Buildings Greening Energy

Potentials and Interdependencies

Executive Report

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Buildings, Greening and Energy: Potentials and Interdependencies

Interdisciplinary guidelines as planning aid for the activation of energetic, climatic and design potentials under consideration of the interdependencies of building, greening and building environment.

Credits:
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Darmstadt University of Technology
Department of Architecture
Unit of Design and Landscape Architecture (FG e+f), Prof. Dr. Jörg Dettmar
Unit of Design and Energy-Efficient Building (FG ee), Prof. Manfred Hegger

In cooperation with:
Brunswick University of Technology
Institute of Geoecology
Department Climatology and Environmental Metereology, Prof. Dr. Stephan Weber

Authors:
Nicole Pfoser, Dipl.-Ing., MLA
Nathalie Jenner, Dipl.-Ing.
Johanna Henrich, Dipl.-Ing.
Jannik Heusinger, B.Sc.
Prof. Dr. Stephan Weber

Staff:
Johannes Schreiner, B.Sc.
Carlos Unten Kanashiro, B.Sc.

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Project Management/Corresponding Author: Nicole Pfoser (mail@pfoser.de)
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Cause/Initial Position

With the increasing existence of a sharpened environmental consciousness on our actions and creation and establishment of new implementation strategies, the mission of sustainability becomes motor of progress; in architecture, landscape architecture and urban design and planning new goals are set. For the discipline of architectural design, this leads to a new organisation of building envelope surfaces in regards of functionality and design: areas of energetic function, areas of vegetation, and areas for illumination and shading systems are to be organized in optimized positions in line with ecological and functional criteria.

Subject of Research

„Green Architecture“ is becoming a self-evident part of the decision making process in building development in the commercial and private sectors.The possibility to use building (surface) areas as „green spaces“ without land use, the increase in value for building and address and the new synergy of „sustainability“ and „dwelling quality“ gain the attention of developers and investors, who rely on and need a positive cost balance. The multi-faceted potentials of an additional form of urban flora on the urban space, the parcel and the building itself are being presented in graphic 1. Future suitability thereby is in everyone’s interest – in regards of constant appropriateness of the implemented greening systems for the private and civic goals, and in respect of their (quantifiable) contribution to the climate goals, air quality control, and the protection of nature and diversity of species.

Hereby the research report delivers basic knowledge for the greening of buildings in connection with energetic measures and performance criteria: synergies and competitions in regards of heating and cooling demand are presented in graphics 2 and 3; synergies and competitions in regards of electricity, fresh air, and water demand are presented in graphic 4; graphic 5 illustrates the synergies of vegetation and energy in regards of surface water, rain water evaporation, noise protection, and biodiversity. The positive effects and energetic potentials of building greening measures are documented in literature research and own measurements. In addition, computer simulations were executed to quantify thermal effects on the urban space.

Between scientific knowledge and successful realisation lies a wide area of necessary expertise and practical experience. The value of green roofs and the rediscovery of facade vegetation are eventually determined through the practical and creative success in their implementations. This research project aims to provide a source of interdisciplinary information on the multitude of implementations and interdependencies and synergies of building green with the technologies of energetic building. The merger of architecture, active and passive energy generation and use, landscape architecture and botanic is the core thought behind a new, interdisciplinary building envelope design, the façade-integrated building vegetation system.

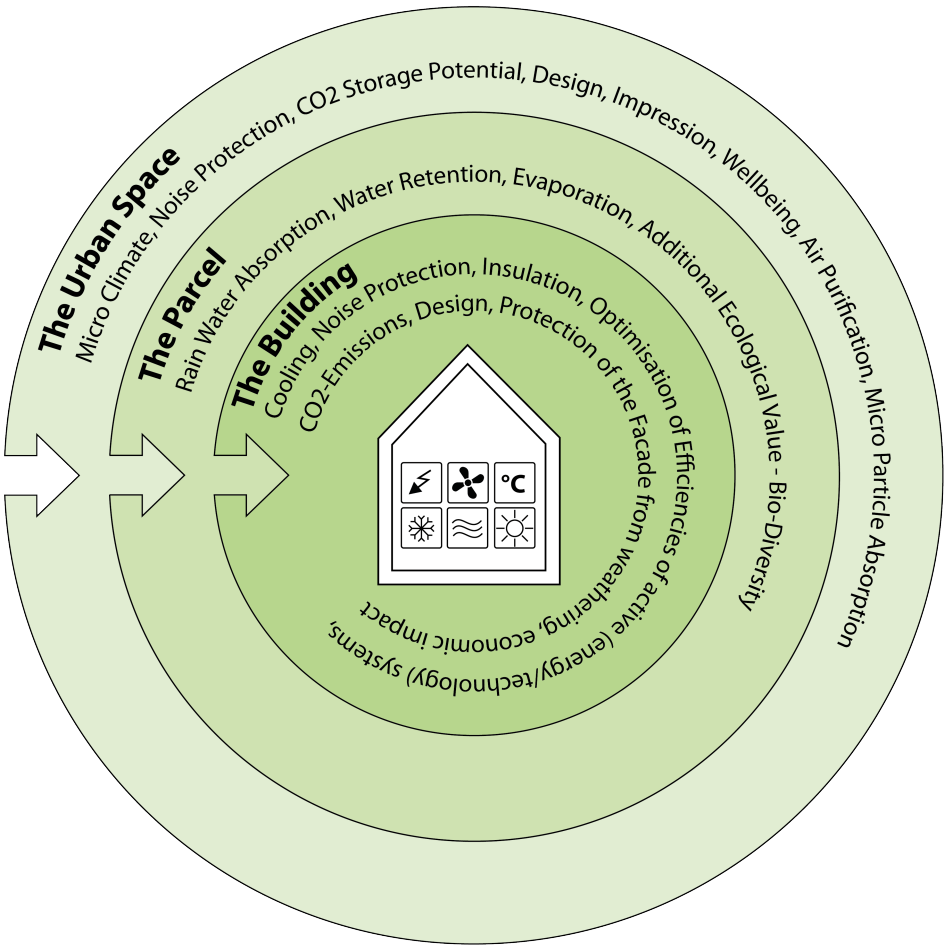
Thereby, successful realisations and reliable empirical values prove the achievable design synergy, silencing effect, ecology and economy. Besides constructive solutions, botanic prerequisites and faunistic demands, climatic specifics, state and civic building code and neighbour relations, influences from surrounding buildings, supply, care and maintenance situations, and last but not least cost and practical implementation sequences, have to be considered for the realisation. Therefore, within this project, an emphasis was laid on the creation of practice-oriented guidelines for the interdisciplinary planning of different building greening systems. This guideline offers support for a successful and error-free implementation in practice. It summarizes the state of knowledge on the different greening technologies and connects it with decision parameters both at the level of singular buildings and organisational and planning parameters for the implementation in urban design. The breadth and variety of solutions and their botanic and energetic impact is presented in current examples of realised

architectural and urban design projects, simultaneously conveying the new design opportunities to be gained from nature-friendly integration of development and natural areas.

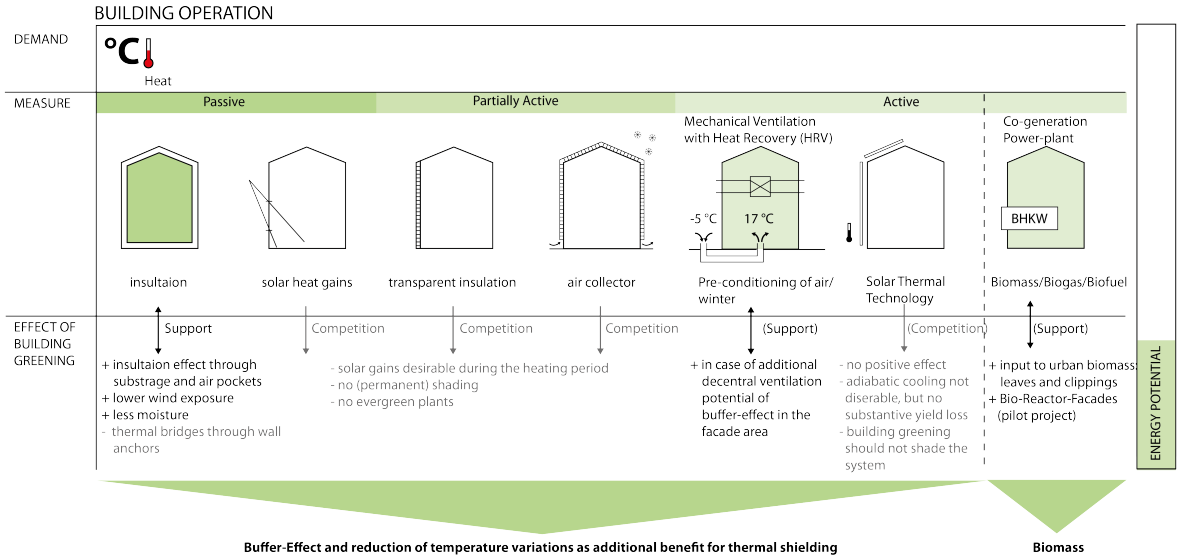
Conclusion

The interdisciplinary treatment of building technology, greening technology, botanic and architecture is vital for the success of building vegetation. Simultaneously, proven success is the prerequisite for growing interest and acceptance. Motivation of decision makers and planners roots in comprehensive knowledge and information. Interest and the will of implementation can be supported through exemplary prototypes and information about the performance spectrum of building vegetation, energetic surface activation and the synergetic connection of both potentials. The detailed guidelines aim to provide security to clients, designers and contractors in addressing safety and preventing failures and wrongful decisions, by giving step-by-step, individualized and practicable advice.

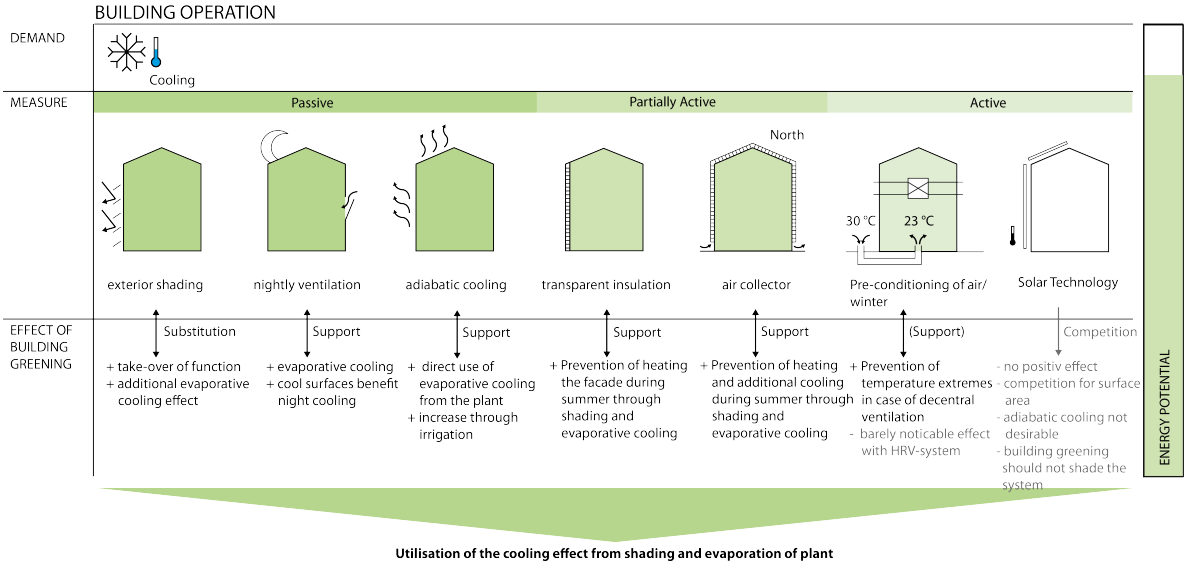
Pictures/Graphics



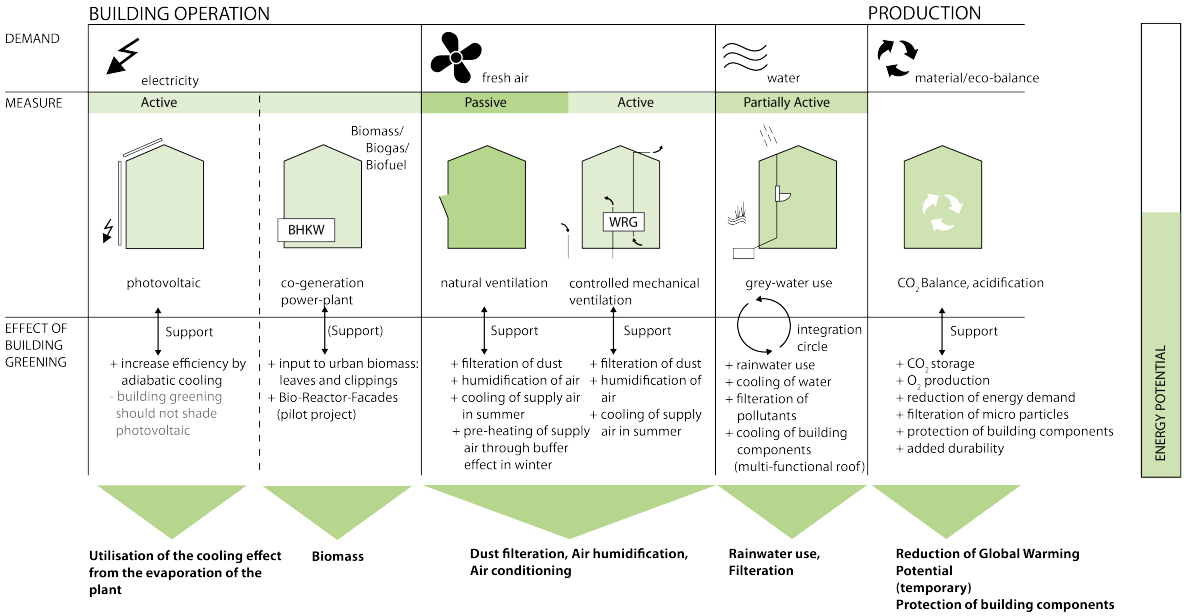
Graphic 1: Circle_Diagramme.png
Impact potential of greening of buildings on urban space, parcel and building
(TU Darmstadt, FGee, FGe+f)



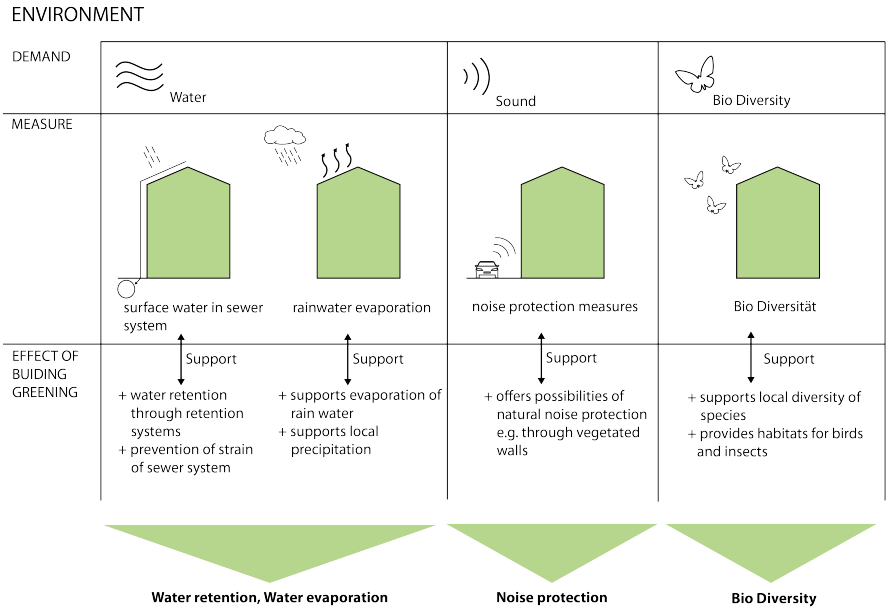
Graphic 2: fulfilment_heating_demand.png
Measures for fulfilment of heating demand. Presentation of synergies and competitions in combination with greening of buildings (TU Darmstadt, FGee, FGe+f)



Graphic3: fulfilment_cooling_demand.png
Measures for fulfilment of cooling demand. Presentation of synergies and competitions in combination with greening of buildings (TU Darmstadt, FGee, FGe+f)

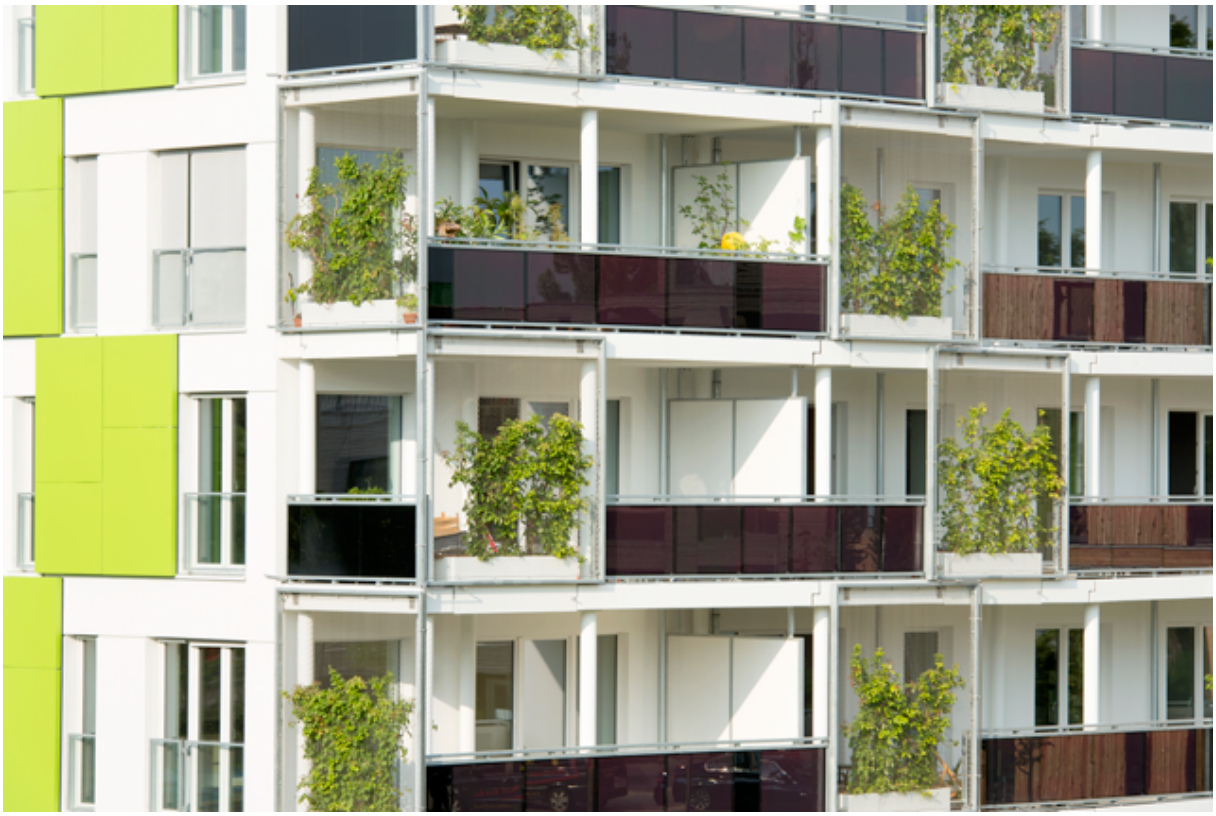


Graphic 4: fulfil_demands_of_electricity.png
Measures to fulfil the demands of electricity, fresh air and water in the operation of buildings and eco-balance aspects of material production. (TU Darmstadt, FGee, FGe+f)



Graphic 5: synergies_building_environment.png
Presentation of synergies in the building's environment in regards of surface water management, rain water evaporation, noise protection measures and biodiversity in connection with the greening of buildings.
(TU Darmstadt, FGee, FGe+f)

Graphic 6: Munich_MTZ25.jpeg
Roof-mounted PV: Synergy of photovoltaic and evaporative cooling on an extensive green roof
(Photograph: ZinCo GmbH)



Graphic 7: Smart_is_green.png
Smart is Green - IBA 2013 Hamburg: Field-by-field wall-integrated facade vegetation (Cooling, partial shading, facade impression, space definition, privacy) in connection with photovoltaic (loggias)
(Photograph: CHRISTIAN HACKER FOTODESIGN for zillerplus)