

System modeling for energy-efficient and sustainable building design and city planning

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Why do we need systems engineering for sustainability?

- Sustainability is multidisciplinary
- Involves physics, engineering, environmental science, economics ...
- Disciplines interact and form a complex network of interdependencies
- Systems engineering and modelling helps to find well-performing configurations





Parametric Systems Modeling (PSM) Synthesis of the System





Parametric Systems Modeling (PSM) Analysis of the System



Watergy Building Berlin (de) / Greenhouse in Almeria (es)



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Urban Systems Composition – Use Cases and Requirements



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Urban Systems Composition – Structure and Item Flows



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Performance-oriented Design – Parametrics and MOEs



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Nürnberg Weststadt – Sustainable development of a livable urban district



Qualities and Quantities



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Effect Structure



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Conclusions

System Modeling Provides:



 Overview of Actual System Flows and Parametric Interdependencies

 An Interface between Geometric Modeling and Engineering and Simulation

• A Basis for Design Exploration and Computation (e. g. Design of Experiments or Optimization)