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, and 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.

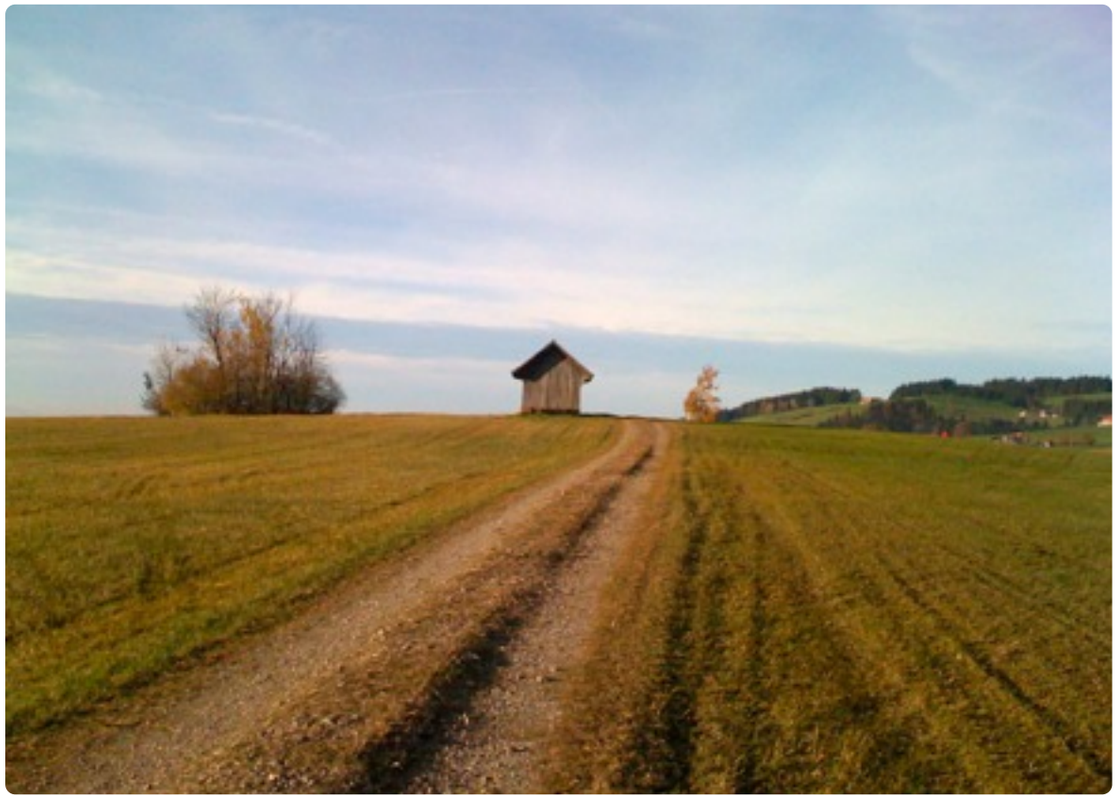
Pick any part of a modern building, such as a chair or an oven in any region of the world and try to retrace the path of all the components to their origin. Then, retrace the path to the origins of the materials of the components, and you will probably see a tree like structure spanning most of the globe. 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, which make 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 using only local material.

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 even entire buildings. Construction is a typical example of material flows around the world, and probably one of the most energy and CO2 intensive activities that can be imagined. The 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 right of 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 limits this choice to positioning a building intelligently on a small site or, in high-rises, to floor level and orientation.

Gallery 11.1 Building construction site



Schmitt, G. 2008. *Construction location and form follow the function of this simple building close to Einsiedeln.* [Photograph]. Switzerland.

Building construction material

Early construction took the material directly from the vicinity of the construction site. Clay, stone and wood in various variations were chosen in temperate climates. Protected from rain and ground moisture, even organic materials last for centuries. It was and still 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 challenge is to connect them to modern standards of living.

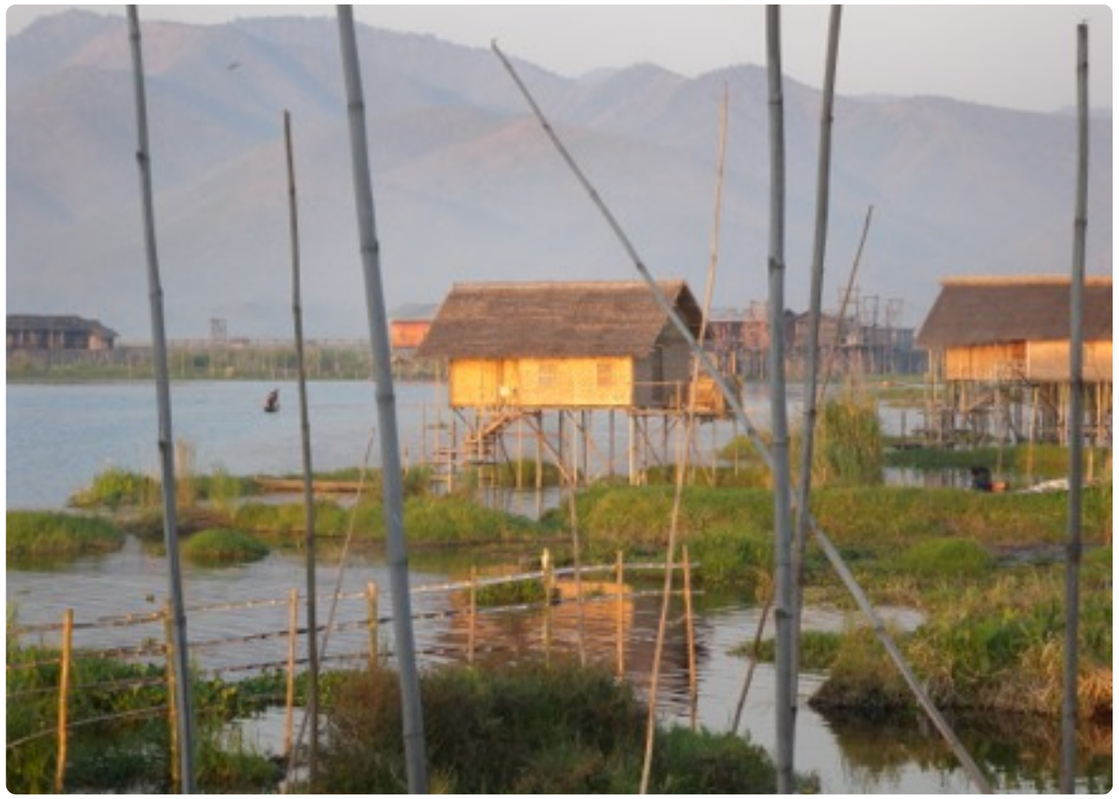
Gallery 11.2 Building construction material

Schmitt, G. 2008. *Oak wood, with adobe and straw infill. These local materials help sustain this schoolhouse in Schönberg since 1697.* [Photograph].

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. In these areas, water plays, in general, a larger role, as it is constantly available as convenient stock and flow, providing food and mobility.

Gallery 11.3 Construction sites in the tropics

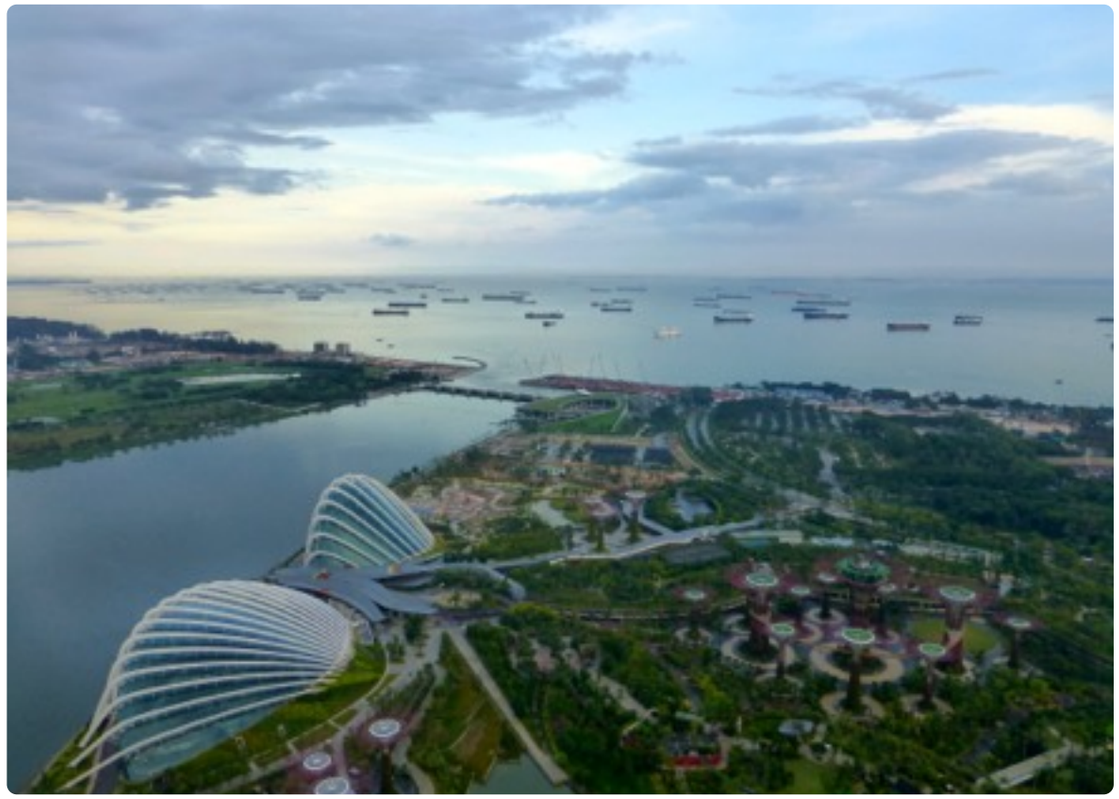


Schmitt, G. 2011. *Construction site in Nampan, South end of Inle lake in Myanmar, which serves as source of food and provides mobility.* [Photograph].

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 that all criteria for settlement are perfect in a certain location, but no land is available, it is possible with technical means to create this land. The sustainability of this approach needs to be explored.

Gallery 11.4 Artificial construction sites



Bettschart, F. 2012. *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.* [Photograph].

The archaeology of de-construction

The end of a building often reveals the best view on the construction of the structure. In countries and cities, where building materials are valuable for economic reasons, border recycling of building materials is important for ecological reasons, so every building is taken apart carefully, piece by piece. Almost turning it into an archaeological site, the recycling of buildings has turned into an art. Yet this practice is known for at least 3000 years.

Gallery 11.5 The archaeology of construction

Schmitt, G. 2013. *View on a demolition site in Einsiedeln, Switzerland, where a building is separated into its parts. This process can take a long time, but leads to meaningful recycling.* [Photograph].

Section 2

Future Cities Laboratory: construction

THE ASSISTANT PROFESSORSHIP FOR CONSTRUCTION AT THE FUTURE CITIES LABORATORY

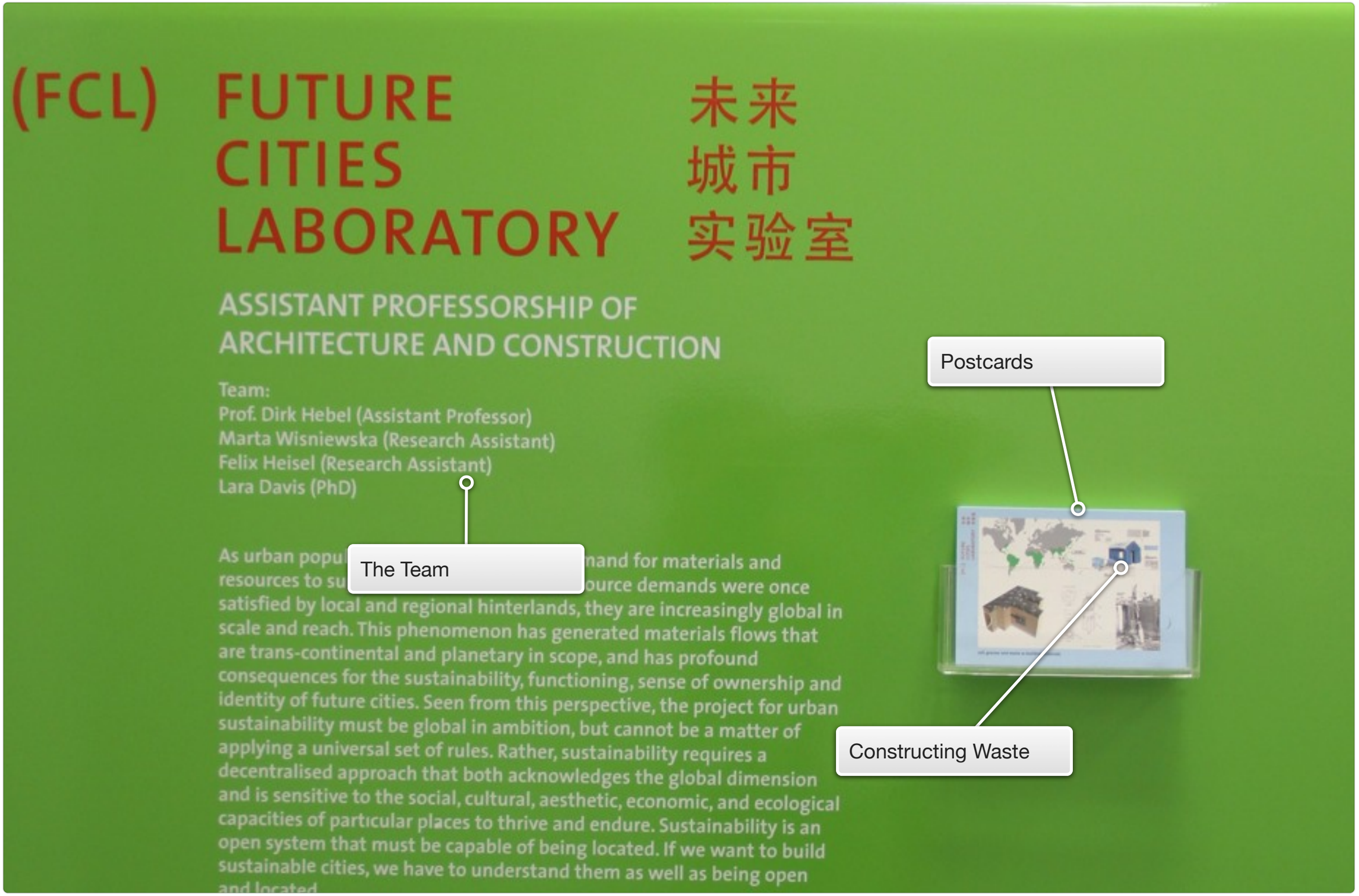
The Future Cities Laboratory at the Singapore–ETH Centre has established an assistant professorship for architecture and construction, since 2011. Dirk Hebel, the founding assistant professor, specialises in sustainable materials and their use in the developing countries around the equator.

The following information was taken from discussions with Dirk Hebel and from the publication "(SEC) Singapore-ETH Center, (FCL) Future Cities Labaratory Booklet, 2nd edition, Zurich," revised on 27 January 2012.

Given the fact that existing and future cities become less and less dependent on their immediate hinterlands, the assistant professorship of Architecture and Construction 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. The 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, after 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 11.1 FCL Assistant Professorship of Architecture and Construction - description



Interactive 11.2 FCL Assistant Professorship of Architecture and Construction - exhibition pod