Smart cities: anticipating and managing change

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Wageningen University and Research Centre

- Two parts:
 - Wageningen University
 - 9 Research Institutes (and development)
- > 5,000 fte, >9,000 students (>100 countries)
- Academic research, applied research and valorization
- #1 'Sustainable University' in the Netherlands



Wageningen UR and Alterra





Global challenges





Increasing world population





Population growth



Projected growth: from nearly 7 billion people today to more than 9 billion in 2050 (>60% in cities)

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Impact



y-axis: number of planet earths, x-axis: years

WWF, Zoological Society of London, and Global Footprint Network, "Living Planet Report 2008," 2008.

In 2007:

1.5 planet Earths to cope with humanity's demands \rightarrow change needed!



Majority of world's population – in urban areas

52% in 2011, ~67% in 2050 (United Nations, 2011)

Cities – hotspots of resource conversion

67% of the primary energy use and ~ 71% of GHG emissions on a global scale (International Energy Agency, 2008)



Current Situation



Linear metabolism:

Untapped resources

WAGENINGEN UNIVERSITY WAGENINGEN UR High input requirement (quality & quantity) High waste generation Target



Smart cities (The Netherlands)

See

http://www.youtube.com/watch?v=wreEGosSwII&feature =player_embedded



Smart cities (Wageningen UR)

Computer-aided method for real-time integration of Urban Harvest Approach and very large amounts of data

Updating current status of flows and states in energy-water-(biodegradable)material networks

Serious gaming to support decision-making processes

- power, gas distribution and (drinking/waste)water services
- public services









Urban Harvest Approach





Agudelo-Vera, Claudia M. *Dynamic water resource management for achieving self-sufficiency of cities of tomorrow*. Wageningen University, 2012.



The Sum of Parts



The Whole



Objectives of program

External

Concepts for city development

Scenarios evaluation Decision Support, Real-Time Control

Internal

Simulation tool

Different scales (household-block-city) Water-Energy-Material Dynamic (storages) Spatial distribution Combination of existing models



Work Plan



Stage 1: identification of the main unit-

blocks and connections between

them



Stage 2.1: Modelling of each unit-block



Stage 2.2: Including the surroundings



Stage 3: Introducing the spatial distribution



Stage 2.3: Connecting the unit-blocks

Bottom-up stage

The actual modelling starts here.





What has been done already



What has been done already



Household level



Household level



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Block level



City level





Concluding remarks

- Work together for aware and adaptive cities;
- Innovate and be smart!
- How would it apply to your company/city?





Get in touch!

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