

SMART CITIES

Fall Semester 2015, ETH Zürich

Gerhard Schmitt

TEAM



PROF. DR.
GERHARD SCHMITT

Professor, Project
Leader & Lecturer



DR. REINHARD KÖNIG

Senior Researcher



DENISE WEBER

Executive
Assistant



MSc. ARCH
ESTEFANIA TAPIAS

Research Assistant &
PhD Student



MSc. CS
ARTEM CHIRKIN

Research Assistant &
PhD Student



DIPL. ING.
MATTHIAS STANDFEST

Research Assistant &
PhD Student



MSc. ETH
LUKAS TREYER

Research Assistant



M. ARCH
JING ZHOU

Research Scientist



DIPL. ING.
CHRISTINE MEIXNER

Researcher



MSc. ETH CS
DANIEL ZÜND

Research Assistant &
PhD Student



MSc.
DANIELLE GRIEGO

PhD Student

The Information Architecture iA Team Zürich

Content

- Introduction and first Definitions
- Teaching at ETH: Smart Cities
- MOOCs from ETH: Smart Cities
- Resources: iBook, pdf, links
- Expected outcomes from future designers
- Exercises 1-3
- Towards Responsive Cities









Hauptallee 10

Hauptallee 10

ACHTUNG!
AUTOMATISCHES
TOR

Privatgrund
Zutritt von Fußgänger
verboten!

SCHLÄCHTEREI u. FETTWAREN

GEGR.

ANTON STERKL 1740

WURST- u. SELCHWAREN

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Postfiliale
Postfiliale aller Art
1/208 19 92

5. Margareten-
straße

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PARTY SERVICE

FLEISCH *antique*

Le Pommier





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Gutschein für den nächsten
Einkauf bei uns.
Gültig bis
31.12.2023
in allen Filialen
des Unternehmens

SILCA



Schlüssel dienst







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

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).*
- *„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“ 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

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.

From: **Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia** (Englisch) Gebundene Ausgabe – 5. November 2013 von [Anthony M. Townsend \(Autor\)](#)

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3 PJ: Urban
Systems II

4 GS: Urban
Systems III

5 GS: Urban
Research

6 GS: Urban
Science

7 GS:
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9 GS:
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10 GS: Final
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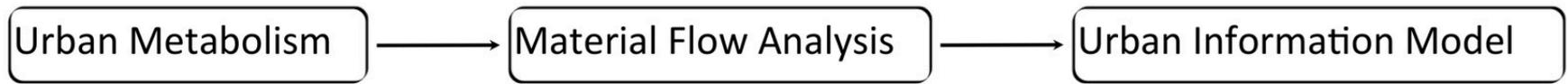
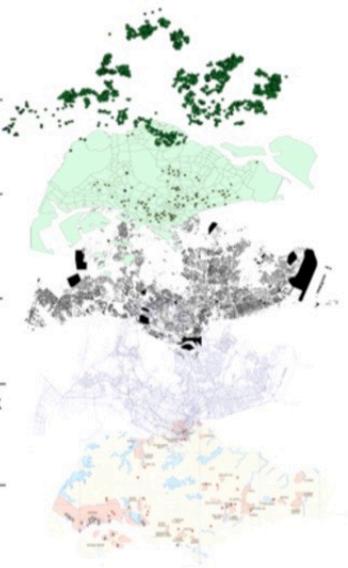
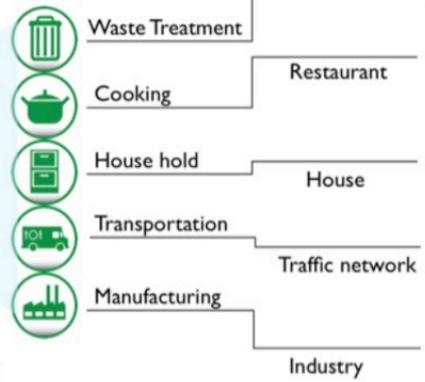
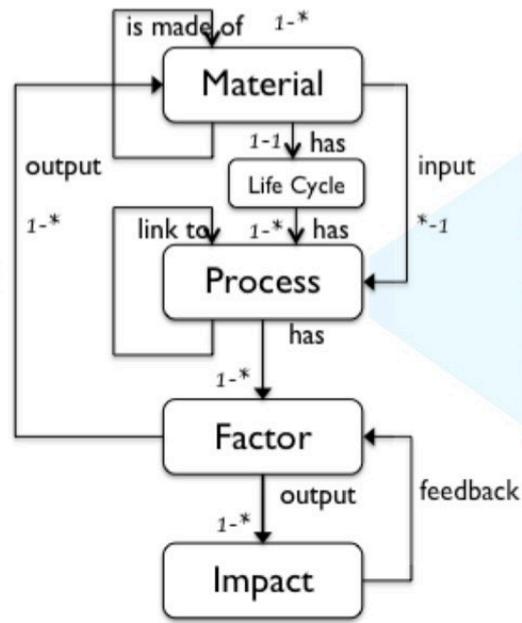
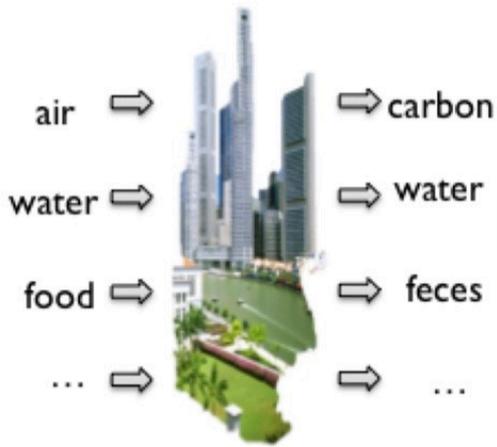
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ETH Zurich Information Architecture MOOC

Massive Open Online Course (MOOC) on Future Cities: An overview to understand a city's people, components, functions, scales and dynamics, as precondition for its sustainable design and management. The course explores the city as the most complex human-made "organism" with a metabolism that can be modeled in terms of stocks and flows. We open a holistic view on existing and new cities, with a focus on Asia. Data-driven approaches for the development of the future city are studied, based on crowdsourcing and sensing. More than 13'000 students from 167 countries registered.



35051



Electric Tramway Power Station, Singapore.

The great wall between the rich and poor of China



A girl washing her hair (left) at a basin at a migrant workers' village, and French hairdresser Eric Constantin (right) at his shop in Paris, one of the most luxurious hair salons in Beijing.



Ma Fan Tang, Wei and her children (left) in their 5-sq m home in a migrant workers' village, and Mr. Zhao (right) with his wife and daughter in their 227-sq m apartment. Mr. Zhao, who runs his own company, owns two apartments in Beijing.



A man walking in a alley in an old residential area (left) where old homes will make way for luxury skyscrapers, and a woman riding her pet dog (right) in a residential and commercial complex in a wealthy district of the city.



Families having dinner (left) at a restaurant in a migrant workers' village, and two men chatting over drinks (right) at a club in Beijing's Beijing hotel.



The number of dollar billionaires in mainland China has passed 300 for the first time, an annual ranking of wealth in the world's second-largest economy showed on Wednesday.

But 13 per cent of its people live on less than \$1.00 per day, according to United Nations data. And the average

annual urban disposable income is just 21,810 yuan (\$3,400). The country has a high Gini coefficient, a measure of income inequality.

Reuters photographer Kim Kyung-Hoon tramped the streets of Beijing capturing images that show just how disparate the lifestyle of wealthy Chinese is from the less well-off.



A man ferrying his family on his electric bicycle cart (left) on a Beijing road, and visitors looking at a vintage Rolls-Royce (right) during the luxury carmaker's Concours d'Elegance event, held to celebrate its 100 years in business in China.



A man eating his dinner (left) while watching his neighbours gamble in an alley in a migrant workers' village, and a waiter serving champagne (right) to guests before a fashion show at the Ming Dynasty City Wall Palace Park in Beijing.

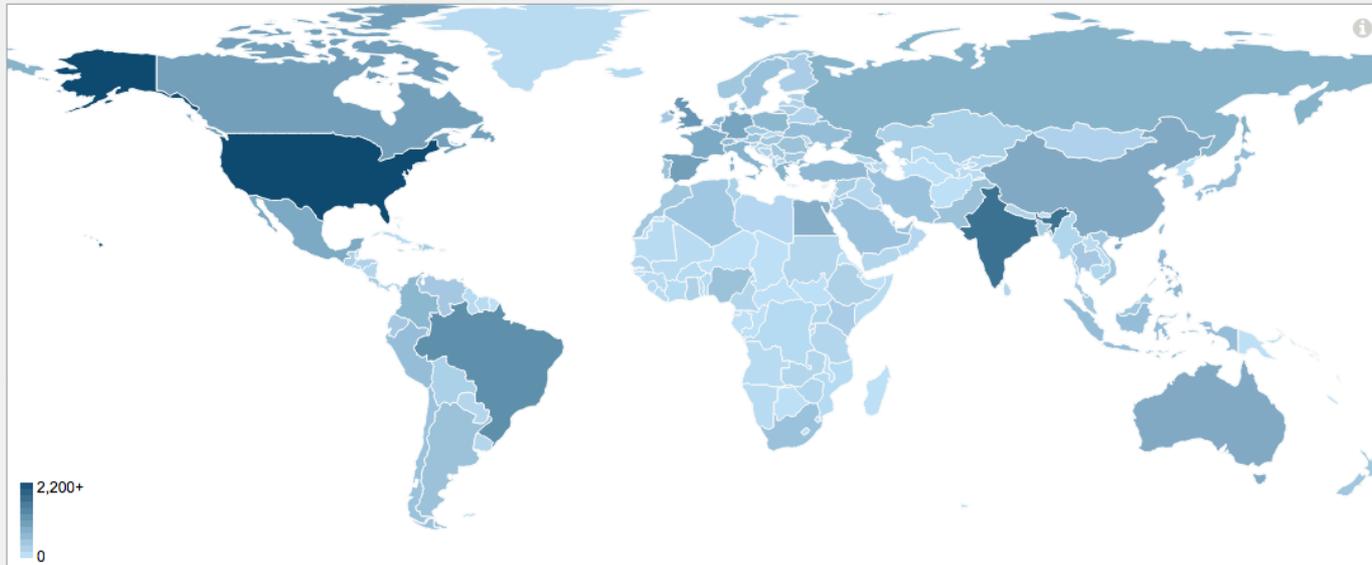


A garbage collector combsing in trash cans (left) for recyclable items in a migrant workers' village, and a worker cleaning trash bins (right) after emptying them in a shopping mall in Beijing.



Geographic Distribution

Where are my students?



Geography Metrics

166

Total Countries
Represented

United States

Top Country by
Enrollment

18% of students

India

Second Country by
Enrollment

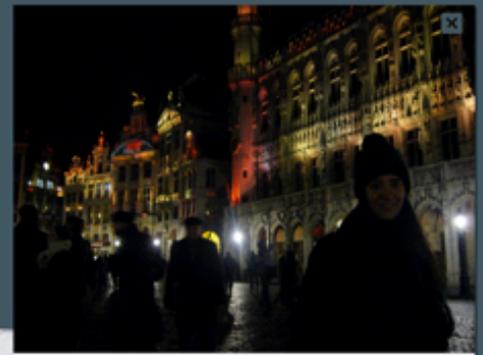
10% of students

Brazil

Third Country by
Enrollment

5% of students

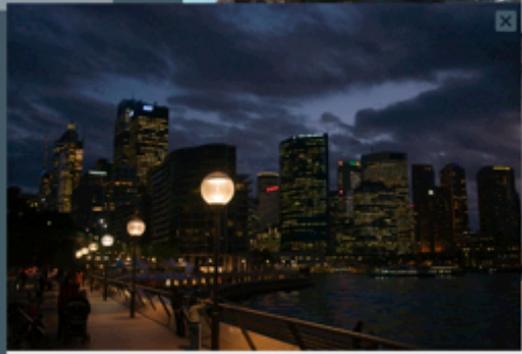
- Examen1_Visible_Visite
- Examen1_BooksAndPages
- Exhibition
- group
- MOOC_Classes
- MOOC_Ecology
- MOOC_Energy
- MOOC_Leads
- MOOC_Marketing
- Task_1
- Task_2



Examen1_Visible_Visite Exhibition group MOOC_Leads

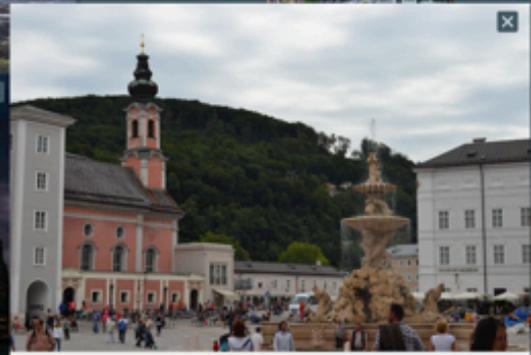
City: Brussels country: Belgium (Name: Belgium, Brussels) see: P&M&R

08.28.2012 [2012] This picture of a site is from Brussels (Belgium). As you can see in the photo there is a romanian architecture, this is the typical view in the center of Brussels. We can see high windows in all the buildings, a golden statue, we also see how many arches in the highest part of the house, a few clocks in the walls and some lights. Also, you can see there are many arches and columns at the bottom of buildings to allow traffic of people. And this is the visible information. Two invisible informations are: one invisible information can be that the powerful lights focused to people and streets create a safety sensation in the night, another non-visible information is that wall clocks are only used in official important buildings.



Task_1

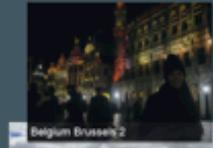
Examen: Australia, Sydney



Examen1_Visible_Visite Exhibition group MOOC_Leads

City: Salzburg country: Austria (Name: Austria, Salzburg) see: DerTalen 12.07.2012 10:40:42 see: DLTKSLA

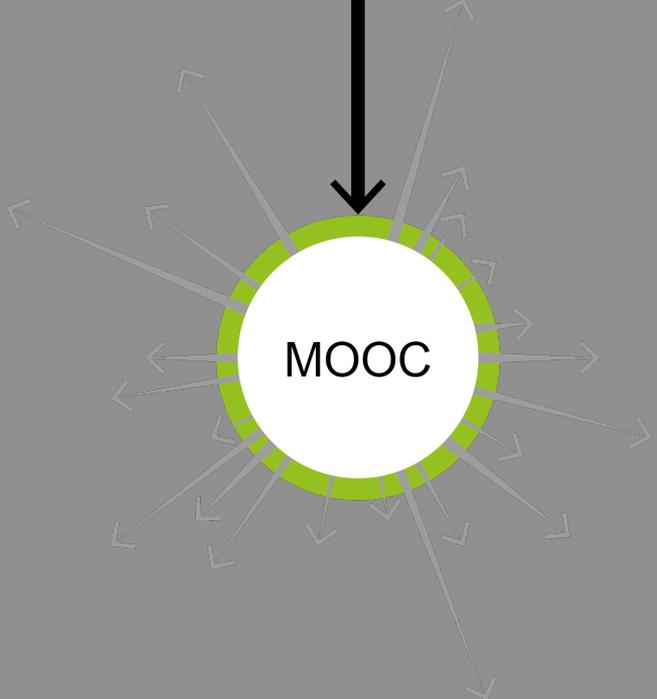
08.28.2012 [2012] The first invisible information that can be extracted out of this picture is that this is a central place in the city, because there are a lot of people. The second is that probably it is a weekend or holiday, because during the week people are at work/university/school, so maybe you do not find so much people at the same place. The mash-up of these two invisible informations can help in the planning of resources from the city administration during weekends and holidays. In other words the administrators of the city can plan more buses that bring to this location, or can plan more police officers and ambulances in the nearby to offer more security to the citizens.

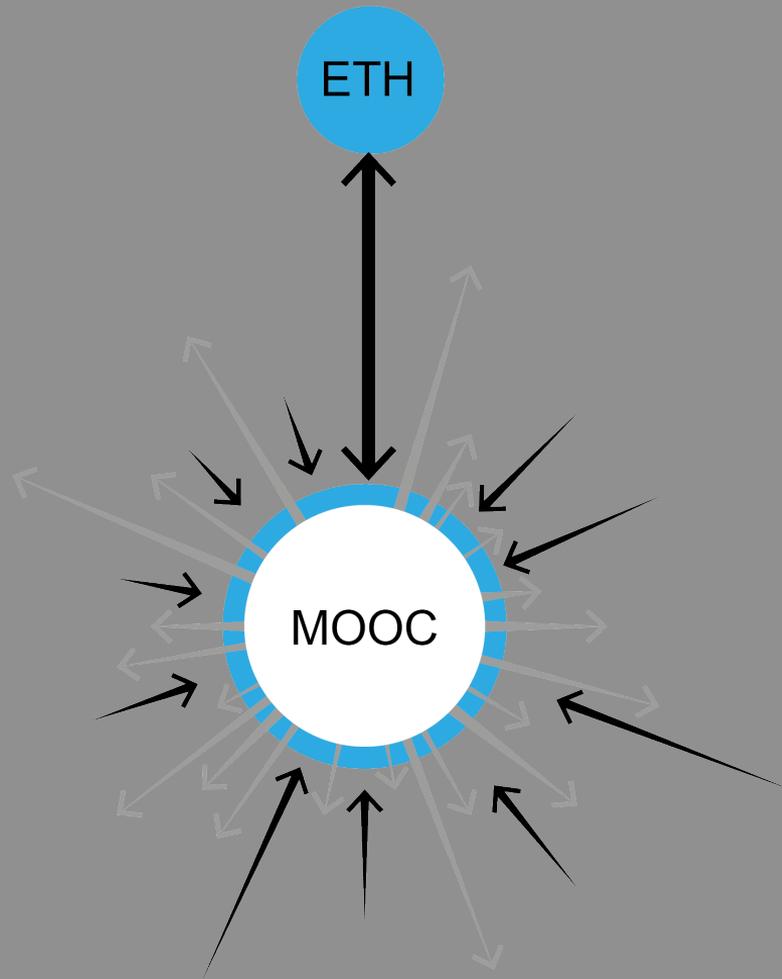


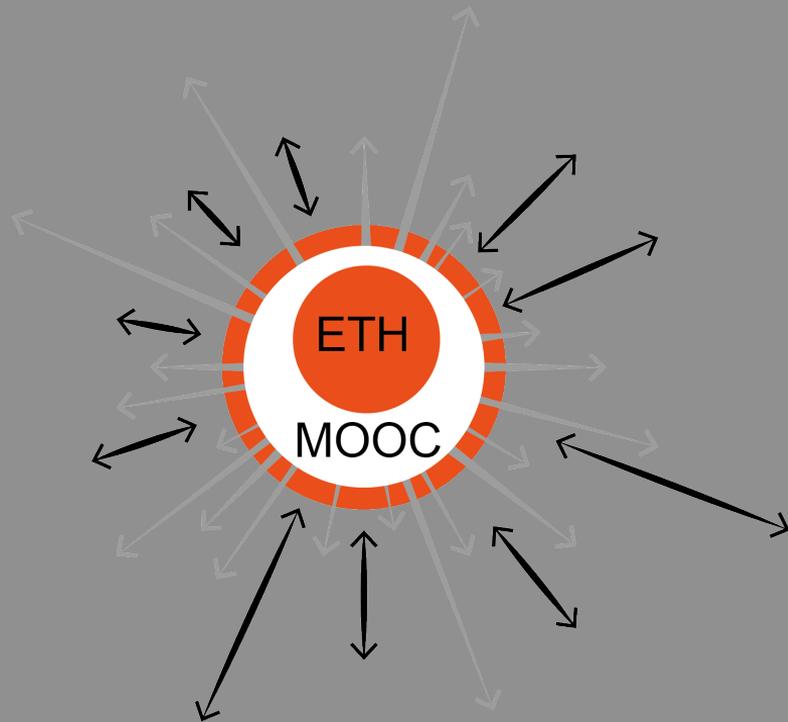
ETH

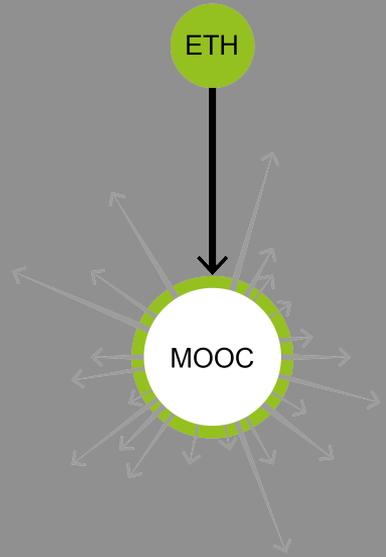


MOOC

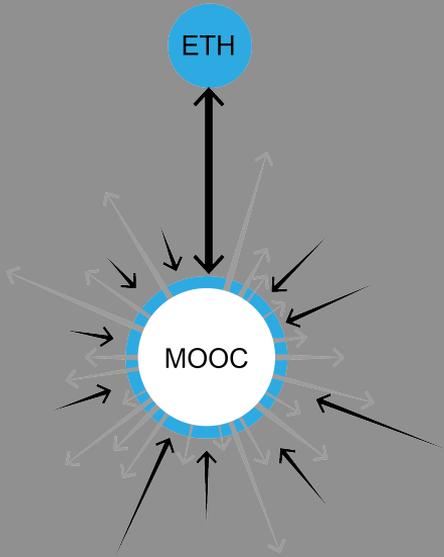




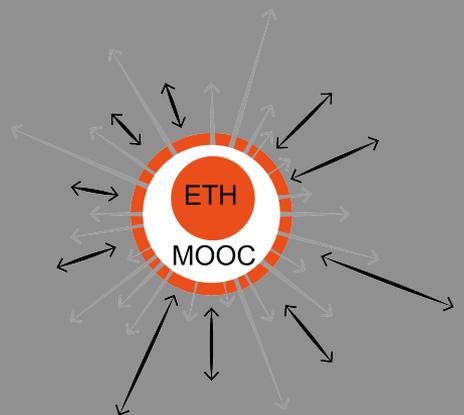




Future Cities I



Future Cities II



Future Cities III





Content

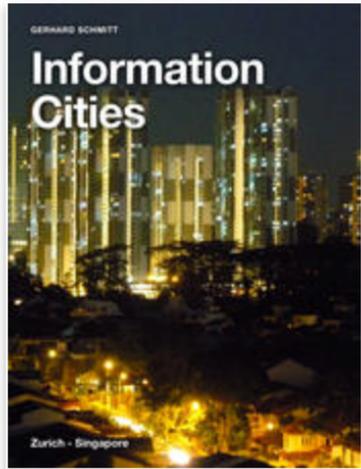
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Information Cities

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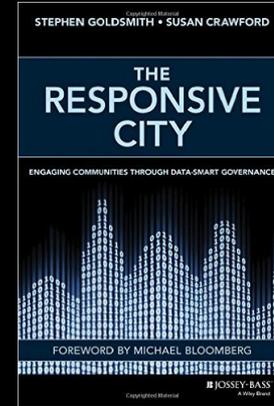
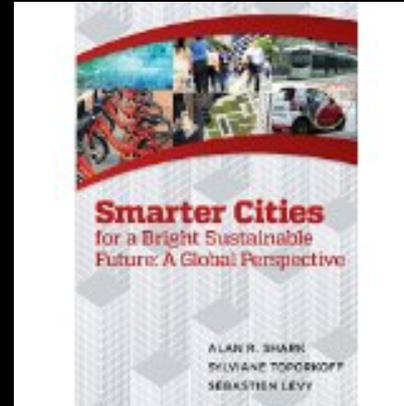
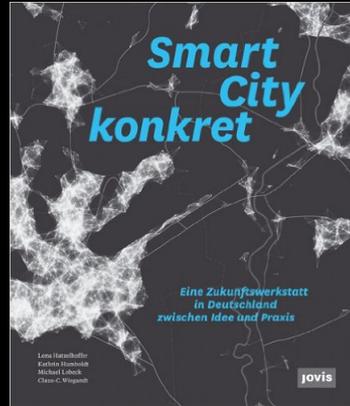
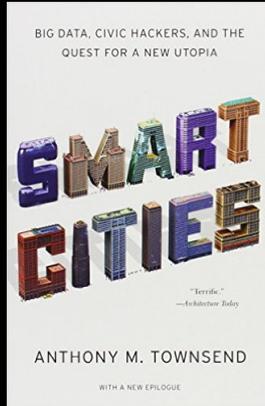
Prof. Dr. Gerhard Schmitt

This book is available for download with iBooks on your Mac or iOS device. Multi-touch books can be read with iBooks on your Mac or iOS device. Books with interactive features may work best on an iOS device. iBooks on your Mac requires OS X 10.9 or later.



Description

What is a city? What is an urban system? Do we understand these most complex man-made artefacts in their entirety? Why do people move into cities? When do they prefer to stay in rural areas? Do cities need skyscrapers? Are there cities without density or are there dense settlements without being a city? Some cities are liveable for the majority, others just for a few. As we enter the first urban century, we start to realise that today's cities are not sustainable, no matter from which side we look at them. Prerequisites for their transformation towards **liveability**, sustainability and resilience are better knowledge and ability to change. Understanding the city and knowledge about the city should be the base for change. As we begin to realise that cities are not neutral objects, but that people define the city, the mobile citizen gains a central role in the definition of the future city.



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航空公用办票柜台分布
Electrion Center Layout

A
B
C
D
E

D

GUCCI

航班信息

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à Ras al-Khaimah (Emirats arabes unis).

Petit à petit, ce type d'outils grandissent pour englober un nombre croissant de paramètres et peuvent même se nourrir les uns les autres. CitySim a ainsi été connecté à Map Sim, un outil développé par EPF Zurich qui simule le comportement des habitants (se rendre au travail, regarder la TV, allumer la lumière) et affine les fluctuations de la demande énergétique des bâtiments. «Ce type d'approches permettra aux urbanistes d'optimiser la distribution d'énergie et les voies de communication ou encore de tester l'impact des mesures telles que le dézonage et l'essor du télétravail», souligne Darren Robinson.

GERHARD SCHMITT,
SINGAPORE-ETH CENTER:

«Ces citoyens virtuels dorment, se réveillent, cuisinent, vont travailler ou faire du shopping. Leur comportement est en partie aléatoire, mais est calibré pour reproduire en moyenne les statistiques réelles.»

À Singapour, le Future Cities Laboratory de l'EPFZ veut carrément simuler la ville entière en assignant à chacun de ses 5'312'400 habitants un «agent» indépendant, un module informatique capable d'agir

et de se déplacer dans un modèle informatique de la cité-état. «Ces citoyens virtuels dorment, se réveillent, cuisinent, vont travailler ou faire du shopping», détaille Gerhard Schmitt. Leur comportement est en partie aléatoire, mais est calibré pour reproduire en moyenne les statistiques réelles obtenues à travers des questionnaires, des recensements officiels ainsi que des données enregistrées automatiquement par les transports publics.» Même la 3^e dimension devrait bientôt apparaître, avec les mouvements des ascenseurs.

BIG DATA ET SMART CITY

Le big data (ces énormes bases de données nourries par un nombre croissant de senseurs ou d'informations digitales) joue un rôle très important pour valider des simulations en comparant les résultats informatiques avec la réalité, note Michael Batty de UCL. Avec ses compteurs d'électricité et de gaz intelligents, le smart grid veut se transformer en smart city, une ville interconnectée où le système s'adapte aux données transmises par chaque logement, voiture et habitant, parfois à travers des smartphones.

Ce rêve d'une simulation urbaine «totale» rappelle les initiatives telles que le Blue Brain Project de l'EPFL ou FuturICT à l'EPF Zurich qui voient des neuroscientifiques simuler de manière ultra-précise le cerveau animal et des sociologues et économistes

développer des modèles informatiques de la société ou du système financier international. L'espoir est dans tous ces cas de disposer d'un modèle informatique qui permette de tester à l'avance des interventions urbaines, médicales ou politiques.

Reste qu'une simulation numérique n'est utilisable que si elle est validée, tâche d'autant plus délicate qu'il est impossible d'effectuer des expériences grandeur nature sur les espaces urbains. Pire encore, «nous tentons d'atteindre une cible mouvante», souligne Michael Batty. Car nous rajoutons sans cesse de nouveaux éléments – dans le transport, les télécoms ou le commerce – qui modifient la manière dont nous nous organisons dans les villes, qui deviennent sans cesse plus complexes.»

Au final, cette approche très objective de la question urbaine semble occulter un peu l'humain. Pour Geoffrey West, «une ville est simplement l'ensemble des interactions de ses habitants.» La cité idéale passera donc nécessairement par eux – c'est-à-dire par nous. ■

GEOFFREY WEST,
SANTA FE INSTITUTE:

«Le futur de la planète est lié à celui des villes. Ce sont elles qui génèrent les principaux problèmes – comme la consommation d'énergie et l'impact sur l'environnement – mais également les solutions, à travers la créativité qu'elles stimulent.»

Conclusions

- **Smart cities** are emerging in all parts of the world
- The term applies both to existing and new urban and urban-rural systems
- Massive Open Online Courses **MOOCs** are an important vehicle to increase the smartness and responsiveness of cities
- The degree of **smartness and responsiveness** of a city will determine its progress
- **Responsive cities** are an ETH research and design focus at the **Future Cities Lab** in Singapore