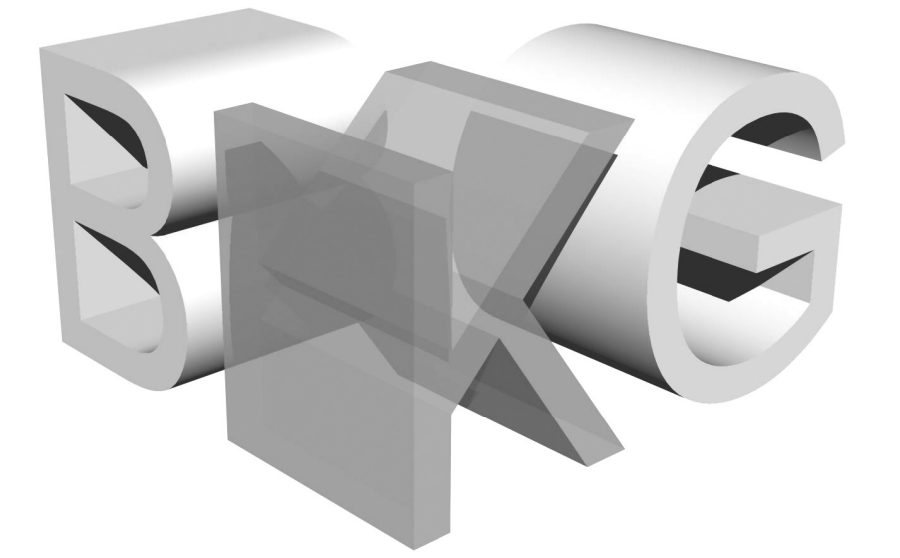


Konstruktives Gestalten und Baukonstruktion



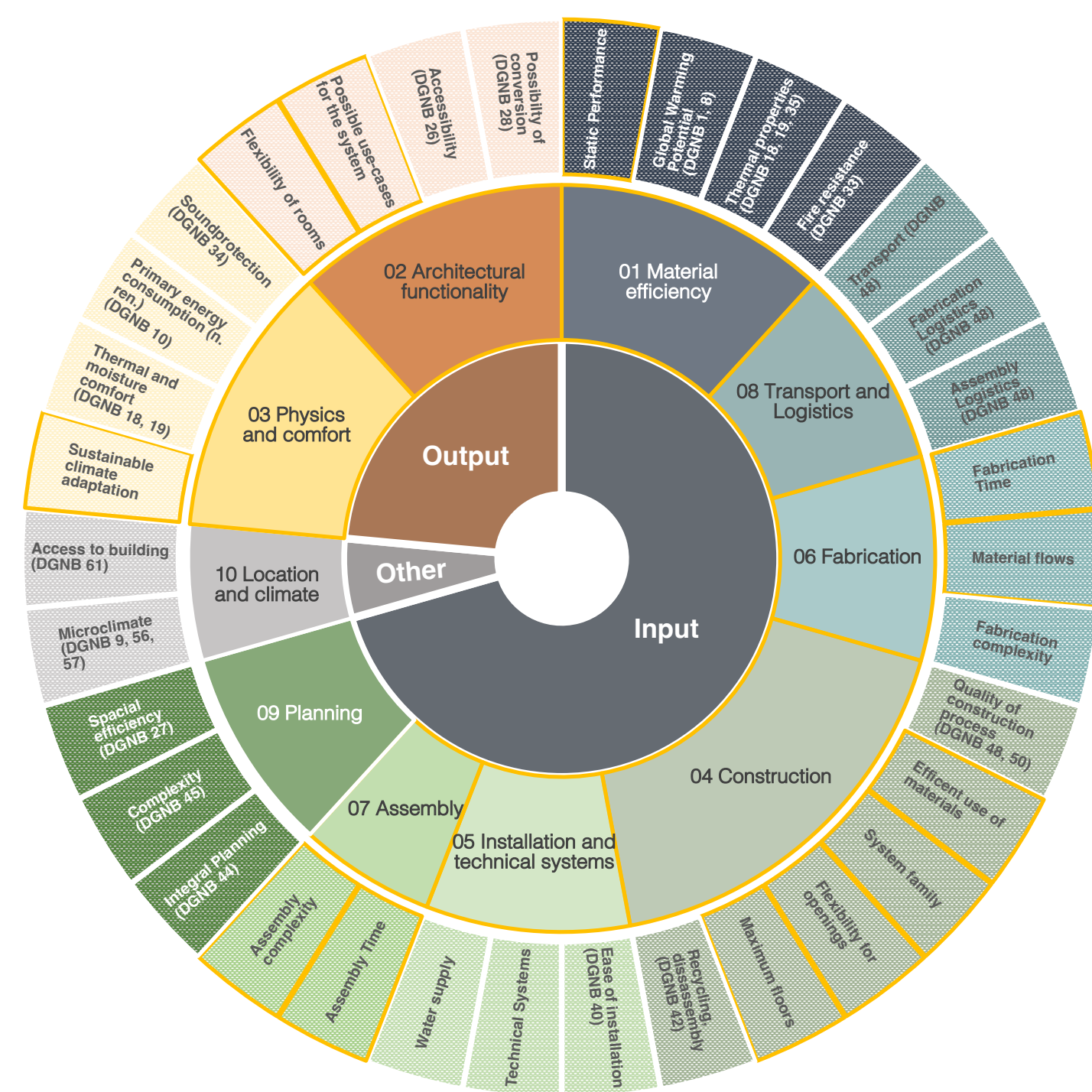
Abschlussarbeit – Sidibe, Hans Martin

Design Parameters for Prefabricated Modular Systems in Germany and Vietnam

Sensitivity for Analysis for Design Parameters

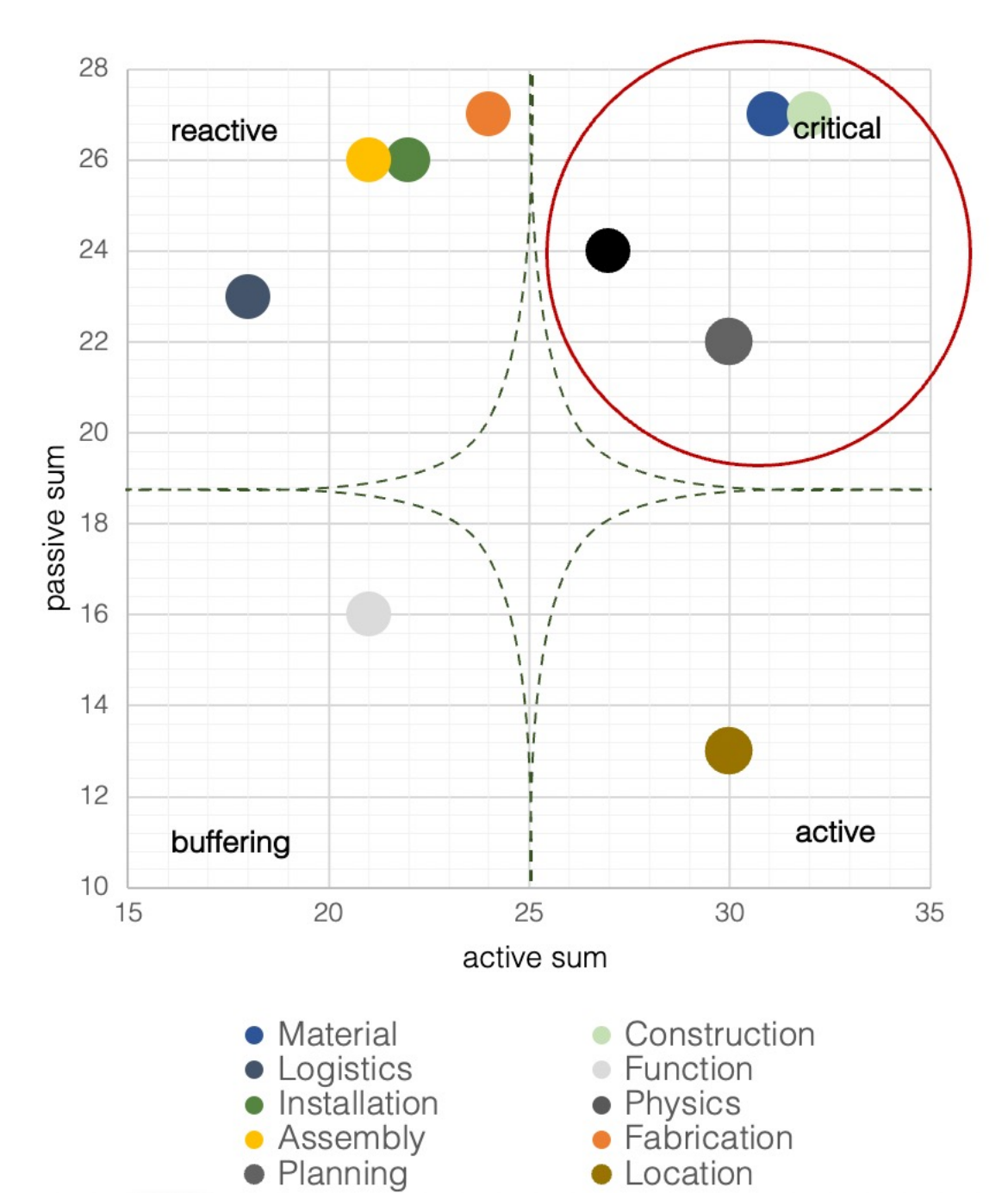
The first part of the thesis dealt with which parameters are suitable for the evaluation of a sustainable module construction.

The basis of this study were the DGNB parameters for the evaluation of sustainable buildings. These were analyzed, supplemented with module-specific parameters, categorized, brought into relation and made measurable by a rating system.

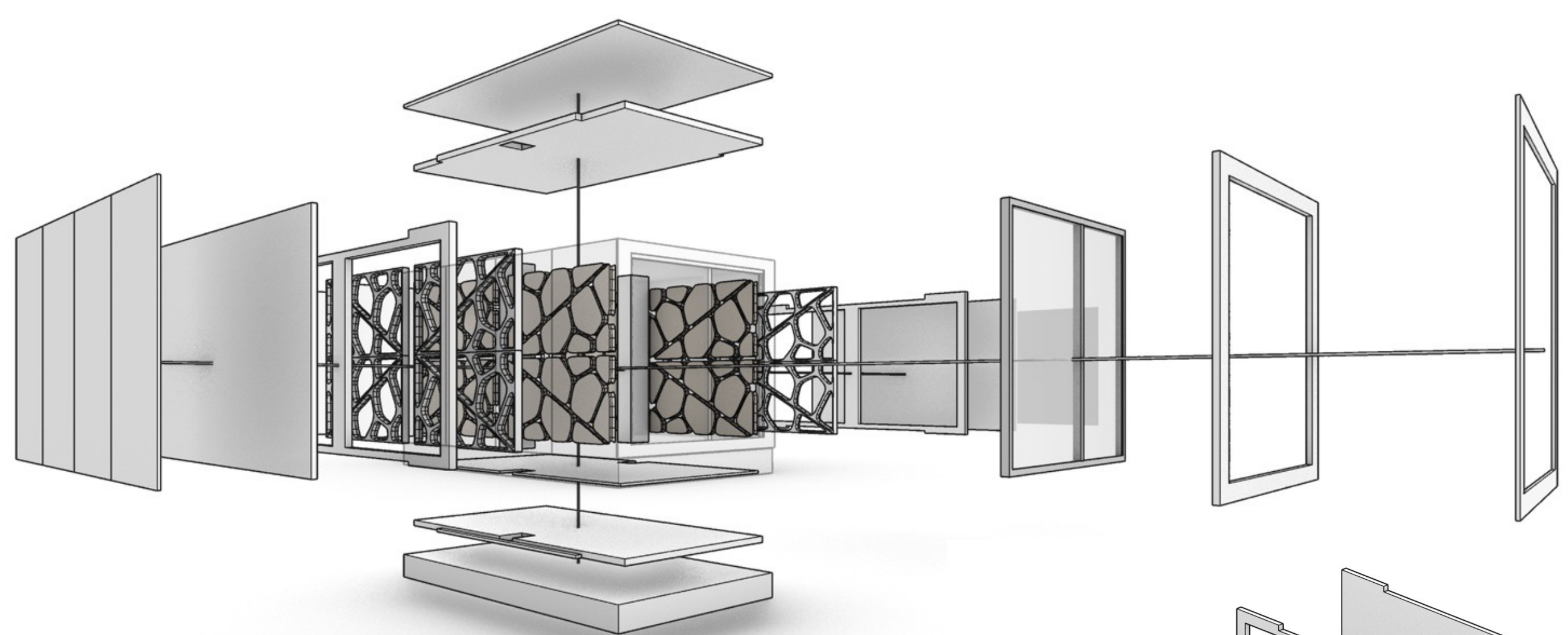


Sensitivity for Analysis for Design Parameters

With the help of Prof. Vester's sensitivity model, it was worked out which factors are critical for the success of the system. It turned out that the planning, as well as an efficient choice of materials, the construction and the physics are crucial.

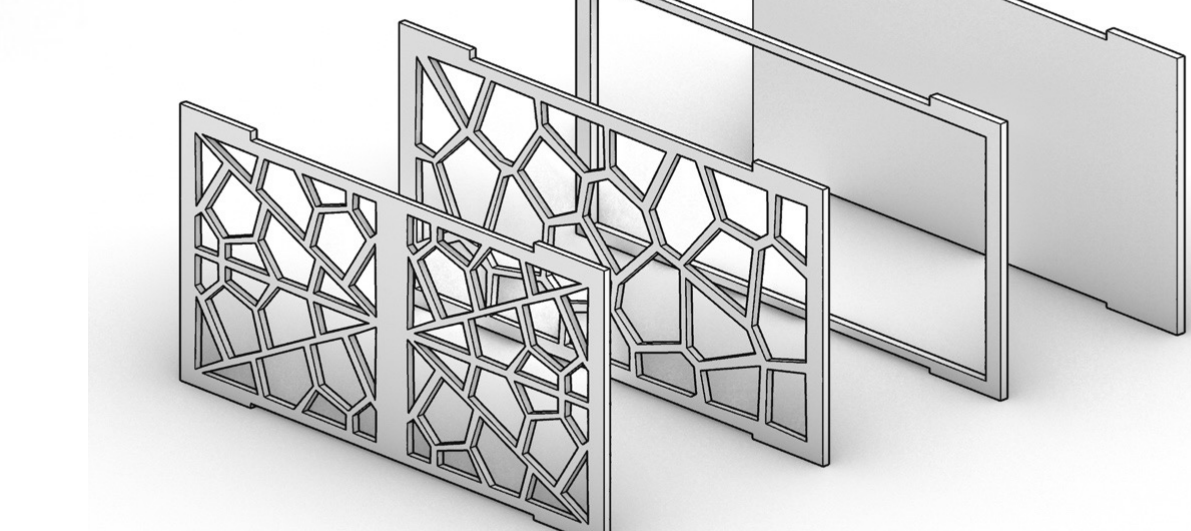


Design of a Modular Construction System in Germany

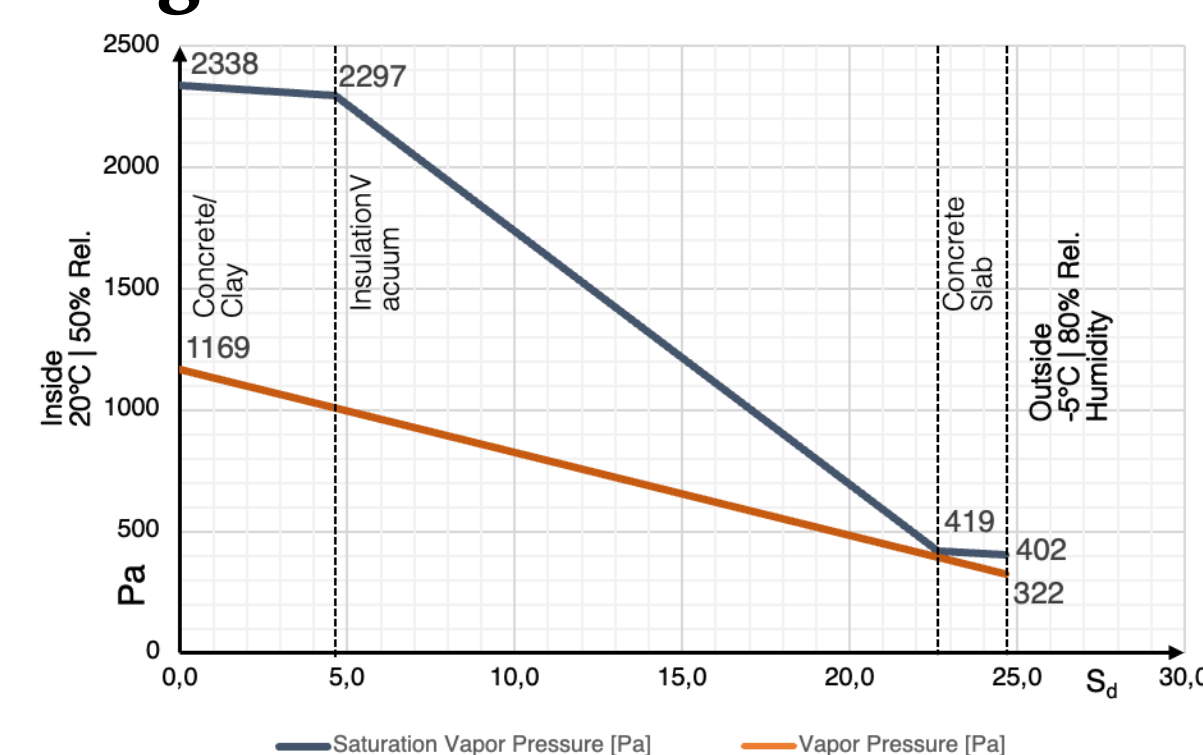


Explosion Drawing

The modular system, which was designed for the German climate, consists of a combination of clay and concrete. The aim was to represent a high thermal storage mass in a relatively light module. In addition, the space efficiency should be as high as possible. This was achieved by very slim walls and small modules that can be coupled in different configurations.



Design of the wall elements

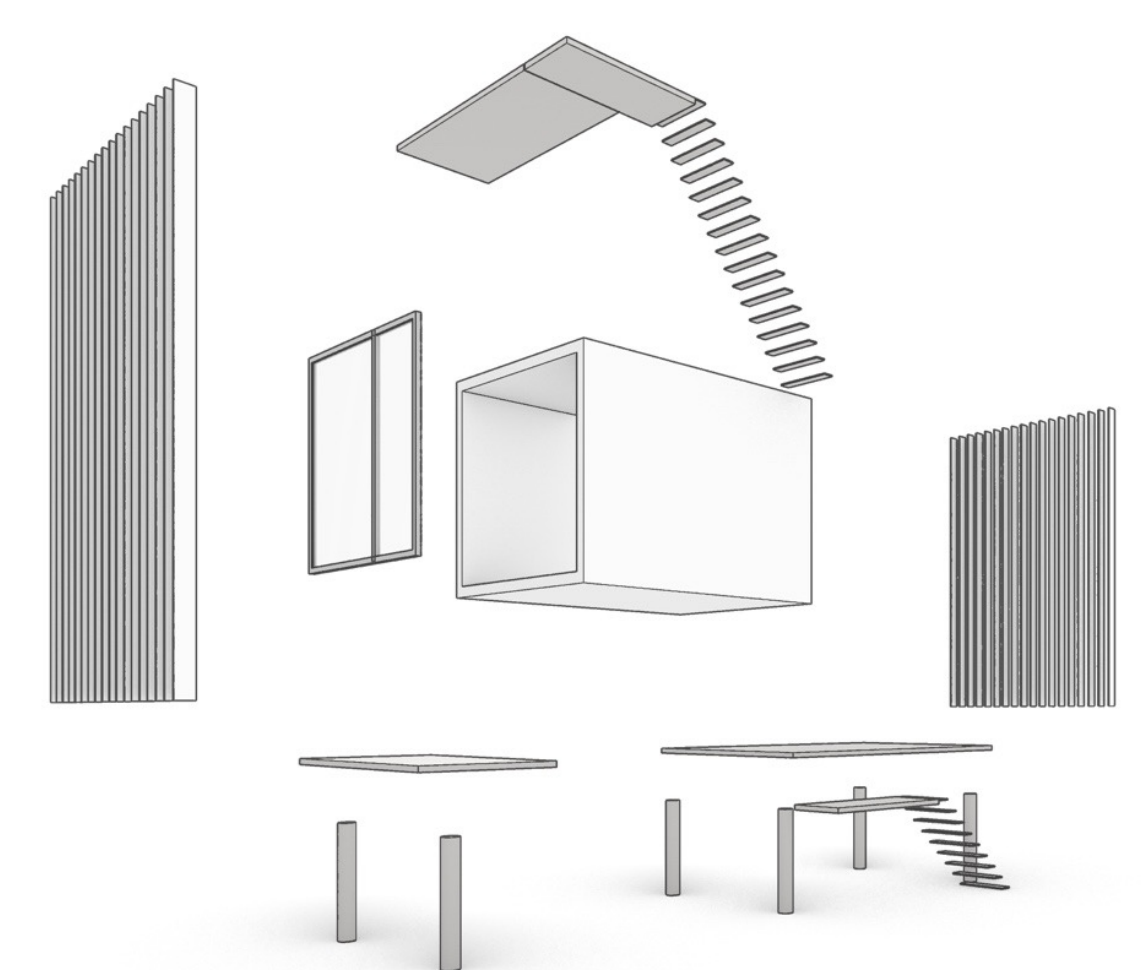


Calculation of possible condensation

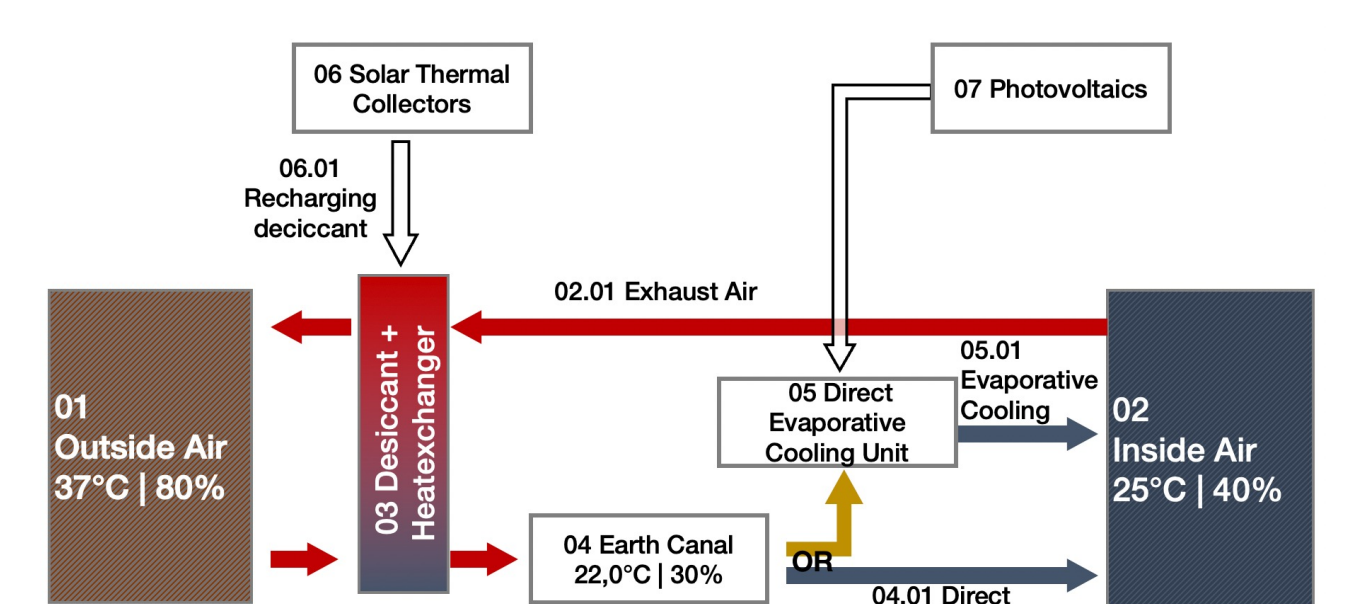
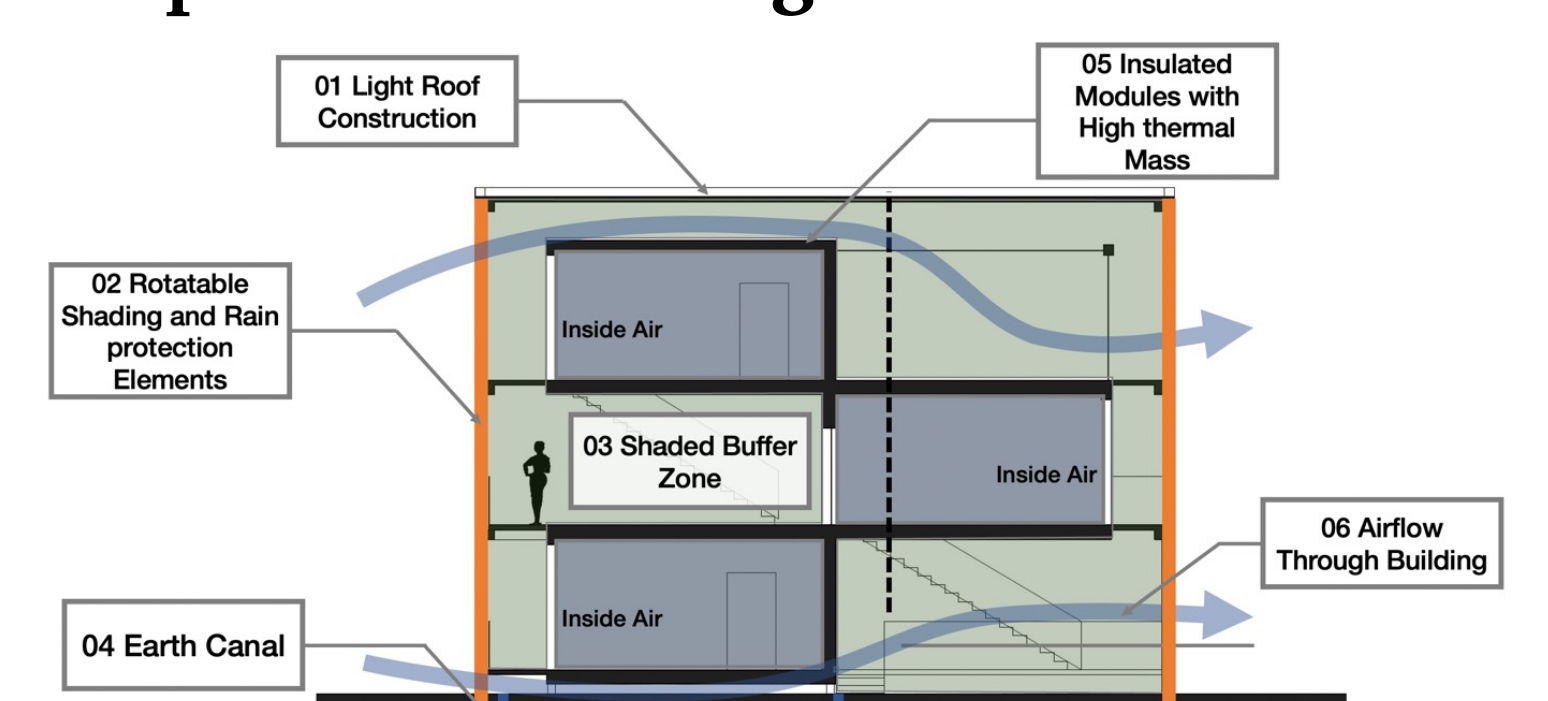
Design of a Modular Construction System in Vietnam

The module design for Vietnam focuses on cooling. The cooling concept provides for various measures to initially prevent excess heat input and to cover the cooling load to the greatest possible extent through passive measures.

The module itself consists of a graduated concrete, which offers sufficient insulation effect for the temperature differences prevailing in Vietnam and can be easily recycled. The modules are protected from excessive solar inputs by a buffer zone, which also houses most of the functions that would lead to high internal heat loads.



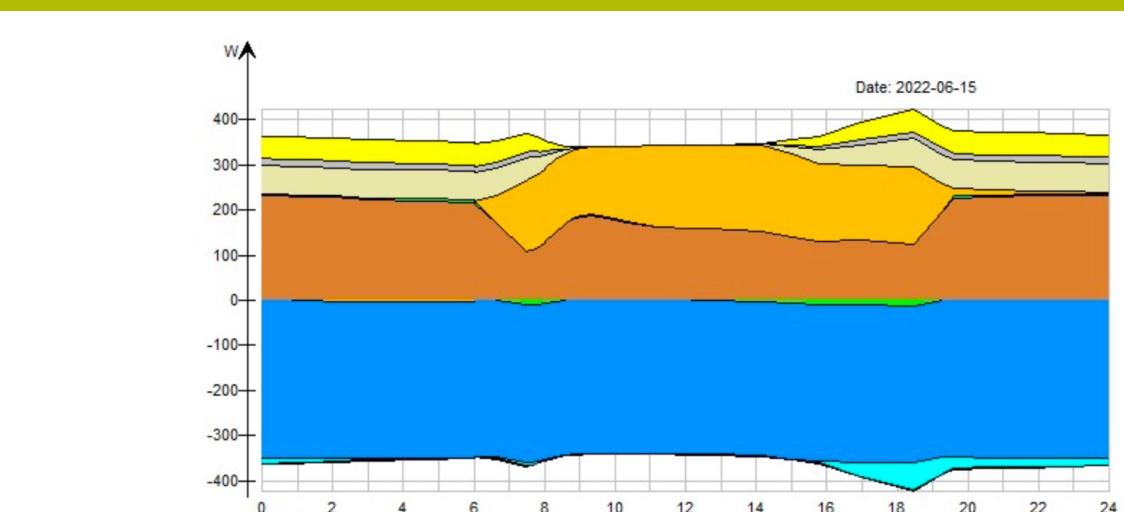
Explosion Drawing



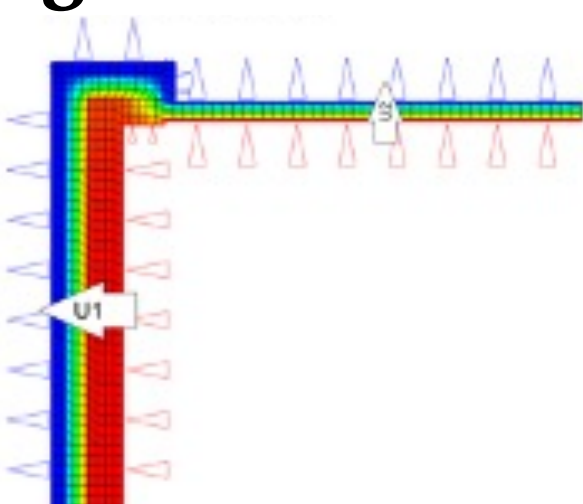
Cooling Concept

Evaluation and Simulation

The performance of the two module systems was evaluated with the help of thermal simulations. Among other factors, the cooling load in Vietnam and the heating load as well as the primary energy demand for the module in Germany were determined. Both modules could, if they generate sufficient electricity or thermal energy, be operated largely autonomously via the roof surfaces.



Cooling load simulation for Vietnam



Thermal bridge simulation for Module in Germany

Results

Both module designs are characterized by low energy consumption. The strategies to achieve this differ considerably. Due to the warm and humid climate in Vietnam, cooling and dehumidification is crucial, while the modular system in Germany minimizes heat losses due to the good insulation effect of the façade in the winter. In summer the storage capacity of the construction is beneficial to avoid the need for active cooling.

