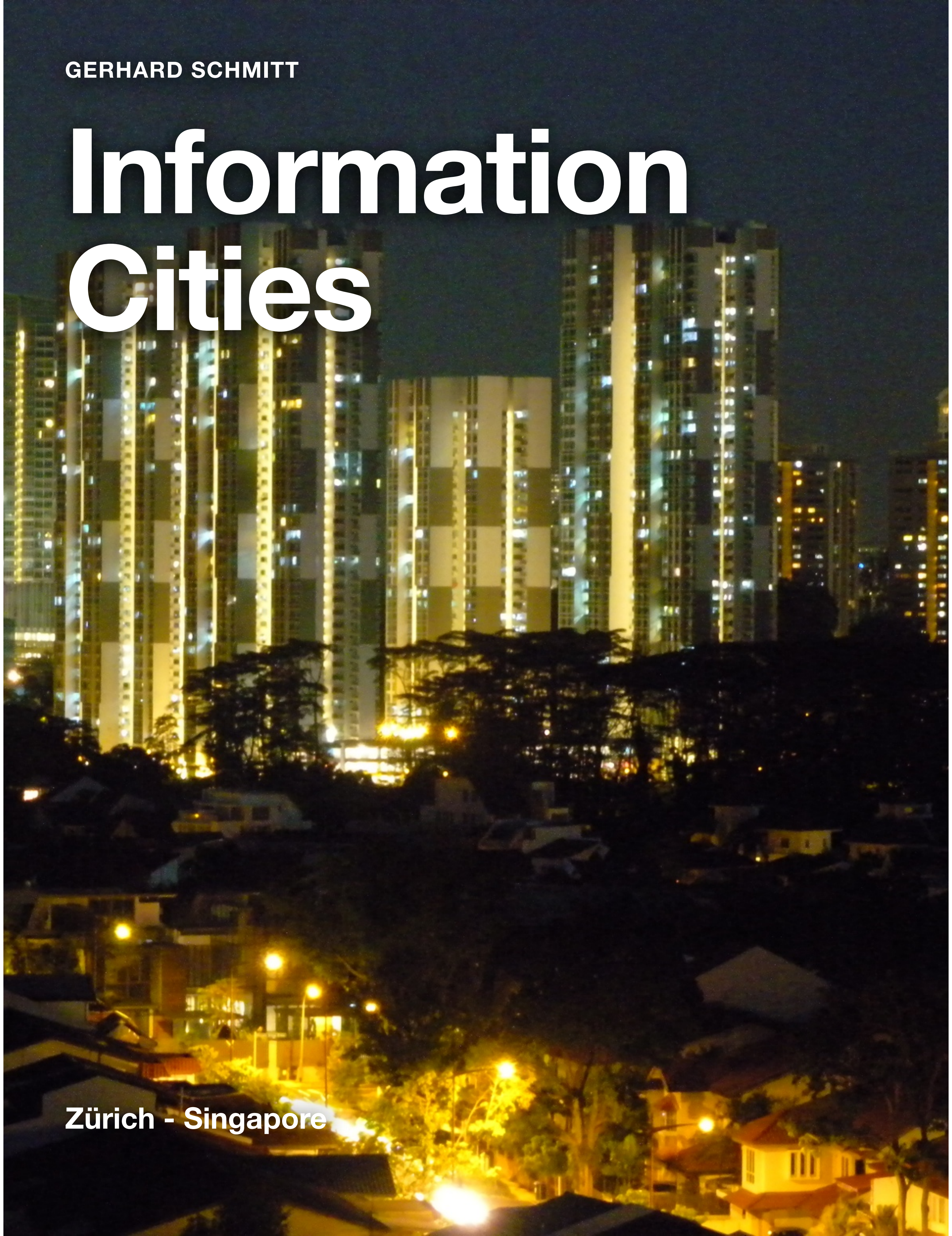
GERHARD SCHMITT

Information Cities

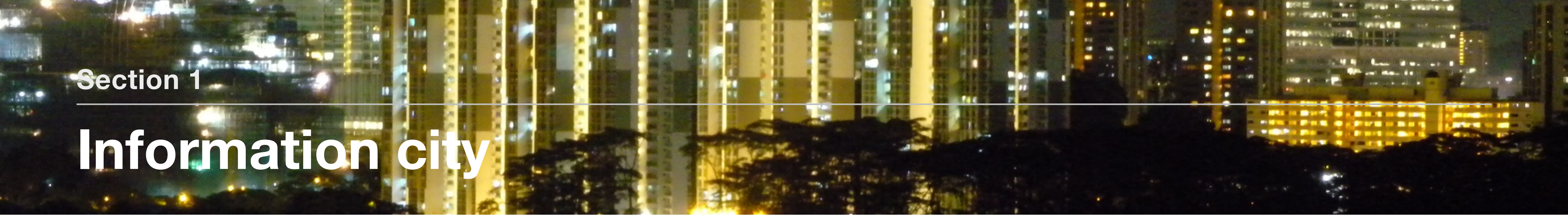


Zürich - Singapore

Chapter 2

Information City

Information in digital representation will be a major component of the future city. We propose the term Information City to differentiate it from the present city and to emphasize the importance of information, its creation, handling, storage, mining and refinement into knowledge for the city of the future.



Section 1

Information city

DEFINITION

Information city describes the extension of information architecture to the urban scale. In analogy to information architecture, information city has two main meanings: (1) making the invisible visible on the scale of a city and thus helping to understand the functioning of an interaction between components of the city and to design new cities; (2) information city might become a metaphor for the structuring and ordering of vast amounts of data, created increasingly by the city‘s inhabitants and its infrastructure.

With information citiy we do not mean the various InfoCities projects that focus on the seamless integration of information and communication technologies. We also do not mean completely virtual cities.

Increasingly, cities seem to take on personalities of their own. They are labelled as megacities, industrial cities, green cities, liveable cities, rich cities, smart cities, innovative cities, tele cities, info cities, or future cities. These properties of the city are sometimes related to the society they are positioned in. It is therefore surprising that the information society or the knowledge society has not produced an equivalent adjective with regard to the city.

We therefore put forward the suggestion that the information society is increasingly living in **information cities**. Cities and urban systems have for a long time been the place where societies accumulated and stored their information. More important, they made this information available to the general public in the form of libraries and exhibitions. Yet the information displayed in libraries was mostly static and describing the past.

New today is the ability of any person using computational devices to generate large amounts of data, and in particular of real-time data. The storage and display of this information cannot occur in traditional libraries any more. Instead the entire city becomes an information organism that at the same time generates data, turns it into information, and displays information in real-time. The visualisation of this information creates new knowledge about the city and is fundamentally different from previous knowledge, as it is able to make the invisible visible.

City information, visible

Like in buildings, much city information is visible, but not all. Coming to a city, we take photos of the obvious information: people, buildings, traffic, parks. At night, other information becomes visible: Lights in buildings, streets, and parks. It may give less 3D information, but more activity and occupancy information.

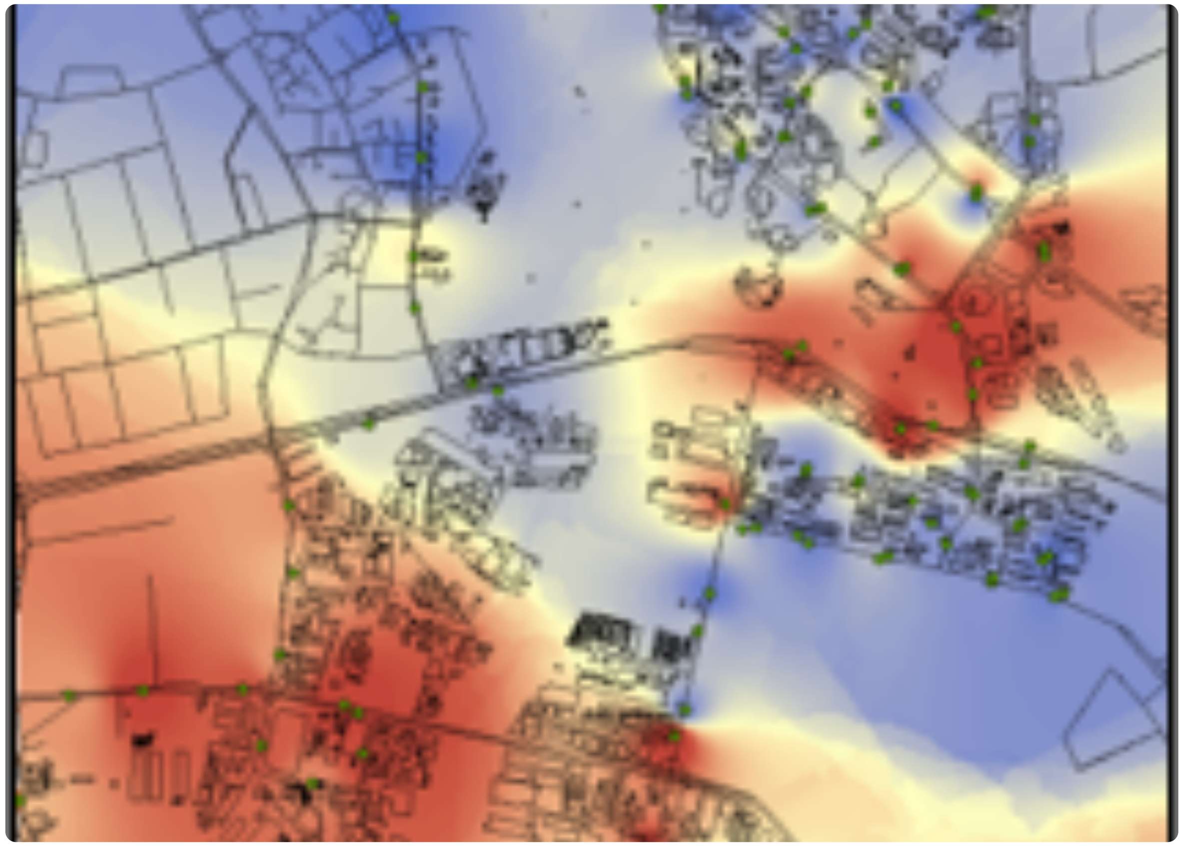
Gallery 2.1 City information

Lights in buildings and cities as indicators for activities. Marina Bay Sands in Singapore. Photo: Matthias Bettschart, December 23, 2010.

City information, invisible

The inhabitants of the city produce a constant flow of data. They can be visualised, admired, and taken as a basis for observation or future decisions. The first step is to derive a connection between data, activities, and locations in a meaningful sense by deducting relations between data. **Chen ZHONG** has performed pioneer work in this area, in that she is able to clearly relate use of buildings and travel behaviour.

Gallery 2.2 City information



Interpolated probability of working places - red: highly probable, blue: less likely. Chen Zhong, January 2013.

City information, invisible

Coming to a city, we may sense the areas where poor, middle class or rich people live. This information is normally invisible, the building and streets are not labelled this way. This information is normally contained in the census data of a city. But how do we sense it? It is a combination of observations that leads to the categorization. **Comparative urbanism** is developing tools to gather and visualize this information.

Archaeology of the future city

The plans of today, using information Architecture to depict a possible future, are the historic documents of tomorrow. Seen from the future, they are archaeological items. This view produced the title of an exhibition in Tokyo in 1996, the «Archaeology of the Future City» by **Takashi Uzawa**. It demonstrated the power of combining Architecture and information in the sense of information as the new building material.

Gallery 2.4 Information city

Making invisible information visible: comparing cities. Meeting of the comparative urbanisms group at the Future Cities Laboratory on February 8, 2013. Photo: Gerhard Schmitt

Gallery 2.5 Archaeology of the Future City

«TRACE» installation by Florian Wenz in the exhibition «Archaeology of the Future City» by Takashi Uzawa. Florian Wenz, 1996

Chapter 3

Stocks and flows

The concept of stocks and flows helps to bring some order into the complexity of a city. While the concept of stocks and flows was not invented in for architecture, but in economics, it constitutes a useful way of looking at and abstracting of parts of the urban system. The chapter on city models will place it in its historical context.

Section 1

Stocks and flows

DEFINITION

The stocks and flows concept originated in economy in the 1960s, and best known today are the stocks and flows of finances. Stocks are quantities that do not move, whereas flows are quantities that move. Flows of measured quantities per time. This simple differentiation makes the principle applicable architecture, urban design and territorial planning. The stocks and flows via most interested in are those of people, water, material, energy, density, and information. Stocks and flows are also basic building blocks of system dynamics.

This chapter is merely an overview, in-depth description of the individual stocks and flows is given towards the end of the book.

The Irrawaddy river in Myanmar and the ecosystem it creates is a good example for stocks and flows in architecture, urban design, and territorial planning. The river changes its volume drastically twice a year. The water it brings from the mountains carries sand and other sediments that settle in the areas it floods. Once the water level recedes, the river has deposited a small stock of material in the form of fertile earth on its banks that can then be used for a few months. People move in and erect temporary housing and shelter: a stock of material and low-density emerges for a few months. Animals accompany the peasants and deposit fertiliser, becoming another contributor to the stocks and flows of the land. Information on the usability of the land and of the best places to settle is transferred via mobile telephones, creating a flow of information. Peasants grow vegetables and bring them to market, thus creating a small flow and possibly stock of finances. The entire landscape is changing over the years, and as a result creates a stock and flow of landscape elements such as land, bodies of water, trees, and other vegetation.

Yet the example also shows how a single stock and flow cannot be isolated from the others. The water mixes with the material and the sand deposits. Later people use the clay to burn pots, and they harvest the send and ship it to the city to construct buildings.

Chapter 7

System: construction

Construction used to be simple. There were 2 major approaches: subtractive construction by carving material out of existing rock or earth; or additive construction by adding material on top of each other. Today, the additive approach is dominating and most technical construction support tools are geared towards sophisticated addition of layers. Nevertheless, the construction process shows another aspect of the building as a system: material, function, and process hyperlinked as part of the building system. This system can be represented in an abstract form as information.

Section 1

Construction

TYPES OF CONSTRUCTION

Construction is the interaction with and the manipulation, partial destruction and alteration of an existing system. Construction involves the finding, processing, transporting and assembling of material. This process changes the place where the material was found, the place where it is finally used, at all the places in between to a lesser degree.

Construction used to be a localised activity, but with the advancement of construction processes and construction materials, almost every building contains components of a globalised economy. The construction process becomes more knowledge intensive and the necessity of architects, designers and territorial planners to understand construction as the alteration of the system increases.

Pick any part of a modern building, such as a chair or an open in any region of the world and try to retrace the path of all the components to their origin, and then retrace the path to the origins of the material of the components, and you will probably see a tree like structure spanning most of the globe. If in addition you calculate the energy needed and the CO2 produced for mining, transporting, assembling, shipping, selling, and installing the chair or the oven, you will probably see unexpected and astonishing numbers and places, making the tree structure even denser. Some of the parts will be equipped with RFIDs to be able to follow them back to the place they were produced, in case something goes wrong. In other words, construction has become a global activity, and it is almost impossible, to build and equip a building from local material only.

Information technology, information architecture, and the information city concept provide for the first time the opportunity to visualise and follow the life cycle of any material, building part, building equipment or entire buildings. Construction is a typical example for material flows around the world, and probably one of the most energy and CO2 intensive activities that can be imagined. They result of construction is a building, a material stock. Yet the building‘s life-cycle energy consumption and CO2 production by far exceeds the amount of energy that went into its original production.

Building construction site

The construction site determines the sustainability of a building to a high degree. Given the choice, one could place buildings in locations where they produce more resources than they consume and could become sustainable structures over time. However, a system of restrictions, protecting other aspects of the human habitat, often limit this choice to positioning a building intelligently on a small site or, in high-rises, to floor level and orientation.

Gallery 7.1 Building construction site

Construction location and form follow the function of this simple building close to Einsiedeln in Switzerland. Photo: Gerhard Schmitt, October 26, 2008

Building construction material

Early construction took the material directly from the vicinity of the construction site. Clay, stone, and would in various variations were chosen in temperate climates. Protected from rain and ground moisture, even organic materials last for centuries. It was and is the knowledge about the behaviour of the material over time that determines its sustainability. This way, old timber frame buildings can have an extremely small carbon footprint. The challenges is to connect them to modern standards of living.

Gallery 7.2 Building construction material

Oak wood, with adobe and straw infill. These local materials help sustain this schoolhouse in Schönberg since 1697. Photo: Gerhard Schmitt, October 10, 2008.

Construction sites in the tropics

Choosing the right construction site in the tropics involved, like in temperate climates, protection from the elements and from the enemies, as well as access to food and transportation. The absence of snow and frost offers more possibilities than in temperate climates, and water in general plays a larger role, As it is constantly available as convenient stock and flow, providing food and mobility.

Gallery 7.3 Construction sites in the tropics

Construction site in Nampan, South end of Inle lake in Myanmar, which serves as source of food and provides mobility. Photo: Gerhard Schmitt, April 7, 2011.

Artificial construction sites

Construction sites can be created artificially, If the ideal site cannot be found otherwise. San Francisco for example, created much artificial land to house part of the city. The same is true on a large scale for Hong Kong, Shanghai, or Singapore. Given all criteria for settlement being perfect in a certain location, but no land being available, it is possible with technical means to create this land. The sustainability of this approach needs to be explored.

Gallery 7.4 Artificial construction sites

View from Marina Bay Sands Hotel on the gardens by the Bay and the Marina barrage. The entire visible land is reclaimed from the sea. Photo: Felicia Bettschart, November 9, 2012.

Building construction site protection

Construction of a building lasts between few days and several years. The construction site is in a specific state during this time. Robotics can also support the construction of fences.

Building construction process

Building sustainability

Urban construction site

The urban construction site creates a situation of disruption and danger. But it also creates increasing interest, in that by-passers can participate in the emergence of a new street, the demolition of a building, the renovation of a city block or the step-by-step buildup of an entire city quarter.

Territorial construction sites

Construction on rivers and lakes have regional, territorial, and sometimes global impact on cities, societies, and climate.

Future Cities Laboratory: construction

THE ASSISTANT PROFESSORSHIP FOR CONSTRUCTION AT THE FUTURE CITIES LABORATORY

The Future Cities Laboratory at the Singapore–ETH Centre has established an assistant professorship for architecture and construction in 2011. Dirk Hebel, the founding assistant professor, specialises in sustainable materials and their use in the developing countries around the equator.

The following information is taken from discussions with Dirk Hebel and from the publication (SEC) Singapore-ETH Centre, (FCL) Future Cities Laboratory Booklet, 2nd edition, Zürich, revised 27 January 2012.

Given the fact that existing and future cities are less and less dependent on their immediate hinterlands, the assistant professorship of Architecture and Construction of **Dirk Hebel** takes special interest in the globalisation of the material flows in constructing and renovating cities. This development is seen as a challenge to the local identity of cities, but also to the efficient use and ownership of material resources. The chair places special emphasis on the category of waste, its possible location in the value chain of construction products and into its potential to increase the ecological and economical efficiency by reducing the global flow of construction materials.

The chair considers the intelligent re-use of material as direct contribution to the construction of buildings. It also conducts research on the process of recycling of potential building materials. A most interesting contribution will be the research of Dirk Hebel and his group to replace energy intensive materials in the existing construction materials. They have embarked on the systematic rediscovery of bamboo as a building material in conjunction with concrete. Eventually, and processed in a way that makes bamboo more resilient with regard to water and decomposition, it may be able to replace steel in concrete throughout wide areas of the world where urbanisation and high-density are not necessarily connected to high-rise construction.

Interactive 7.1 FCL Assistant Professorship of Architecture and Construction - description