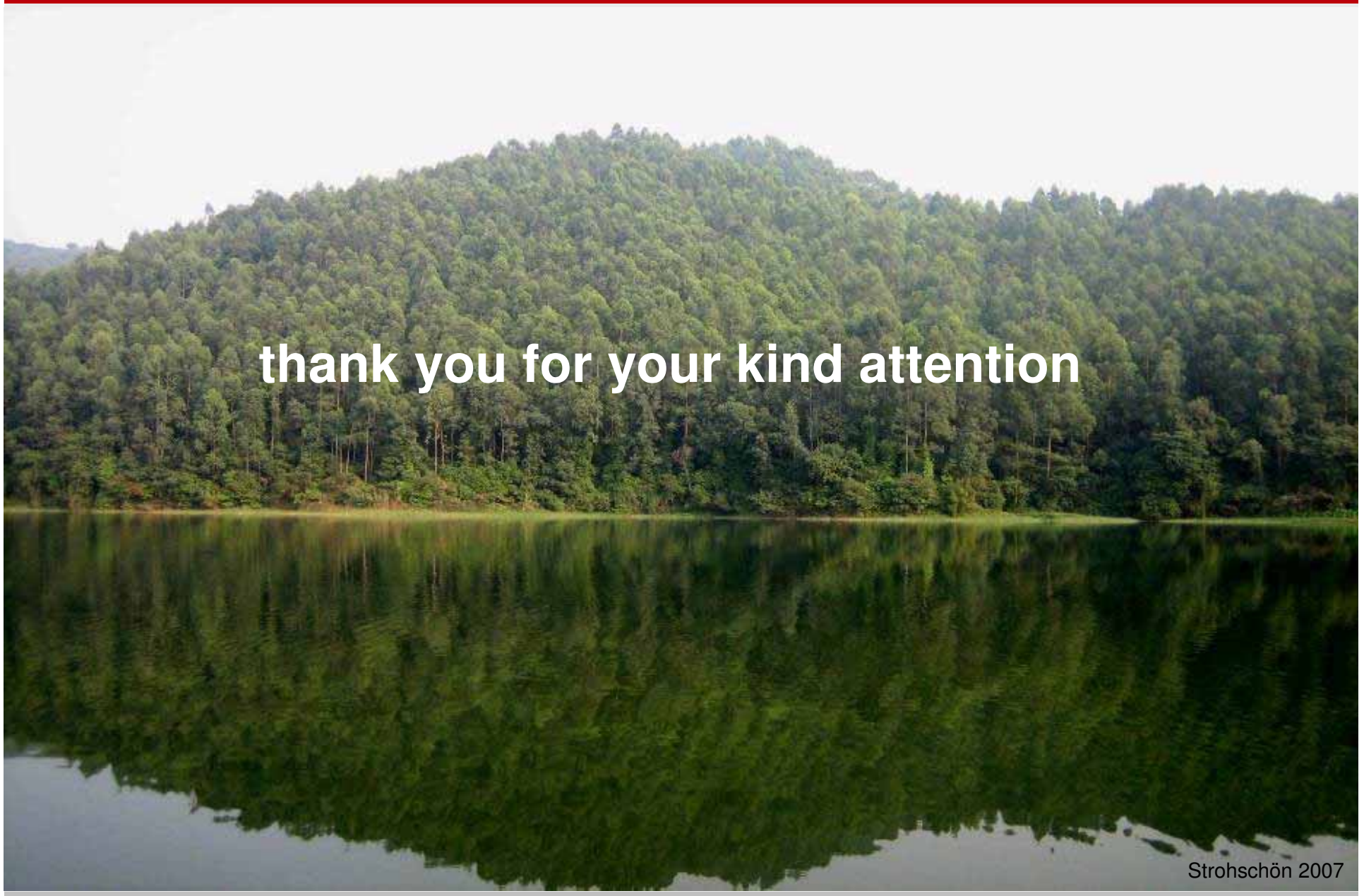
Identification of water resources' vulnerability
in megacity Guangzhou

Conclusion

Urban units as an analysis tool for mega-urban development?

The concept of urban units

- can help to understand complex (mega)city structures,
- can identify vulnerable areas and
- might also identify ‚best practice-areas' for sustainable urban planning



Strohschön 2007