SMART CITIES

Urban Systems 1, September 28, 2015

Gerhard Schmitt

Smart Cities

1 GS: Introduction	2 GS: Urban Systems I	3 PJ: Urban Systems II	4 GS: Urban Systems III	5 GS: Urban Research	6 GS: Urban Science	7 GS: Complexity Science	8 GS: Urban Governance	9 GS: Responsive Cities	10 GS: Final Critique
Principles of Information Architecture and Urban Simulation	Smart Cities	Methods and Tools for Urban Design	Stocks and Flows in Urban Systems	A Conversation: Measurements in the City	A Conversation: Citizen Design Science	Cities as Complex Systems	Participatory Design and Management	Cognitive Design Computing	Presentation of Results from 3 Courses
Exercise 1: Examples of Smart Cities			Exercise 2: Data Collection and Specification			Exercise 3: Energy and Mobility Data			Certificates

The story so far:

- 28.9.2015 From smart houses to smart cities – emerging criteria for smart cities as urban systems
- 21.9.2015 Cities are complex systems. Ideally, they are sustainable, resilient, livable, smart, and finally responsive – from production machines to human habitat

The story so far:

1. Cities are complex systems, have a metabolism that can be expressed in terms of stocks and flows

2. The criteria for the livability of cities are emerging

3. Urban climate influences livability. An Urban Heat Island is a side effect of urban planning and architecture

4. In the tropics, UHI, in combination with air pollution, can have a significant effect on livability

Smart Cities

1 GS: Introduction

Principles of Information Architecture and Urban Simulation

Exercise 1: Examples of Smart Cities

2 GS: Urban Systems I

Smart Cities

Information Architecture

- Information ARCHITECTURE: Making the invisible visible in architecture, urban design and territorial planning

- INFORMATION Architecture: Using the metaphor of architecture for the structuring of big data
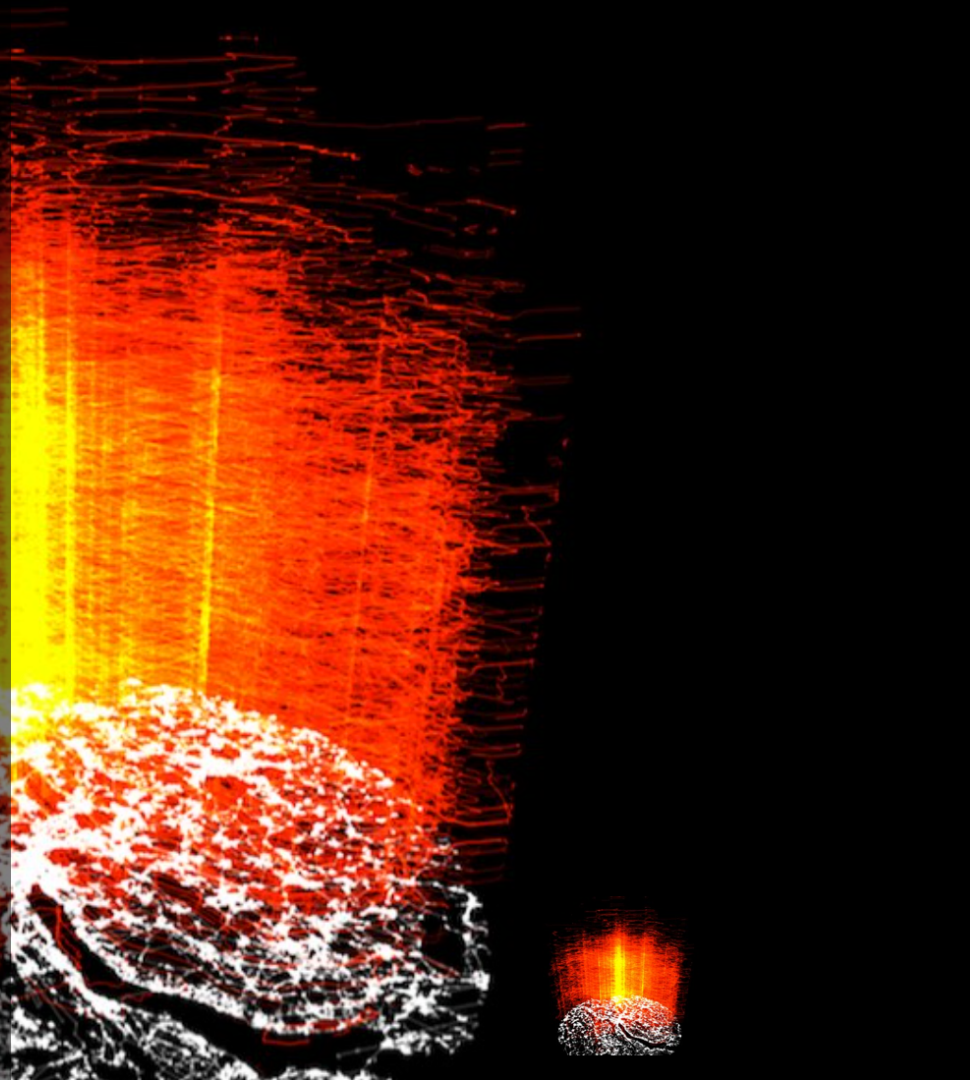
Information Architecture

Chapter 2

Information Architecture

In the realm of the built environment, Information **ARCHITECTURE** visualises the information inherent in a building and thus makes the invisible visible. In the realm of the virtual, **INFORMATION** Architecture serves as a metaphor to structure the vast amount of data produced in modern society. We define **INFORMATION ARCHITECTURE** as the necessary framework to understand architecture, urban systems and territories in the knowledge society.

City Simulation

Simulation is the imitation of the operation of a real-world process or system over time. In science, simulation is becoming an important method in addition to theory and experiment. In architecture, simulation has been used for decades, mainly to predict structural behavior, energy consumption or life cycle cost. In urban design, simulation is gaining importance in exploring future scenarios in pedestrian movements, vehicle mobility, or land use alternatives. In addition, in territorial planning, simulation helps to predict the functioning of large-scale operations in transportation or energy supply.

Urban Simulation
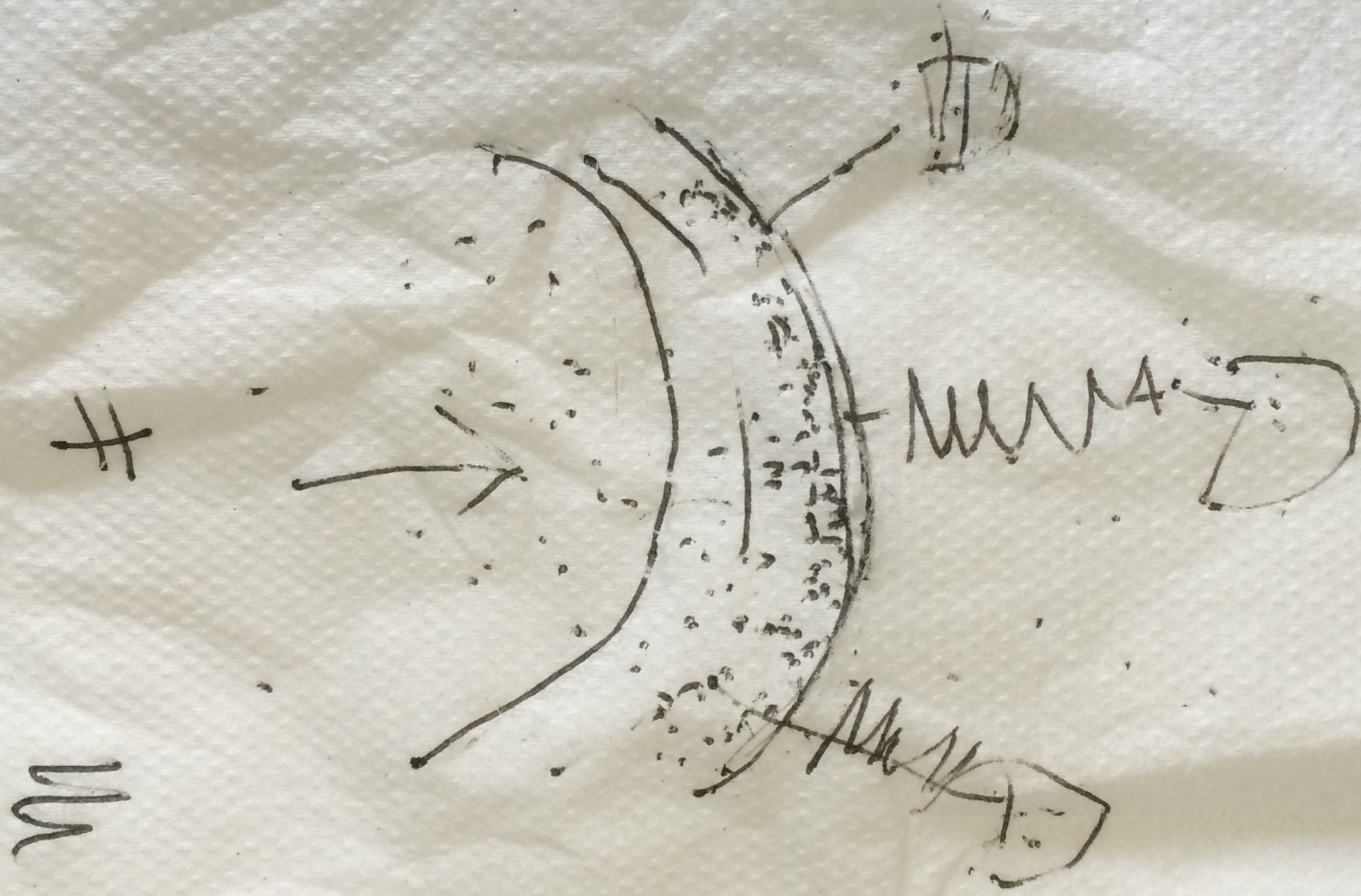
Smart House – Smart Home

- Control
- Convenience
- Performance
- Security
- Architecture?

Houses and Smart Houses

Houses - analog

- Architecture
- Security
- Convenience
- Performance
- Control

Smart Houses - digital

- Convenience
- Security
- Control
- Performance
- Architecture?

„In 2003 the UK Department of Trade and Industry (DTI) came up with the following definition for a smart home:
"A dwelling incorporating a communications network that connects the key electrical appliances and services, and allows them to be remotely controlled, monitored or accessed."“
http://www.fardaintelligent.com/Smart-home-En.html
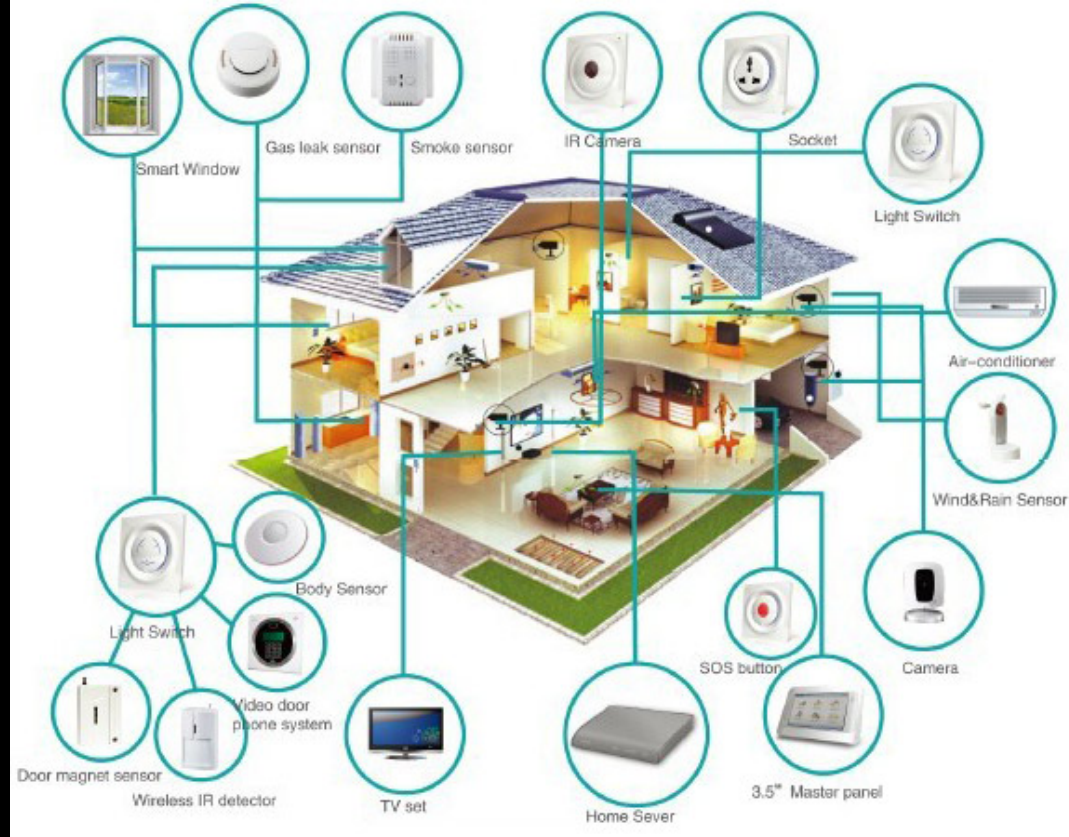
„Machen Sie Ihr Haus zum Smart Home
Somfy Smart Home macht Ihr Zuhause intelligent und Ihr Leben sicherer und komfortabler.
Per Smartphone, Tablet oder PC bedienen Sie die gesamte Haustechnik."
https://www.somfy.ch/de-ch/smart-home/was-ist-tahoma/tahoma-connect

Systemdarstellung
Die Hauszentrale Vitocomfort 200 (1) ist das Herzstück zur drahtlosen Bedienung und Kontrolle der Haustechnik. Etwa zur Regelung der Raumtemperatur (6, 11), zur Steuerung von Licht (5) oder zur Überwachung offener Türen und Fenster (9, 10).

Systemkomponenten

[1] Vitocomfort 200 Zentrale

Smart Energy

[2] Zähleradapter

[3] Bewegungssensor

[4] Energiesteckdose

[5] Doppeltaster

Smart Heating

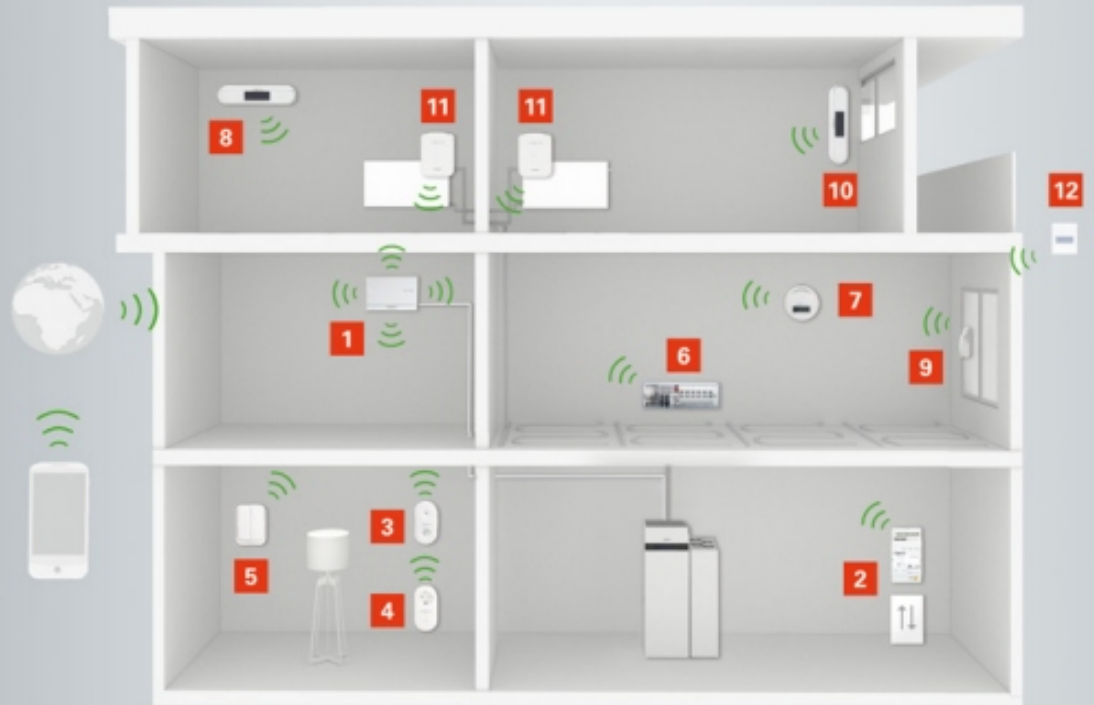[6] Fußbodenthermostat

[7] Raumthermostat

[8] Klimasensor

[9] Fenstergriff

[10] Öffnungssensor

[11] Heizkörperthermostat

[12] Funk-Außentemperatursensor

http://www.viessmann.de/de/wohngebaeude/vitocomfort-200.html

From Smart Houses to Smart Cities

Smart Houses

- Convenience
- Security
- Control
- Performance
- Architecture?

Smart Cities

- Control
- Convenience
- Performance
- Security
- Urban Design?

Smart city

From Wikipedia, the free encyclopedia

See also: Smart Cities in India

> 🧹 This article **may be confusing or unclear** to readers. Please help us **clarify the article**; suggestions may be found on the **talk page**. *(May 2015)*

A **smart city** (also **smarter city**) uses digital technologies or information and communication technologies (ICT) to enhance quality and performance of urban services, to reduce costs and resource consumption, and to engage more effectively and actively with its citizens. Sectors that have been developing smart city technology include government services,[2] transport and traffic management, energy,[3] health care,[4] water and waste. Smart city applications are developed with the goal of improving the management of urban flows and allowing for real time responses to challenges.[5] A smart city may therefore be more prepared to respond to challenges than one with a simple 'transactional' relationship with its citizens.[6] Other terms that have been used for similar concepts include 'cyberville, 'digital city", 'electronic communities', 'flexic.., 'information city', 'intelligent city', 'knowledge-based city, 'MESH city', 'telecity, 'teletopia", 'Ubiquitous city', 'wired city'.

Major technological, economic and environmental changes have generated interest in smart cities, including climate change, economic restructuring, the move to online retail and entertainment, ageing populations, and pressures on public finances.[7] The European Union (EU) has devoted constant efforts to devising a strategy for achieving 'smart' urban growth for its metropolitan city-regions.[8][9] The EU has developed a range of programmes under 'Europe's Digital Agenda".[10] In 2010, it highlighted its focus on strengthening innovation and investment in ICT services for the purpose of improving public services and quality of life.[9] Arup estimates that the global market for smart urban services will be $400 billion per annum by 2020.[11] Examples of Smart City technologies and programs have been implemented in Southampton,[2] Amsterdam,[3] Barcelona[12] and Stockholm.[13]

Some definitions of a Smart City place emphasis on citizen engagement, such as at this hackathon in New York in 2013[1]

Smart Cities in India

The Prime Minister of India, Shri Narendra Modi has a vision of developing 100 smart cities as satellite towns of larger cities and by modernizing the existing mid-sized cities.

The government plans to identify 20 smart cities in 2015, 40 in 2016 and another 40 in 2017.

> **Contents** [show]

Finance [edit]

In this regard an allocation of ₹ 7,060 crore was proposed in the Union Budget 2014. A total of ₹ 48,000 Crores/- will be spent on this project in a period of 5 Years by central govt and an equivalent amount will be spent by respective state governments.

First Year each Smart City will get ₹ 200 Crores following ₹ 100 Crores yearly for next 4 years.

Core Infrastructure Elements [edit]

1. Adequate water supply
2. Assured electricity supply
3. Sanitation, including solid waste management
4. Efficient urban mobility and public transport
5. Affordable housing, especially for the poor
6. Robust IT connectivity and digitization
7. Good governance, especially e-Governance and citizen participation
8. Sustainable environment
9. Safety and security of citizens, particularly women, children and the elderly
10. Health and education

Smart City - Definitions

In summary:

- *„A smart city offers its inhabitants maximal life quality with minimal consumption of resources, based on an intelligent interconnection of infrastructure (transport, energy, communication etc.) on different hierarchic levels (building, quarters, city).*

Smart City - Definitions

In summary:

- *„intelligent" in this context does not necessarily equate information technology. Passive or self-regulating mechanisms are to be preferred to actively controlled approaches when having similar performance."*

Smart City - Definitions

In summary:

- „Smart city" is no new label, but describes a deepening engagement for the expansion of existing activities and projects of an innovative city possessing the „European Energy Award". For those cities, the Smart City programme offers new possibilities for support of their innovative and „smart" projects on the way to achieving the ambitious goals.

Smart City - Definitions

http://www.smartcity-schweiz.ch/en/smart-city/

"Smart City" characterises a city that

- systematically applies information and communication technology as well as technology conserving resources on its way to post-fossil society
- intends to become independent of fossil energy carriers on the long run

Smart City - Definitions

"Smart City" characterises a city that

- connects new technologies for infrastructure, buildings, mobility etc. to uses resources such as energy or water as efficiently as possible

- anticipates and realises future sustainable forms of mobility and the necessary infrastructure

Electric Tramway Power Station, Singapore.

Smart City - Definitions

"Smart City" characterises a city that

- forces integrated (city) planning processes, e.g., for energy planning
- creates the spaces for innovation and the testing of new ideas (cleantech)

Smart City - Definitions

"Smart City" characterises a city that

- installs management systems ("Good Governance") to enable optimised leadership in the different areas and - through a holistic controlling - for developments to be reported in a measurable and verifiable manner
- provides the appropriate personal and financial resources
- The integration and interconnection of these areas is the characteristic of a smart city with the aim of realising the potential for ecologic and social improvements.

Smart City - Definitions

For the giants of the technology industry, smart cities are fixes for the dumb designs of the last century to prepare them for the challenges of the next, a new industrial revolution to deal with the unintended consequences of the first one. Congestion, global warming, declining health—all can simply be computed away behind the scenes. Sensors, software, digital networks, and remote controls will automate the things we now operate manually. Where there is now waste, there will be efficiency. Where there is volatility and risk, there will be predictions and early warnings. Where there is crime and insecurity, there will be watchful eyes. Where you now stand in line, you will instead access government services online. The information technology revolution of the nineteenth century made it possible to govern industrial cities as their population swelled into the millions. This revolution hopes to wrest control over cities of previously unthinkable size—ten, twenty, fifty, or even one hundred million people.

DIGITALISIERUNG

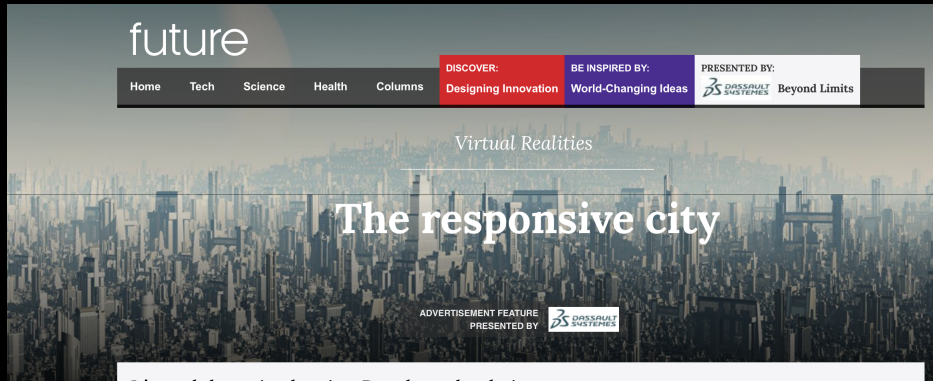# Wie intelligent darf die Stadt der Zukunft sein?

Deutsche Stadtverantwortliche haben häufig ganz andere Ideen, was gut für ihre Stadt ist, als die großen Technologiekonzerne mit ihren globalen Smart-City-Konzepten. Forscher suchen Lösungen für Europa. Ihre erste Erkenntnis: Projekte sollten von unten wachsen.

von Eva Wolfangel

© iStock / Nikada

Was für eine Utopie: Sensoren registrieren jede Aktivität der Bürger, Kameras haben alle im Blick, die sich in einer Stadt bewegen, die gesamte öffentliche Infrastruktur ist mit dem Internet verbunden. Intelligente Algorithmen berechnen aus all diesen Daten den effizientesten Ablauf des Lebens: welcher Verkehrsteilnehmer auf welcher Route am schnellsten zum Ziel kommt, welche Mülleimer geleert werden müssen, auf welchen öffentlichen Toiletten das Klopapier aufgefüllt werden und in welchen Gebäuden die Klimaanlage wie viel kühlen muss und welche Jalousien wann heruntergefahren werden. Die Stadtoberen treffen keine irrationalen Entscheidungen mehr, Computer berechnen schließlich, was das Beste für die Gesellschaft ist – und setzen es auch gleich um: Pragmatismus statt Vetternwirtschaft. Und der Stadtbewohner muss sich um vieles nicht mehr selbst kümmern, er hat wieder Zeit für das Wesentliche im Leben.

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Virtual Realities

The responsive city

ADVERTISEMENT FEATURE
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It's rush hour in the city. People make their way home after a hard day's work. Driverless cars pass by as cyclists steam along purpose-built lanes, safe from motorised traffic and unpredictable pedestrians.

As the city unwinds into the evening, indoor sensors adjust the ambient temperature and turn lights on; televisions, radios and even baths are operated with a gesture from an armchair.

Outside, sensors monitor atmospheric irritants, ready to alert those at risk should dangerous levels be reached. A computer planning the city's waste collection receives data about foul-smelling and full bins. Traffic systems constantly check and adjust, ensuring jams and accidents are a thing of the past. Unbeknown to its citizens, every function of the city is silently optimised to make life simple and efficient.

Of course architecture, infrastructure and planning are important. But at the heart of all cities are communities and people. If the urban future needs to be sustainable, it needs to work much more closely with its inhabitants.

One of the proponents of this personalised approach to planning is Neil Leach, professor of architecture at the University of Southern California (USC). He believes there is a greater need to understand how our brains are affected by spaces, light and noise, for example, and apply this to architecture so that buildings can understand what inhabitants are thinking.

http://www.bbc.com/future/sponsored/story/20140721-the-responsive-city

Employees Safety - PSI Reading

Noor Faizah Binte Othman

Donnerstag, 24. September 2015 16:46

An: **SEC Global**

Dear All

HR had been monitoring the PSI level and at this moment it is in the hazardous level at 314 (psi 3 hrs reading).

It comes to our attention on the safety of our employees and if it continues to worsen please take extra measure to limit your outdoor activities.

For those who are feeling unwell tomorrow you may work from home but please do update HR of your absence from the office.

There are still masks available and you may collect from HR if you need it.

Take care everyone and thank you.

Best regards

Faizah

| Singapore | Asia | World | Today: Thu, Sep 24, 2015 |

Weather Forecast | Air Quality

Current Air Quality (PSI) | Detailed Information by Region

190 NORTH

202 WEST

184 CENTRAL

210 EAST

224 SOUTH

24/09/2015

| 0 | 50 | 100 | 200 | 300 |

| Good | Moderate | Unhealthy | Very Unhealthy | Hazardous |

Click the region on the map to check the detailed information. (PSI based on PM2.5)
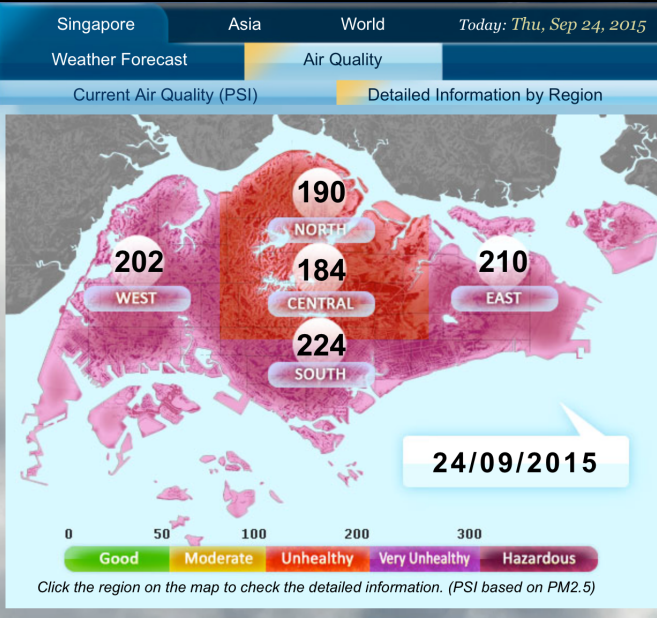
Photo: ST

Libelium Smart World

Air Pollution
Control of CO$_2$ emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection
Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing
Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care
Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care
Vital signs monitoring in high performance centers and fields.

Structural Health
Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Smartphones Detection
Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.

Perimeter Access Control
Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels
Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels
Measurement of the energy radiated by cell stations and WiFi routers.

Traffic Congestion
Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Smart Roads
Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting
Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping
Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps
Sound monitoring in bar areas and centric zones in real time.

Water Leakages
Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis
Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location
Search of individual items in big surfaces like warehouses or harbours.

Waste Management
Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking
Monitoring of parking spaces availability in the city.

Quality of Shipment Conditions
Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Water Quality
Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Golf Courses
Selective irrigation in dry zones to reduce the water resources required in the green.

Future Cities - Smart Cities

Exercises
HS 2015

These exercises introduce you to the interconnectedness of city systems at various scales. They will help you develop a usable definition of what smart cities mean in your work and where that fits within the field of architecture and urban planning. The exercises are additive, and it is therefore expected to demonstrate an understanding of all concepts taught in the lectures to date. The topics which will be included are urban energy and mobility where the basis is the view of the city as a complex system, with an urban metabolism expressed in terms of stocks and flows.

FS 2015 - Exercise 1

SMART CITIES

Smart Cities are to provide "inhabitants maximal life quality with minimal consumption of resources, based on an intelligent interconnection of infrastructure (transportation, energy, communication etc.) on different hierarchic levels (buildings, quarters, city)." This becomes particularly important as cities develop and increase in complexity. Concepts of smart cities are supported by and integrated into the IT, energy, transportation and manufacturing industries to name a few. It is important to have a relevant definition of Smart Cities for architecture and urban planning.

Suggested Reading Material for this assignment: Chapter 1 & 3 of "Smart Cities", PDF available on ETH Bibliothek. Also include your own research and sources.

Negre, E., & Rosenthal-Sabroux, C. (2015). Smart Cities. In Handbook of Research on Social, Economic, and Environmental Sustainability in the Development of Smart Cities (pp. 61-78).

Exercise 1: Examples of Smart Cities

Smart Cities have evolved in order to meet life quality standards for livability as well as environmental standards for sustainability. It is therefore important to understand and begin to integrate these concepts in architecture and urban planning. In order to understand what this means in practice, you will define your own criteria. This exercise has 3 parts:

Part 1: In your own words, develop a definition for Smart Cities. Make a list of at least 5 predominant features of Smart Cities which fit within your description.

Part 2: Research examples of Smart Cities. Make a list of 5-10 cities which fit the criteria and definition that you developed in Part 1. If needed, further improve your definition and criteria based on your research and highlight what are your new insights.

Part 3: Select one of the cities you listed in Part 2 which is of particular interest. Highlight and further describe 2-3 features which make it "smart". Create a sketch/diagram that shows the smart features of the city and how different scales (buildings, quarters, cities) and systems (energy, IT, transportation) are connected.

Make sure to include references & data sources as part of your research. Send in .ppt format until 12:00 October 8, 2015 to griego@arch.ethz.ch

Summary

- Smart rooms, smart homes and smart buildings are building blocks of smart cities
- Scaling up from smart rooms to smart territories is not an additive or linear process, as the complexity of interaction between parts increases exponentially
- To understand the functioning, the opportunities and threats of the smart city, we must focus on the goals, the interactions and the components of Smart Cities
- → Exercise 1