Chair for Information Architecture

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COLLABORATIVE CITY DESIGN

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

MOTIVATION

“MASTER PLANNING HAS BEEN SUBJECT TO MAJOR CRITIQUE, AND IN SOME PARTS OF THE WORLD IT HAS BEEN REPLACED BY PROCESSES AND PLANS THAT ARE MORE PARTICIPATORY, FLEXIBLE, STRATEGIC AND ACTION ORIENTED”

(UN-HABITAT, 2009)

TARGETS AND RESEARCH QUESTIONS

To increase the urban quality.

The city has to be enabled to adapt and to integrate urban, environmental, social and economical impacts.

To encourage the use of collaborative and participatory approaches for urban plan making and evaluation.

How can those participatory processes be linked with new methods for the simulation of sustainable future cities?

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TARGET: COLLABORATIVE URBAN REQUIREMENT DEFINITION

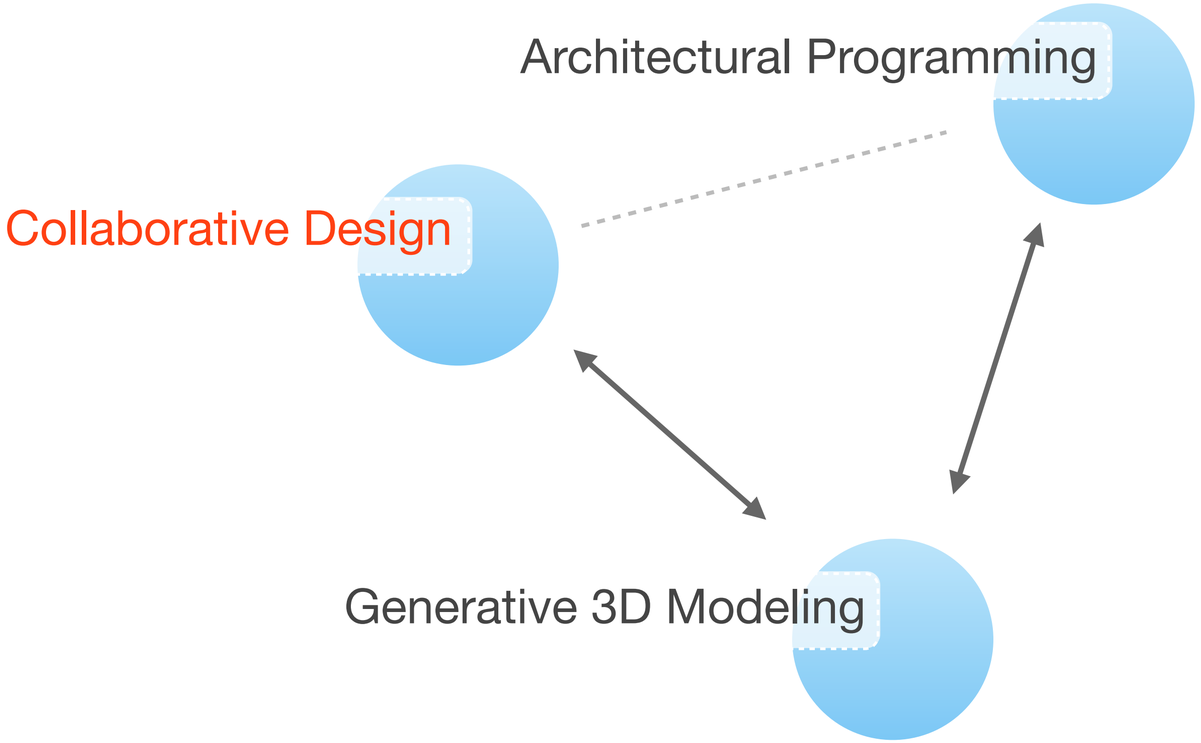
Prerequisites:

Definition of urban planning situation

Coordination of different stakeholders

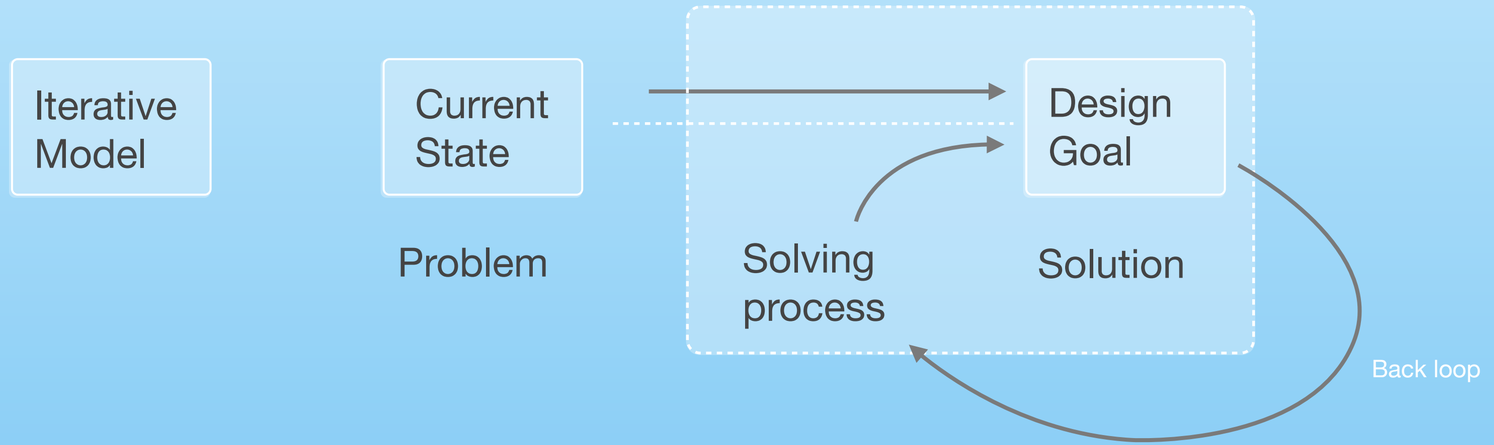
Solution adapted to each case

Solution adapted to each case



Linking different techniques for a mutual agreement

TARGET: EFFICIENT SOLUTION FOR PLANNING PROCESS



REQUIREMENT DEFINITION WITH SYSTEM ENGINEERING

Basic principles

Life cycle model

Problem solving

REQUIREMENT DEFINITION WITH SYSTEM ENGINEERING

1. Basic principles
   - 1.1 Top-down problem definition
   - 1.2 Unified problem solving process
   - 1.3 Generation of design goal variants
2. Life cycle model
3. Problem solving

REQUIREMENT DEFINITION WITH SYSTEM ENGINEERING

1. Basic principles
2. Life cycle model
   2.1 Definition of dynamics
3. Problem solving

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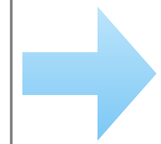
REQUIREMENT DEFINITION WITH SYSTEM ENGINEERING

1. Basic principles
2. Life cycle model
3. Problem solving
   - 3.1 State analysis
   - 3.2 Design goal definition
   - 3.3 Solution & evaluation



Stakeholder participation

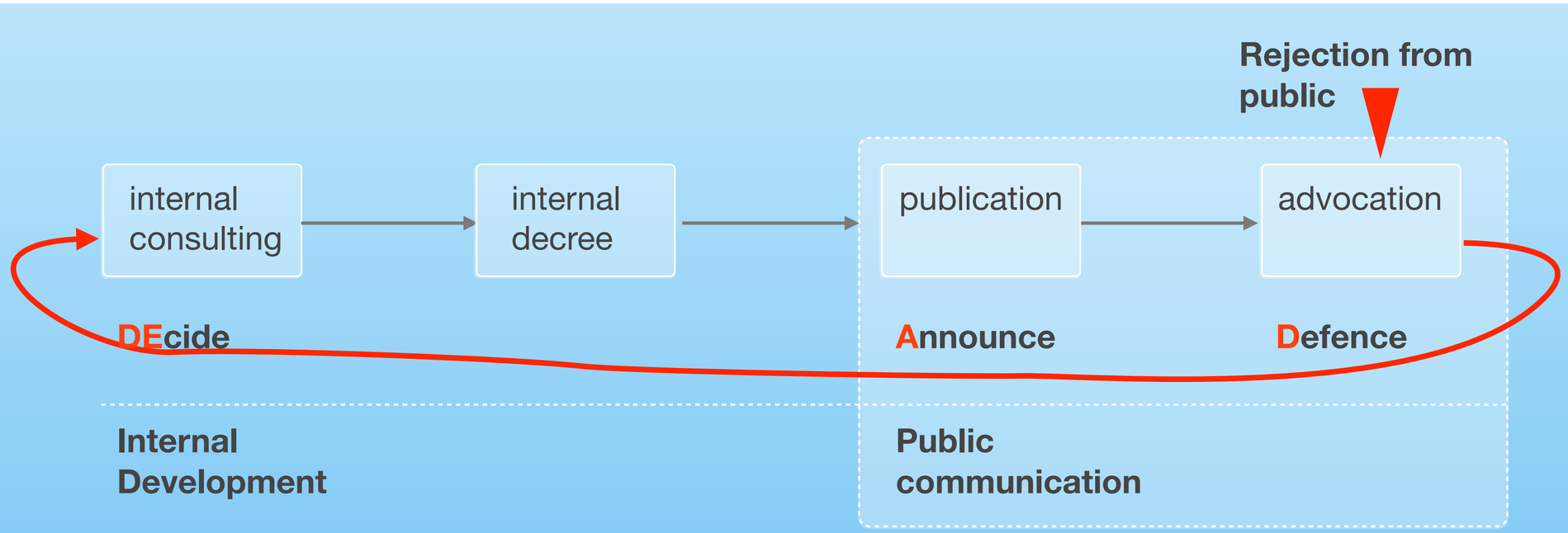
MOTIVATION FOR COLLABORATIVE CITY DESIGN

1. Complex interdependencies between requirements
   - economic
   - ecologic
   - social
   - political

Key factors for sustainable urban design

2. Quality of life index
3. Increasing private stakes (private investors)

WHY ARE CONVENTIONAL PLANNING PROCESSES FAILING? (DEAD MODEL)

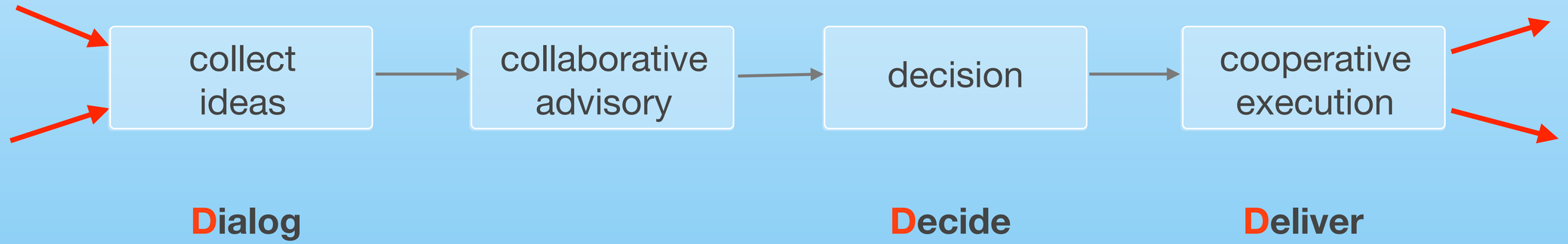


WHY ARE CONVENTIONAL PLANNING PROCESSES FAILING?

1. Internal consulting focus on specialised views
2. Internal decree shares interests different from public
3. Public communication mainly at end of project preparation
4. Zero sum for both sides

ALTERNATIVE:
TRIPPLE-D-MODEL

(Dialogue-Decide-Deliver)



IMPORTANT ACTIVITIES DURING A COLLABORATIVE PLANNING PROCESS

Coordination

Briefing

Moderation

Cooperation

Participation

Communication

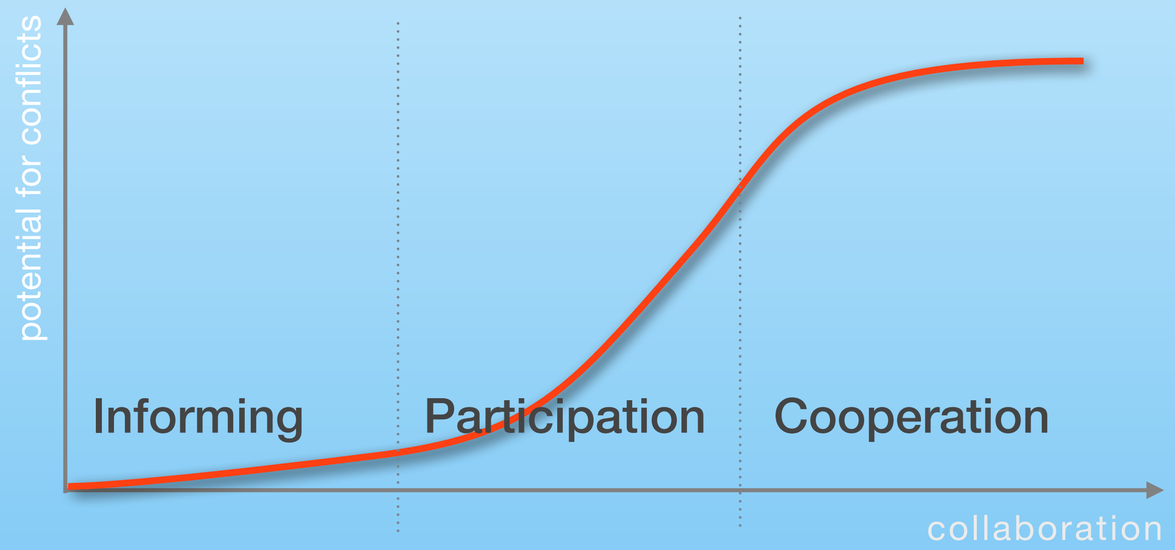
ACTIVITIES WITH

(ORDERED AFTER INTENSITY OF INVOLVEMENT)

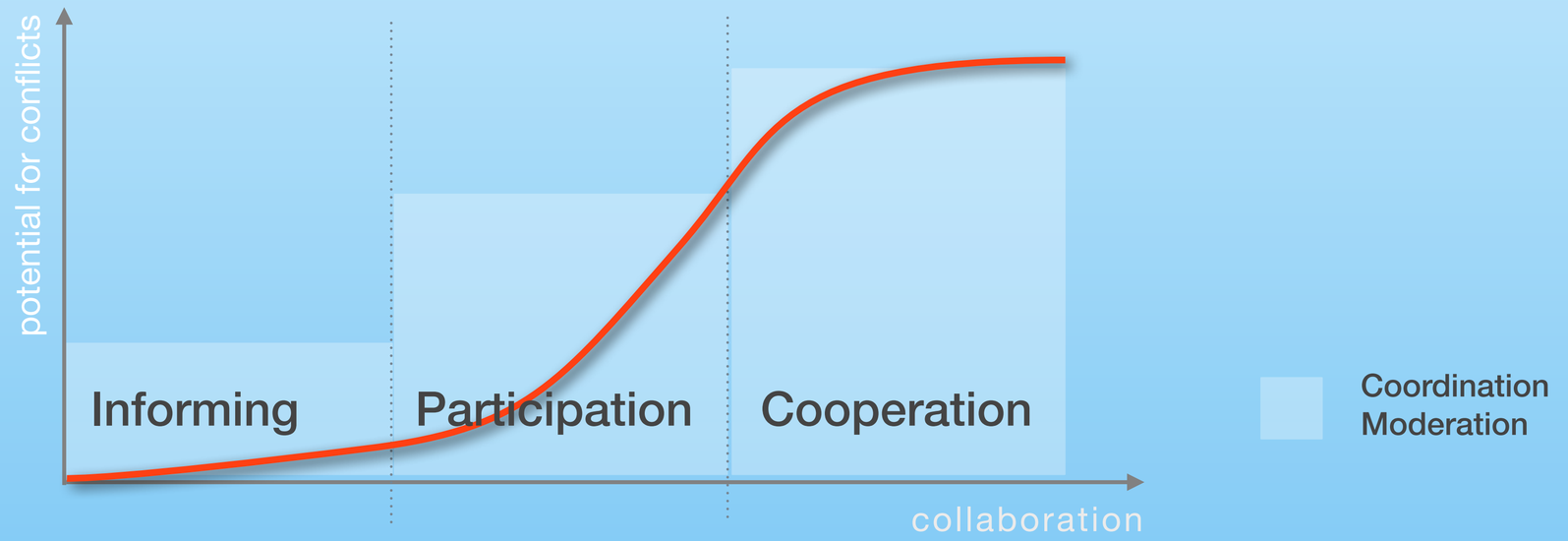
Direct Involvement
- Informing
- Participation
- Cooperation

Decision Support
- Coordination
- Moderation

POTENTIAL FOR CONFLICTS & COLLABORATION



INCREASING DEMAND FOR DECISION SUPPORT TECHNIQUES



COMMUNICATION PROCESS

Communication

Literally: to inform, to act conjointly

Inter-personal behaviour where information is exchanged

INFORMING - BRIEFING AND GATHERING OF OPINIONS

Nature:
Monologue, decision making by project development team

Workshop host who

(a) communicates ideas
(b) gathers opinions
(c) motivates for a change

INFORMING - EXAMPLES

Masdar City

http://www.masdar.ae

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PARTICIPATION

Nature:

- dialogue,
- decision making by project development team.

Focus on:

- exchange of ideas,
- decision making,
- collaborative consideration
- especially: participants expert knowledge, exchange of arguments and views.

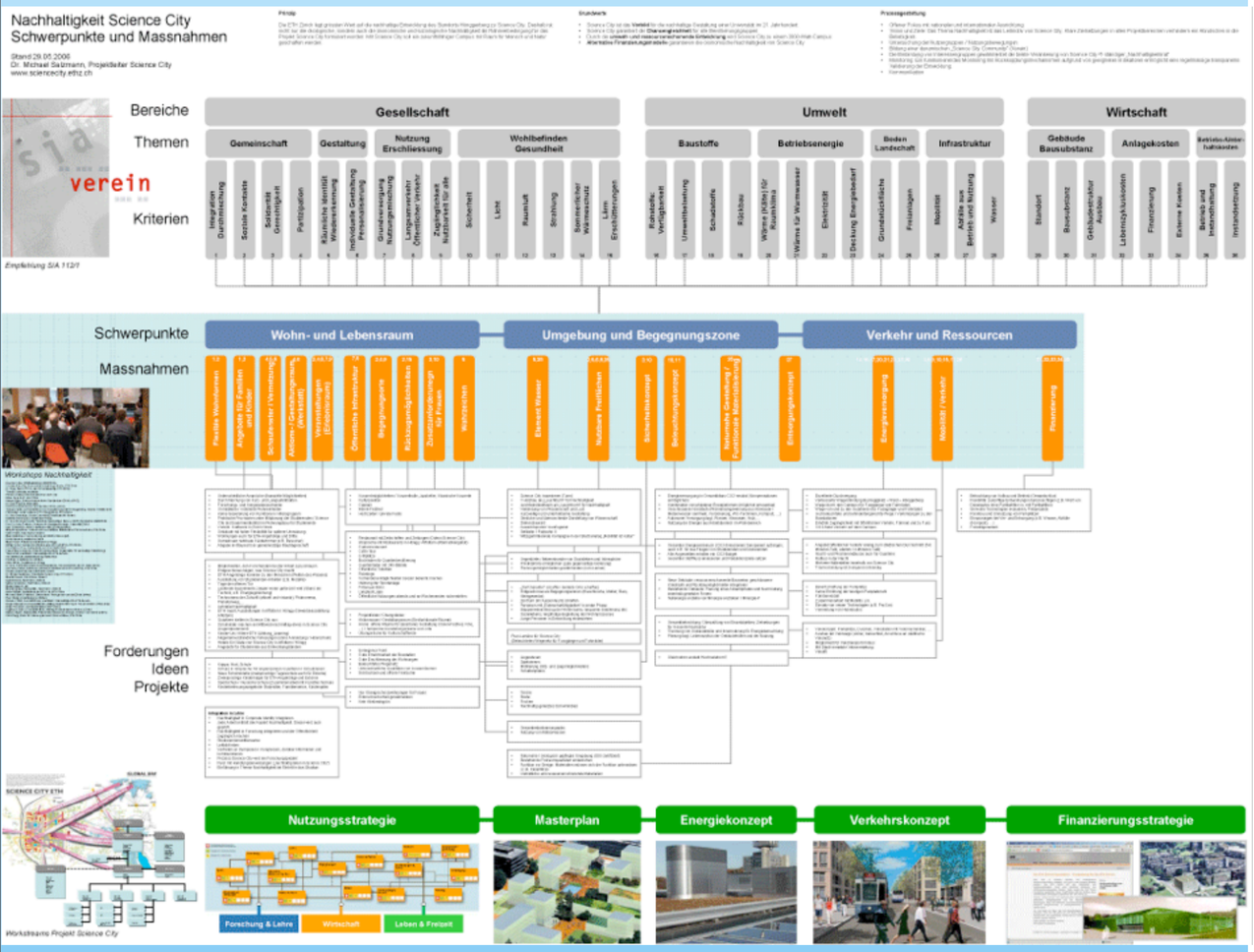
COOPERATION

Nature:

- dialogue
- decision making by stake holders of project
- participants work on specific topics
- important:
  (a) agenda
  (b) mandatory standards
  (c) pre-selected participation

COOPERATION - EXAMPLES

Science City
http://www.sciencecity.ethz.ch



DECISION SUPPORT TECHNIQUES: COORDINATION

Mainly project management and administration

Preliminary for informing, participation, cooperation

Important:

(a) linking resources: activities and competencies

(b) tuning goals and task

DECISION SUPPORT TECHNIQUES: MODERATION

Active management of talks

Moderator: neutral position

WHY IS PUBLIC INVOLVEMENT MANDATORY?

Affected private property (increased, decreased value)

Enhancement through public feedback

Defined by law (e.g. Swiss Federal Building Code)

METHODS FOR COLLABORATION

Informing

Events

- Citizens' forum
- Field trips

Poll

- Household poll
- Interviews

Media

- Radio
- Blog
- Press
- Flyers

Participation

Formal methods

- Public presentation
- Hearing and consideration

Informal methods

- Citizens' jury
- Future workshop
- Working groups

Mainly no definite decisions

Cooperation

Formal methods

- Dispute resolution
- Court of arbitration

Informal methods

- Public-Private Partnership
- Round table
- Mediation (conflict solving)

METHODS FOR PARTICIPATION

Public-private partnership
collaboration between private entities (mainly large companies) and public institutions, limited duration

Round table collaborative consulting of affected stakeholders
equal participants, host moderates events

Mediation

METHODS FOR COOPERATION

Citizens' jury
Approx. 15 participants, heterogenous structure, accompanied by planners, defined duration (up to several weeks)

Working group
Team of people, working constantly on defined matters
constant feedback to decision makers

Future workshops
a) Preparation stage
b) critique stage
c) creativity stage
d) implementation stage

COLLABORATION PROCESSES

Within planning agencies / companies

Together with stake holder from the public

GOALS FOR COLLABORATIVE DESIGN

Saving ressources and investments

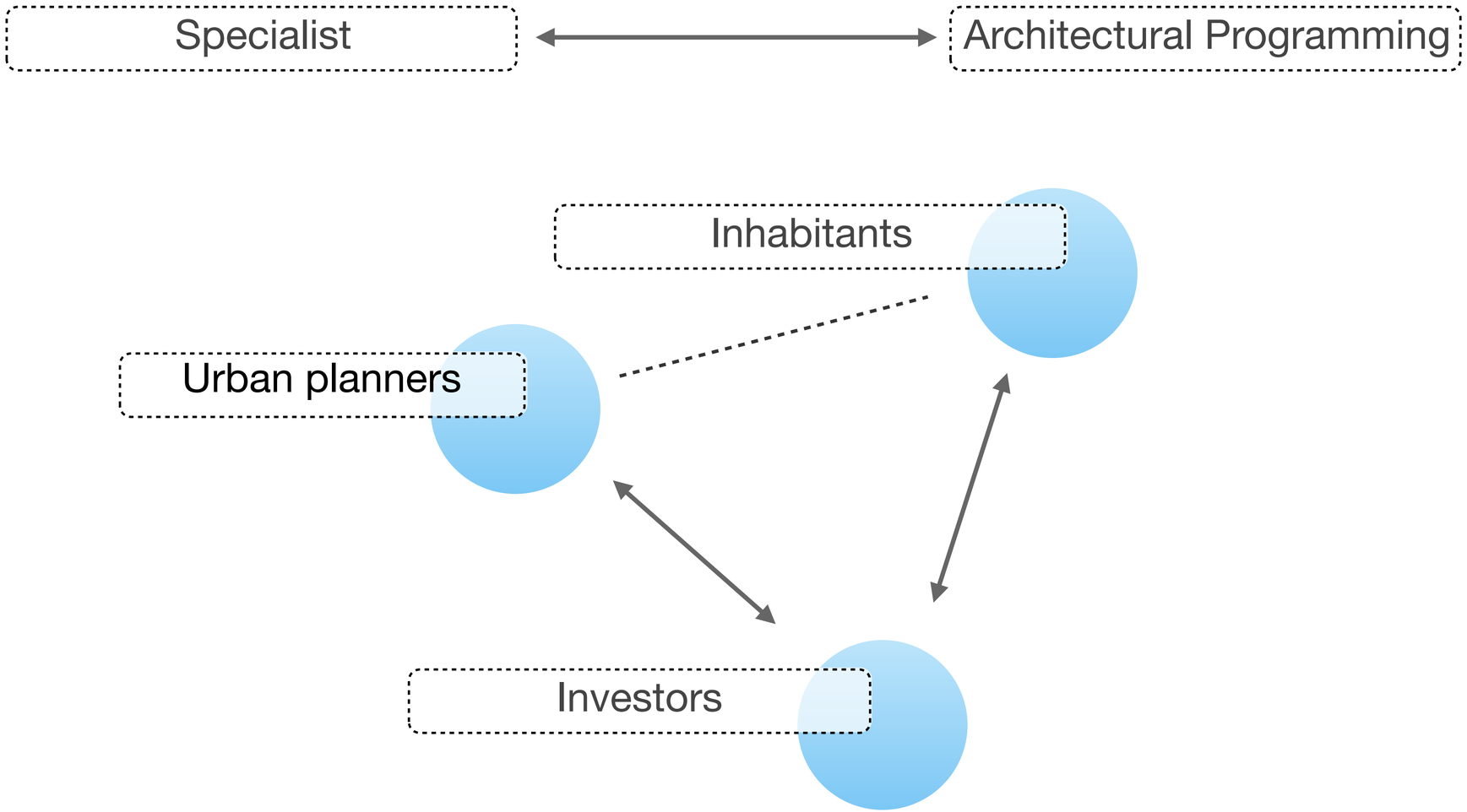
Acceptance of proposed design

Mutual understanding of proposed project

Efficient design rework

Efficient project realization

CONTROVERSY



CONTROVERSY

Specialist ⟷ **Inhabitant**

- enhanced qualities
- more efficient competitive design

- inhabited qualities
- existing social structures

STAKE HOLDERS INVOLVED IN PROJECT

Typical representatives
Urban planner

Architectural office

Planning company

Law offices

Agencies

STAKE HOLDERS INVOLVED IN PROJECT

Typical representatives
Investors

Project developer

Public-private partnership

Housing associations

Mortgage and real estate investor

Private owners

STAKE HOLDERS INVOLVED IN PROJECT

Typical representatives
Inhabitants

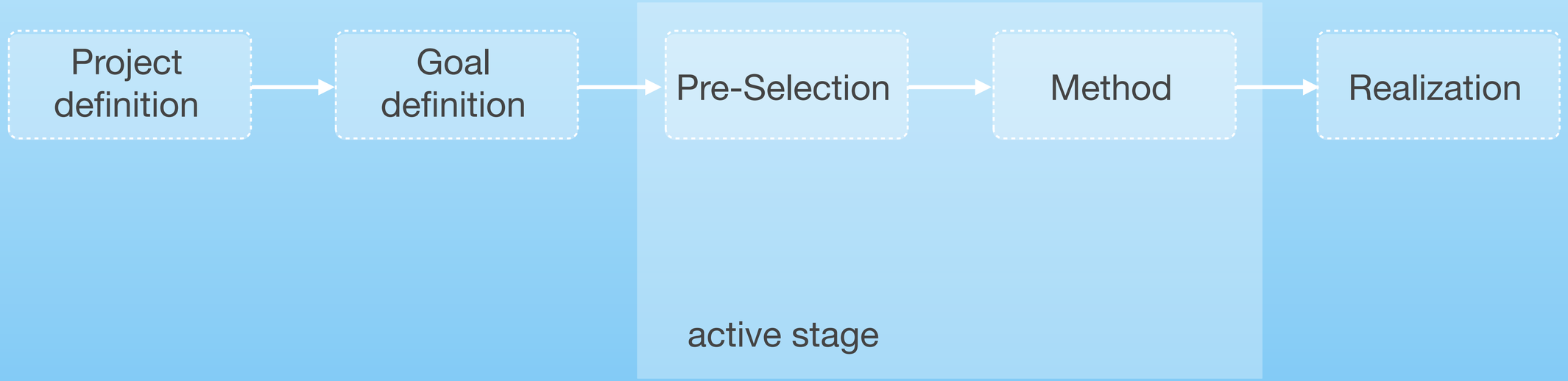
Residents

Public services

Companies

5 QUESTIONS

A concept for the implementation of collaborative methods

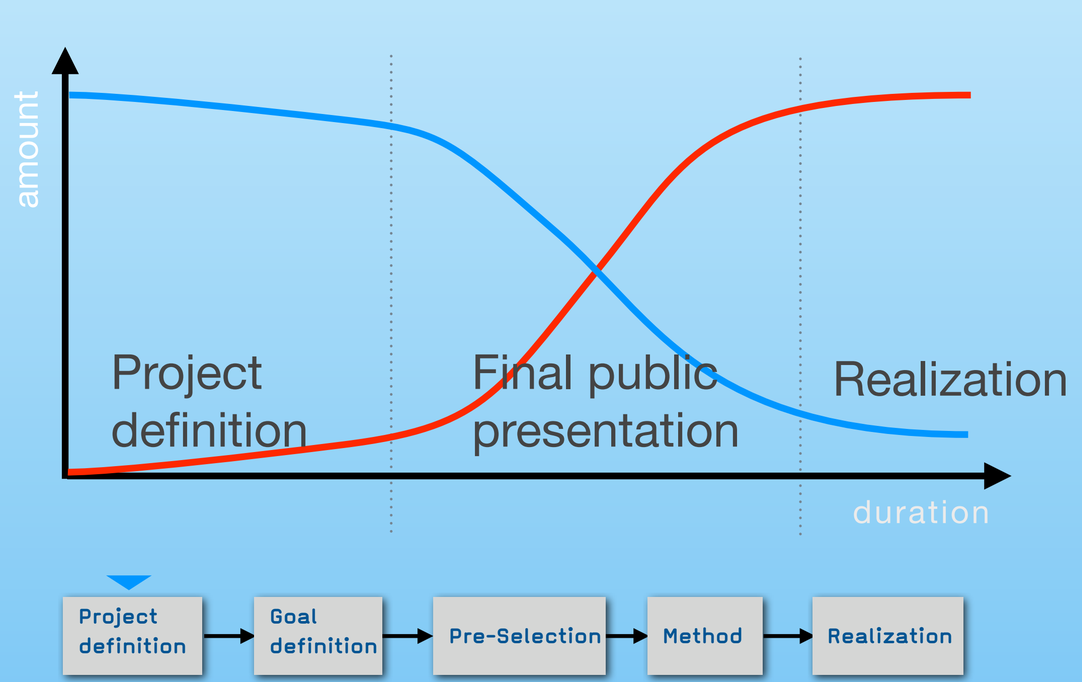


5 QUESTIONS

A concept for the implementation of collaborative methods

When?

Potentials for including collaborative planning:



Degree of freedom

Costs for change requests

5 QUESTIONS

A concept for the implementation of collaborative methods

Why?

Motivation of participants

Planning side

Information
Avoid conflicts
Tagging
Acceleration

Citizenship

self-interests
profit vs. expense

Politics

legitimization
democratic
understanding

5 QUESTIONS

A concept for the implementation of collaborative methods

What?

Distinct definition of relevant topics
Optional: flexibility

5 QUESTIONS

A concept for the implementation of collaborative methods

Who?

Definition of stake holders (to be involved)

Pre-selection according to importance of stake

Scheduling time frames for each group of stake holders

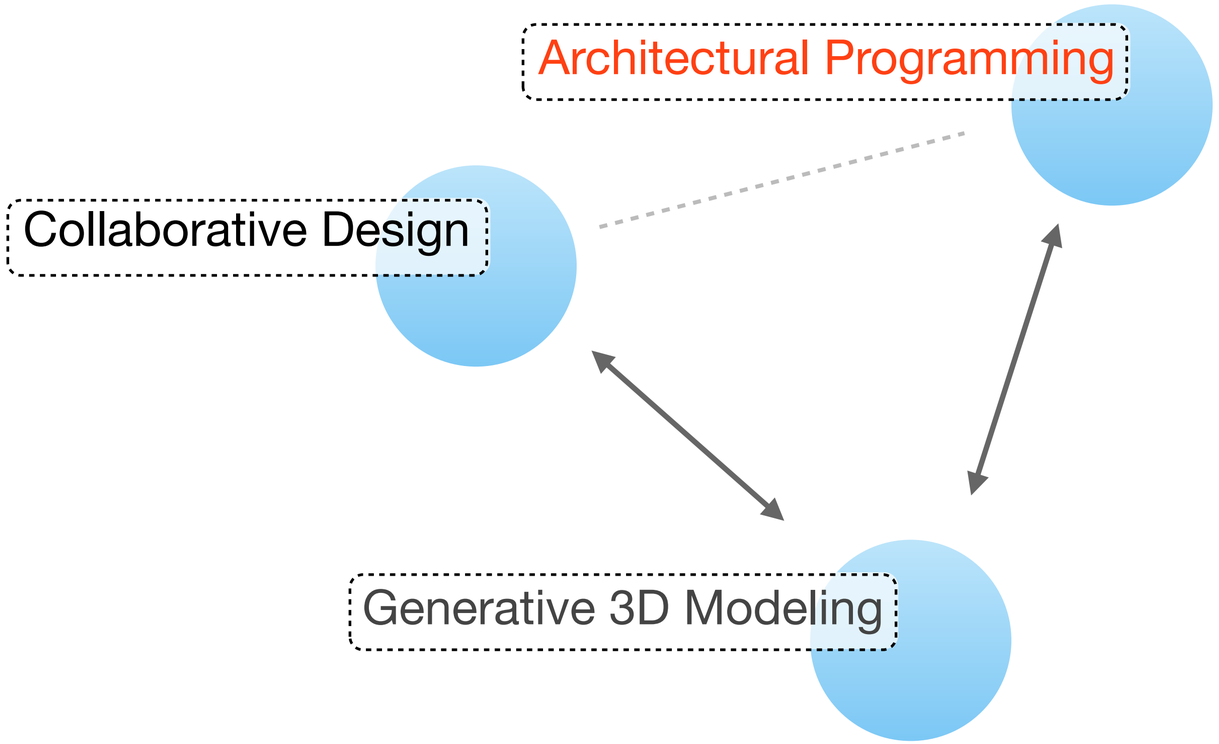
5 QUESTIONS

A concept for the implementation of collaborative methods

How?

Implementation of methods

Methods for informing, participating, cooperating



Linking different techniques for a mutual agreement

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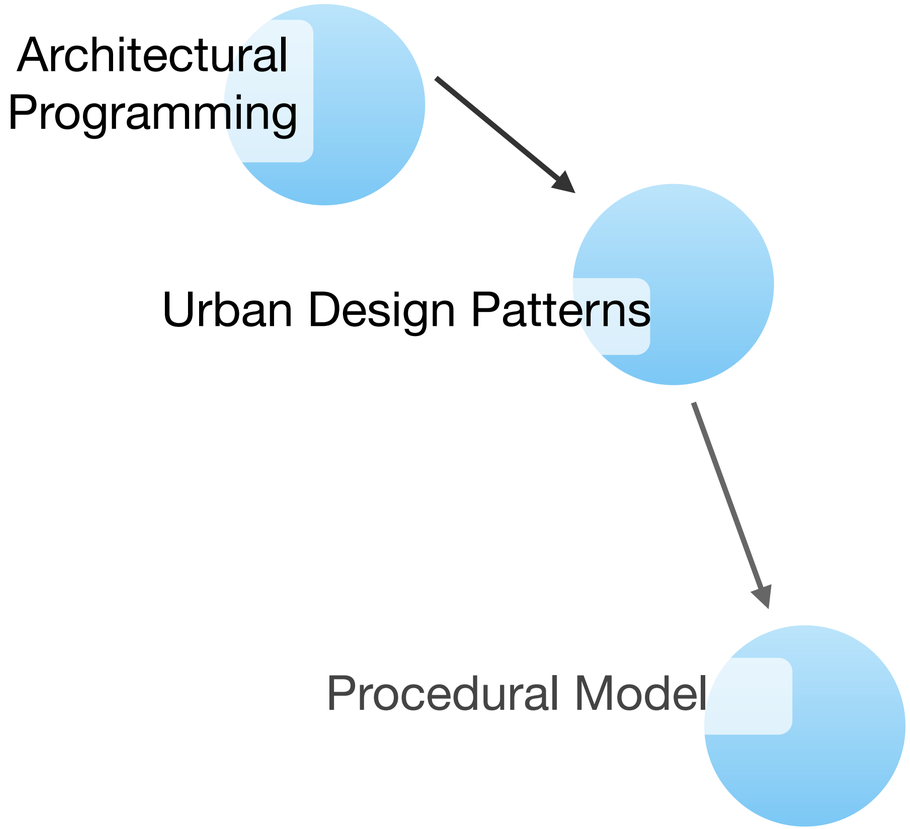
OVERVIEW



Approach
(a) to gather stakeholder requirements and
(b) to incorporate the resulting information in form of urban design patterns into
(c) a procedural multi-dimensional procedural model of the eco-city “Swiss Village Abu Dhabi” (SVA) inside Masdar City.

http://www.swiss-village.com

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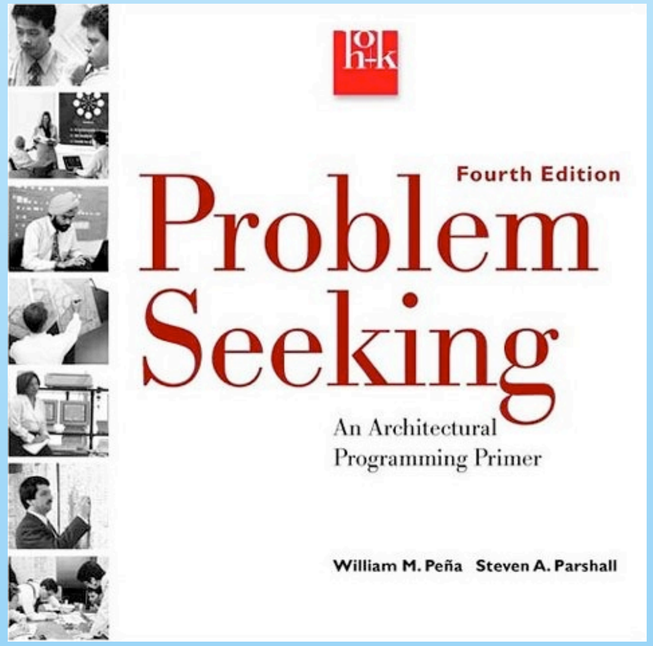
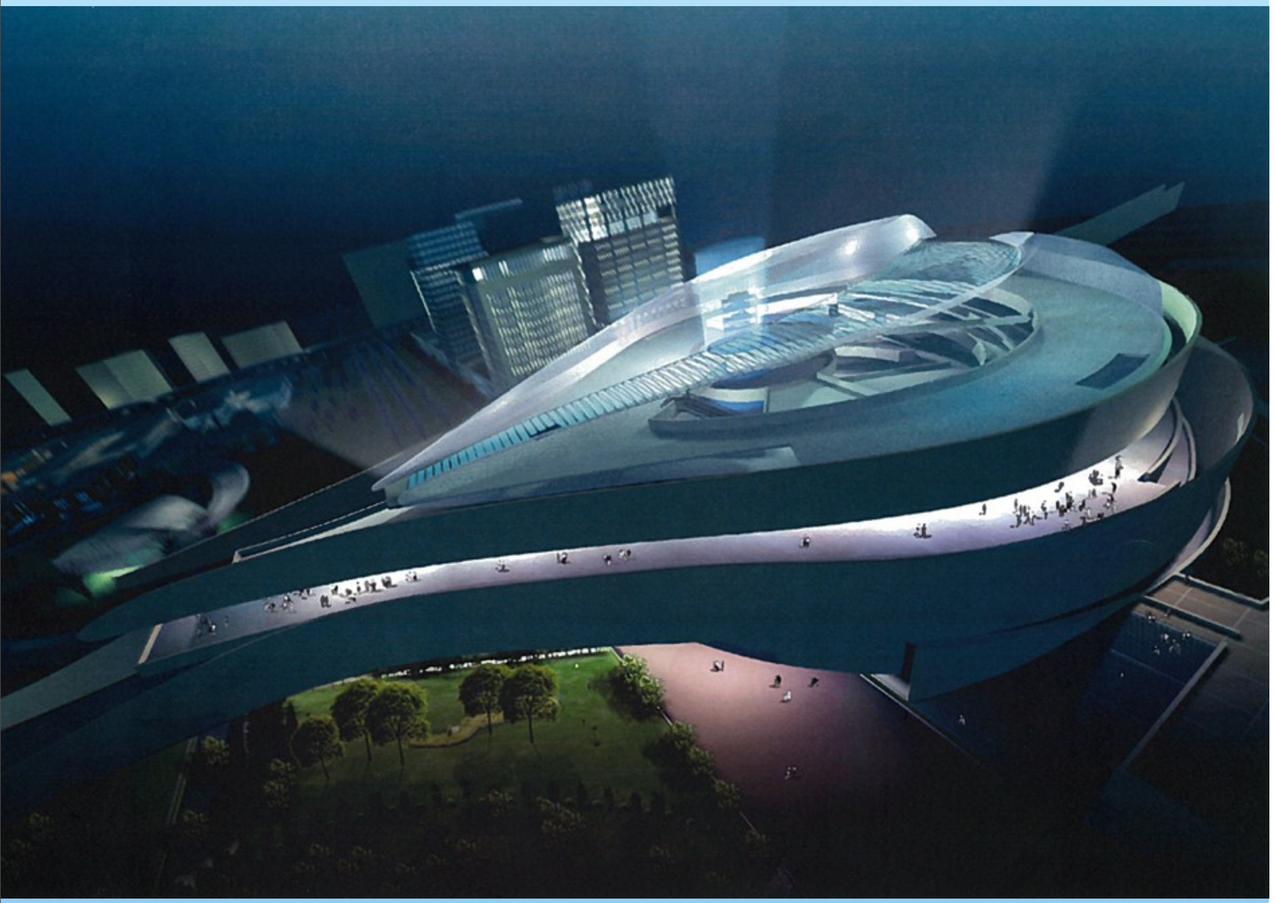


METHOD ‘ARCHITECTURAL PROGRAMMING’

Had been initially introduced by Peña (1977).

Peña, W.M.: 1977, Problem Seeking: An Architectural Programming Primer, CBI publishing Company, Boston - Mass.



Henn Architekten, Bejing Automotive Expo, China,
http://www.henn.com/
Henn, G.: 2004, Programming; Projekte effizient und effektiv entwickeln, in Schürer O. and Brandner G., Architektur: Consulting. Kompetenzen, Synergien, Schnittstellen, Birkhäuser, Basel.

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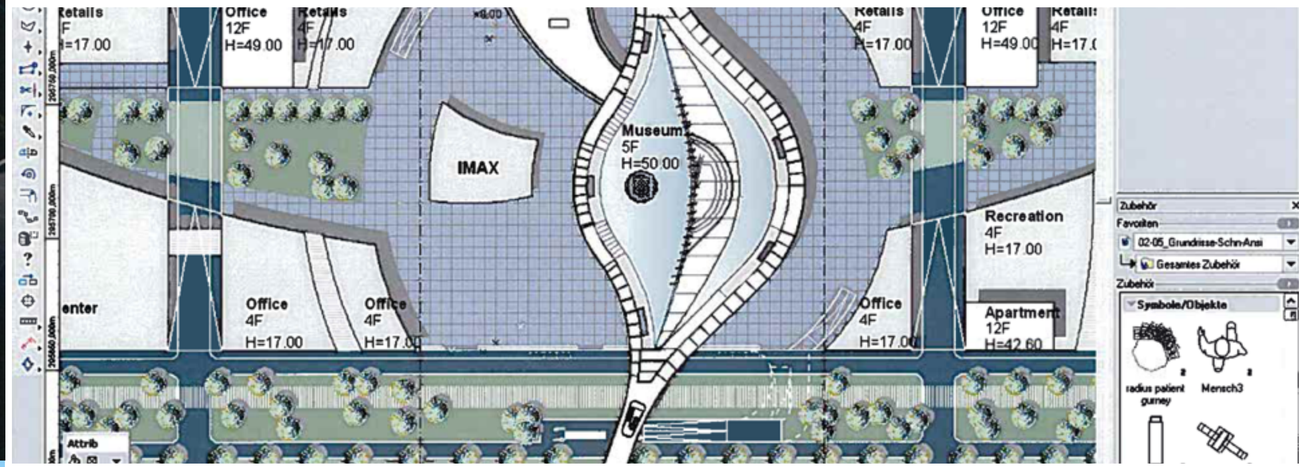

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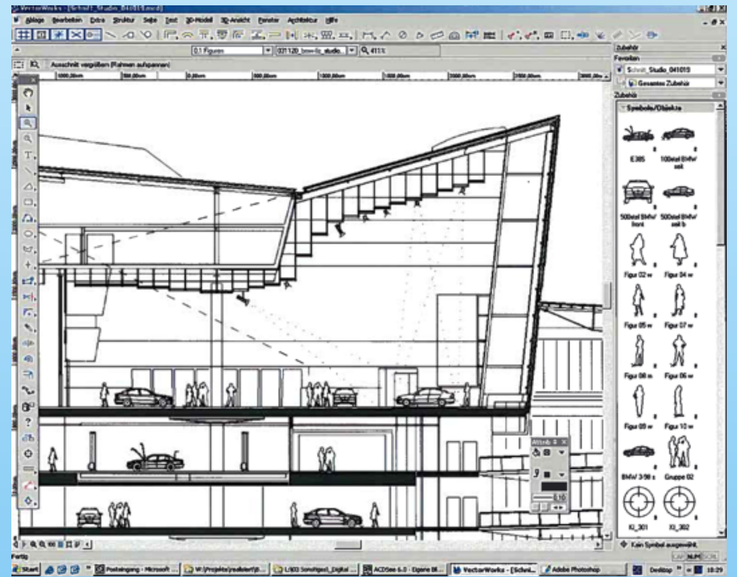
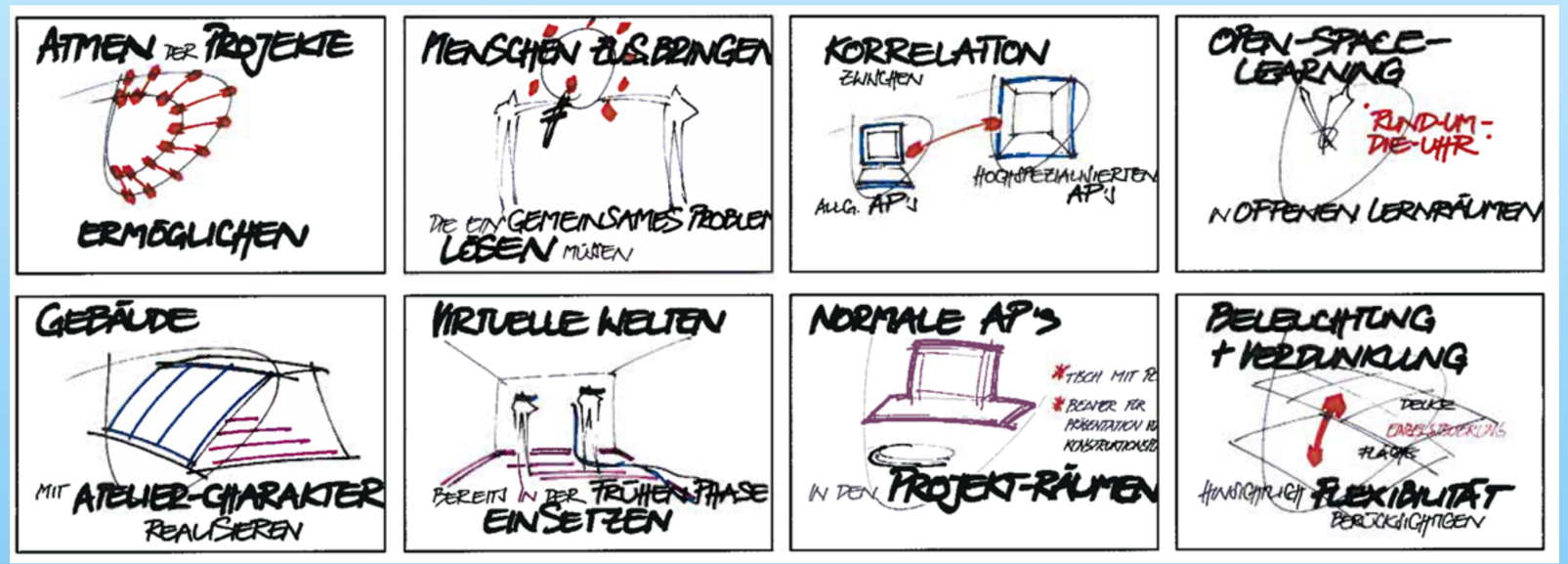
METHOD ‘ARCHITECTURAL PROGRAMMING’

Integration of Architectural Programming (AP) as a quality control instrument for daily use in architectural offices by Henn (2004).

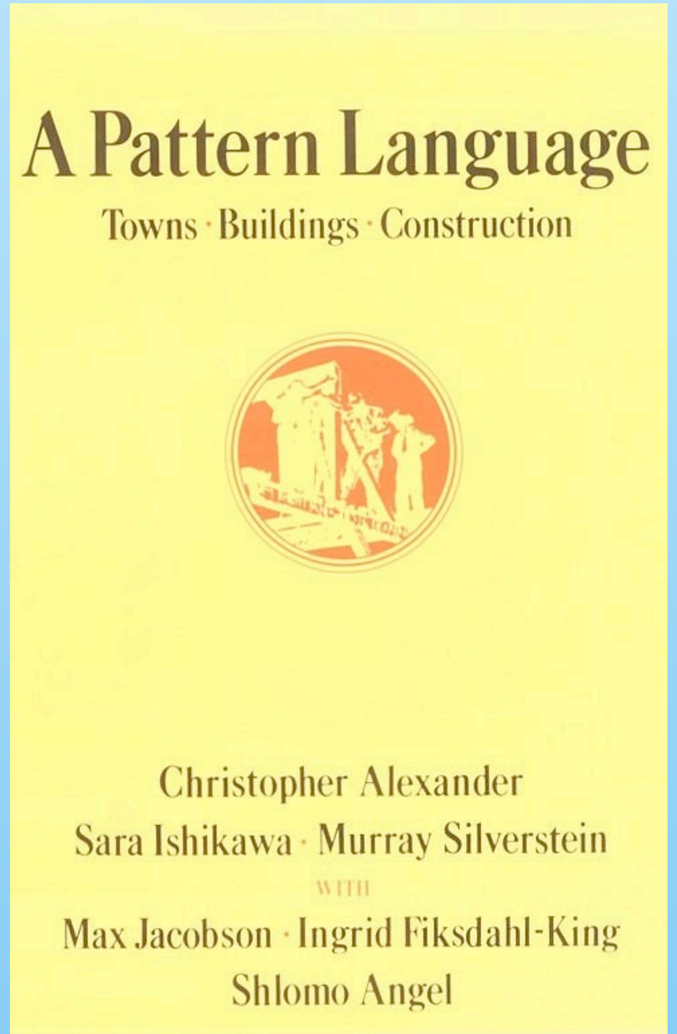
Result: Visual design guidelines.



Henn Architekten, BMW Project House, Munich, Germany



Henn, G.: 2004, Programming; Projekte effizient und effektiv entwickeln, in Schürer O. and Brandner G., Architektur: Consulting. Kompetenzen, Synergien, Schnittstellen, Birkhäuser, Basel.



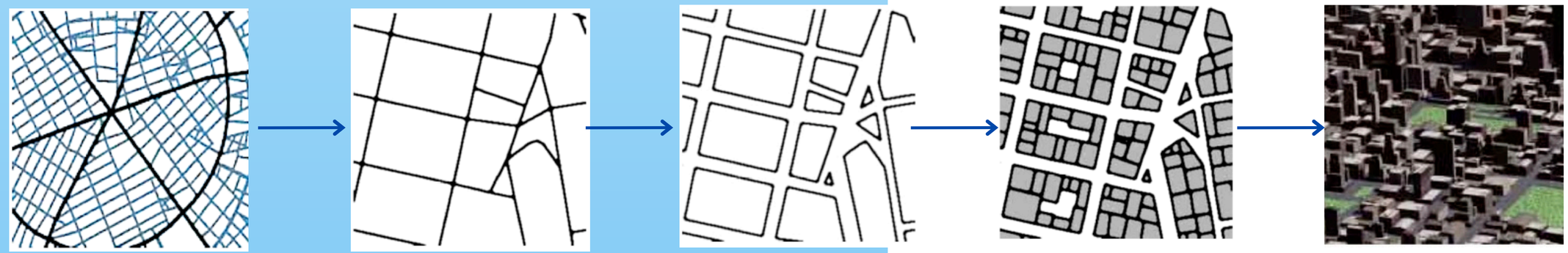
URBAN PATTERNS

Stakeholder feedbacks and resulting requirements are formulated into urban patterns according to “A Pattern Language” and transformed into urban design rules.

Alexander, C, Ishikawa, S, and Silverstein, M (eds) 1977, A Pattern Language: Towns, Buildings, Construction. Oxford University Press, New York.

PROCEDURAL MODEL

For the evaluation and visualization a procedural model was implemented which represents a collection of urban patterns for the proposed solution.



CASE STUDY - 1

Swiss Village Abu Dhabi, Masdar City

Situation of ‘Swiss Village Abu Dhabi’
Foundation For Global Sustainability & ETH Zurich

Architectural programming workshop with 60 students from architecture and environmental sciences.

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STRUCTURE OF THE PREDEFINED ARCHITECTURAL PROGRAMMING MATRIX

According to the sustainability impacts properties described by Bossel (1999).

Work-shop	Impact	Participants
A.1	**Transportation and distribution** **Supply system** *energy, water, food, goods, services* **Waste disposal** **Natural environment**	**42 students of architecture,** **20 students of environmental science,** **2 assistants, 2 moderators** **1 expert of SVA**
B.1	**Masdar guidelines** *passive design strategies (shadings, water consumption, air ventilation), fire safety, volume fabrics, street network, green environment*	**18 students of architecture,** **2 assistants, 1 moderator** **1 expert of SVA**
B.2	**Clean tech guidelines** *cluster effect, interdisciplinary / energy, from innovation to market, clean tech*	**18 students of architecture,** **1 expert in the field of clean tech**
B.3	**Building guidelines** *adaptivity/flexibility of buildings, address access, floor height/plan depth, structure, infrastructure*	**18 students of architecture,** **1 expert in architecture**

Bossel, H 1999, Indicators for Sustainable Development: Theory, Method, Applications. International Institute for Sustainable Development, Winnipeg.

ARCHITECTURAL PROGRAMMING

FACT CONCEPT

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SWISS VILLAGE ABU DHABI

Architecture

ARCHITECTURAL PROGRAMMING CARDS ARE DIVIDED INTO:

Fact patterns for the analysis and

Design concept patterns for a proposed reaction on the existing condition that had been discovered during the briefing.

supply system

supply system

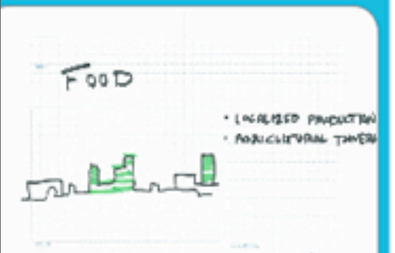
supply system

supply system

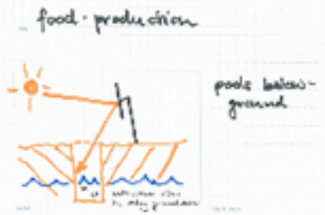
supply system

waste disposal

FOOD



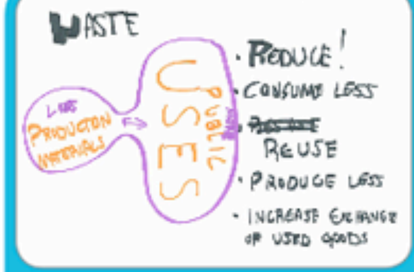
FOOD

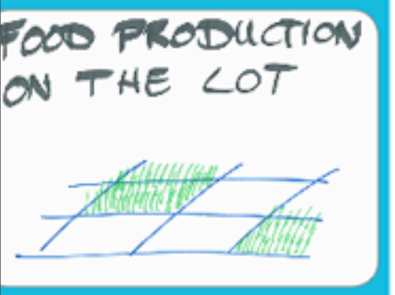


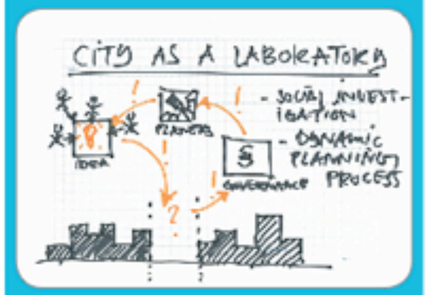
GOODS

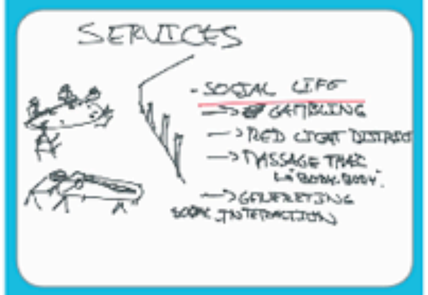
SERVICES

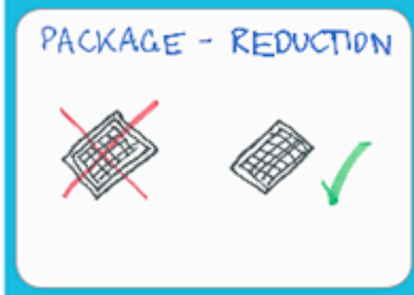
SERVICES

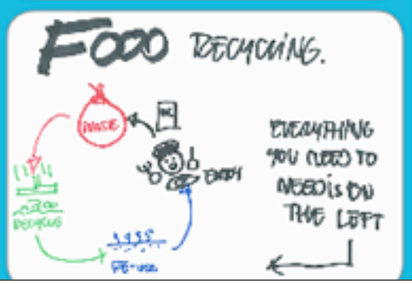


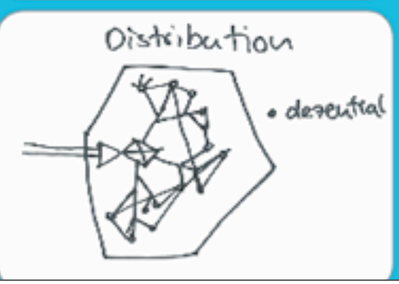


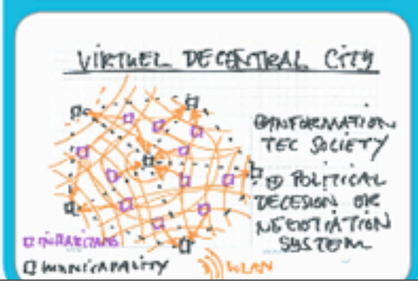


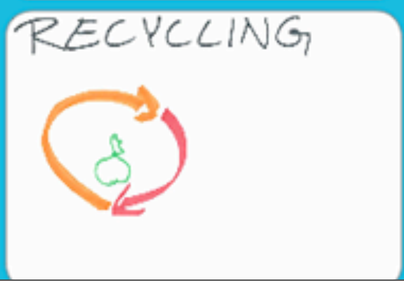




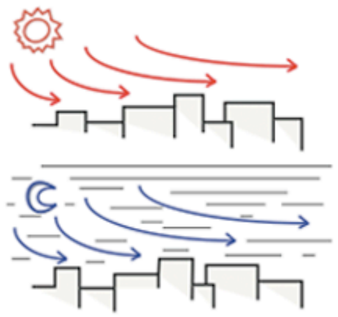








Air Ventilation



During the day a cold heat air comes into the city. At night, the opposite occurs cooling down the city.

Wind Catchers

Wind catchers guide cold wind into the streets and warm ones outside of the city.

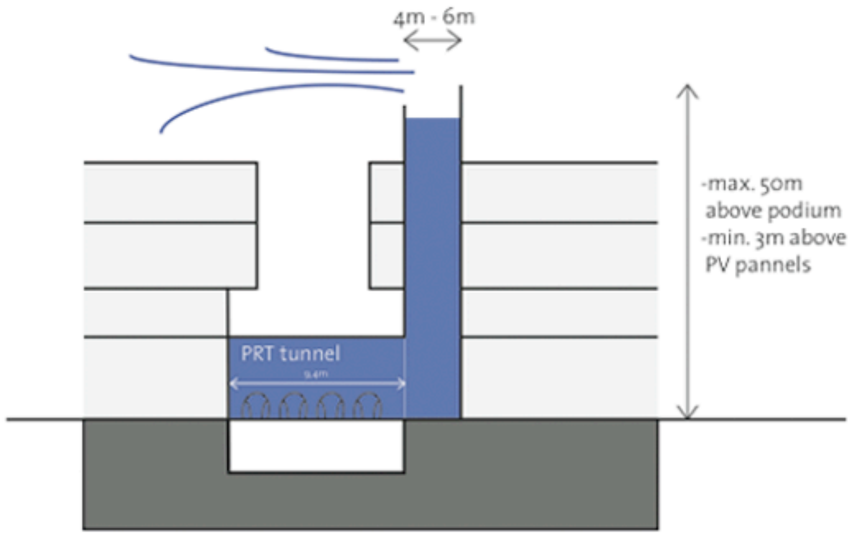
Heat Island

The heat island effect has accompanied with urbanization, and it refers to the fact that man-made structures tend to attract and retain heat at a higher rate than is normal in nature.

Trees

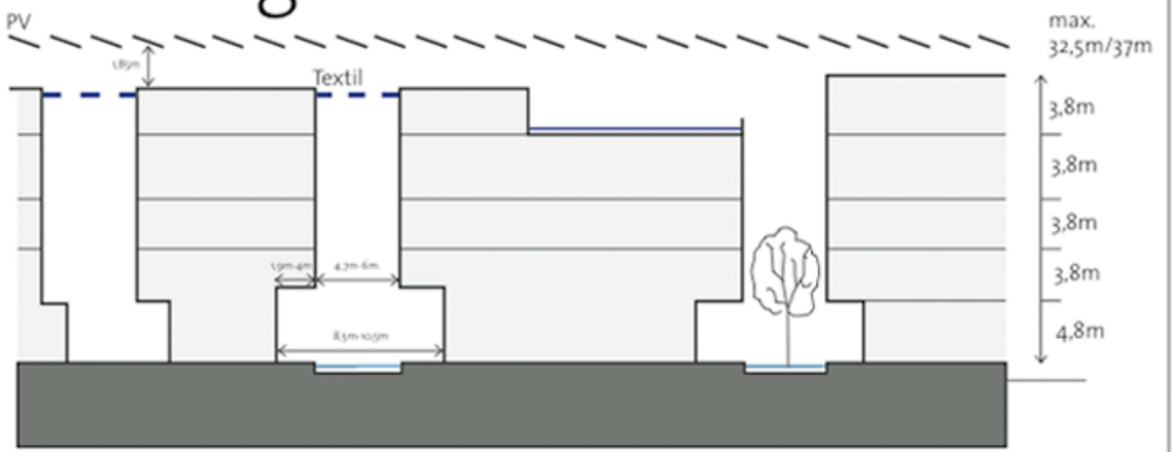
Trees as natural shading elements.

Wind Tower



The wind comes in and pass down trough the tower. Cold air comes out and is connected to the PRT tunnel. The towers should be placed in-line with the wind direction and only on the perimeter of the building. The distance between the towers should be of at least 10m.

Shading Elements



Shading elements to prevent streets from overheating, e.g. textile devices, PV installations, removable shading sails, moveable louvers, fixed louvers. Diffferent building heights to provide shadow for streets and neighbour buildings.

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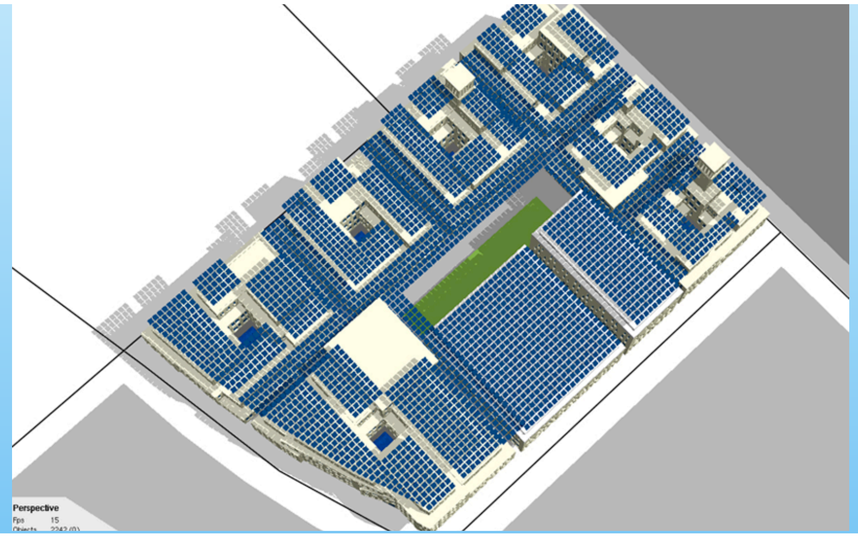
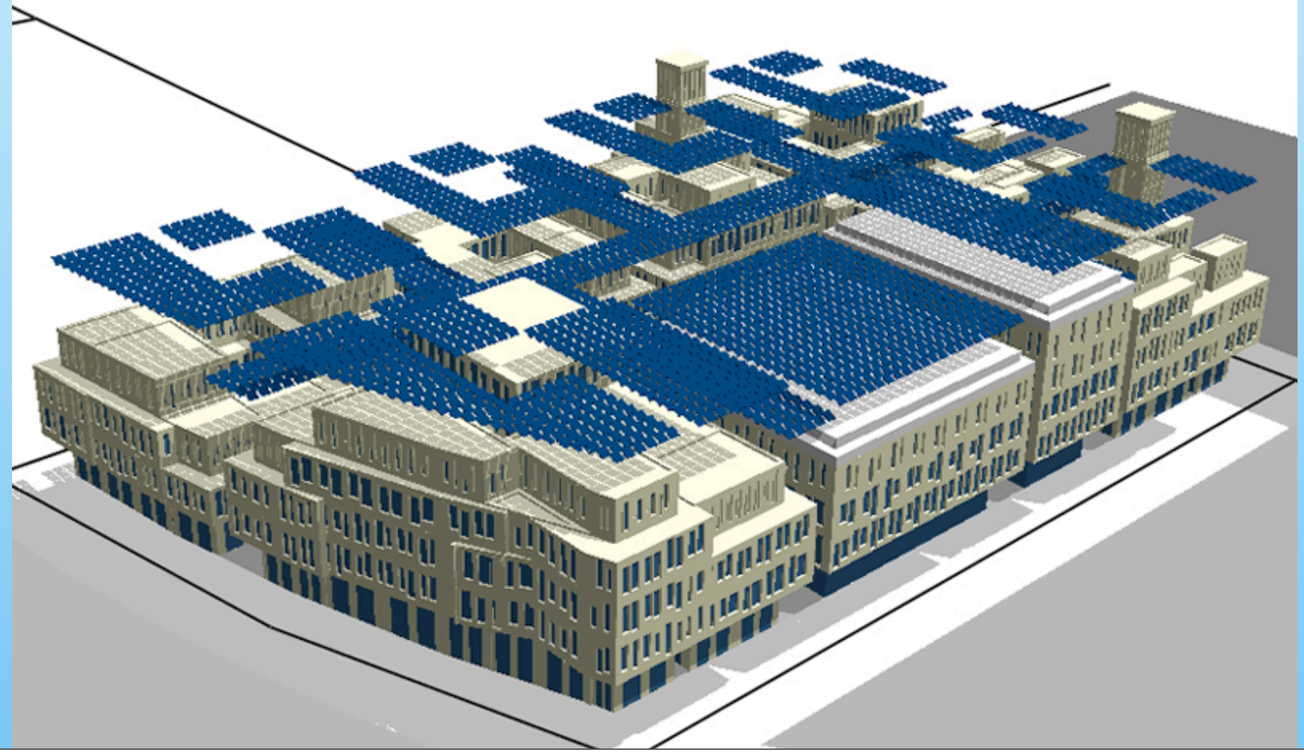
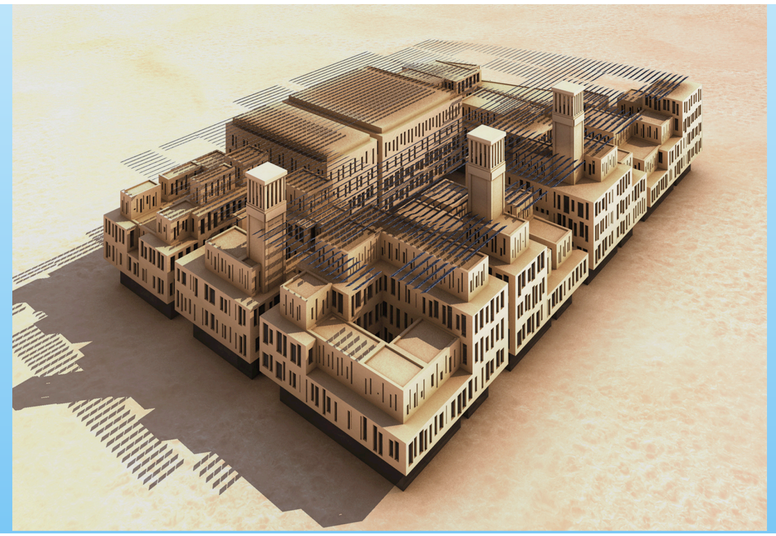


INTERACTIVE PROCEDURAL MODEL FOR A SPECIFIED PARCEL INSIDE THE SWISS VILLAGE ABU DHABI



Elective course “New methods in urban simulations” spring semester 2010, Yuliya Schlegel, Aiste Plentaite, Julia Dyllong, Corinne Hürlimann and Linda Müller.



FINAL PHOTO REALISTIC RENDERING OF THE PROPOSED SOLUTION FOR THE SVA

Elective course “New methods in urban simulations” spring semester 2010,
Yuliya Schlegel, Aiste Plentaite, Julia Dyllong, Corinne Hürlimann and Linda Müller.

CASE STUDY - 2

World Cup 2014 workshop, Porto Alegre Brazil

Architectural programming workshop with 20 participants from the local community centers, planning offices, urban planners and experts (traffic and architecture).

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COLLABORATION MODULE

Definition of the requirements and development tasks (Architectural Programming).

Evaluation, presentation and information about the entire process (Social Network Interface, Exhibition).

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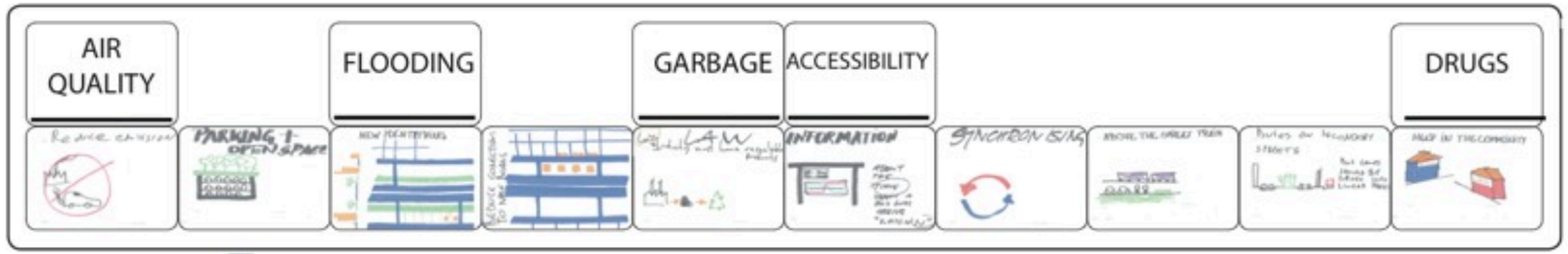
TOP TEN DEVELOPMENT GOALS | 10 OBJETIVOS DE DESENVOLVIMENTO - REGIONAL (PORTO ALEGRE)

SOCIAL
- Adress the drugs consumption problem
- Facilitate the integration between social groups of different income

ECONOMICAL
- Attract new high tech industry
- Prepare the city infrastructure to increase income and positive visitor perception during World Cup 2014

ECOLOGICAL
- Improve air quality
- Protect vital green areas
- Upgrade waste management methods



TOP TEN DEVELOPMENT GOALS | 10 OBJETIVOS DE DESENVOLVIMENTO- LOCAL

AREA 01: TECNOVERDE | GREENTECH

SOCIAL
- Provide a space for conferences, conventions and community meetings.

ECONOMICAL
- Provide incentives for the settlement and creation of IT and logistic companies.

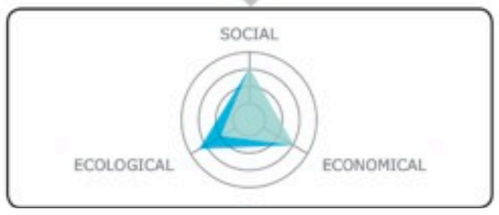
ECOLOGICAL
- Create a large nature reserve with convenient access to the community.
- Build a clean public transport system to reduce vehicle emissions in the area.

AREA 02: PROTÁSIO-NORTE

SOCIAL
- Provide more public spaces for the integration and recreation of the residents of this and other areas.

ECONOMICAL
- Use community spaces to stimulate local commerce and services.

ECOLOGICAL
- Enforce the inclusion of parks and green corridors
- Enforce the design of natural water contention spaces.



AREA 03: BAIRRO INTEGRAÇÃO | INTEGRATION DISTRICT

SOCIAL
- Provide a major center for social activities to integrate residents from the north and the south of the city.

ECONOMICAL
- Generate a seed to propagate commercial activities in the area and boost local employment.

ECOLOGICAL
- Adapt infrastructure to soil, flooding, and vegetation conditions.
- Improve waste management strategies.

AREA 04: VALE DO CONHECIMENTO | KNOWLEDGE VALLEY

SOCIAL
- Generate facilities for education and practice of sports in connection to the university.

ECONOMICAL
- Create sports and housing infrastructure to be used by visitors during WC2014.

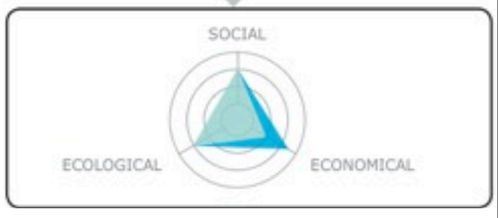
ECOLOGICAL
- Use new infrastructure to test integration of multidisciplinary research on efficient and sustainable design.

AREA 05: PASSEIO DO SOL | SUNWALK

SOCIAL
- Improve landscaping of public spaces to increase the area attractiveness for social interaction.

ECONOMICAL
- Use potential of area adjacent to the football stadium for commercial development.

ECOLOGICAL
- Transportation and building design should reflect environmental guidelines used elsewhere in the city.
- Maintain resilience measures for flooding prevention.



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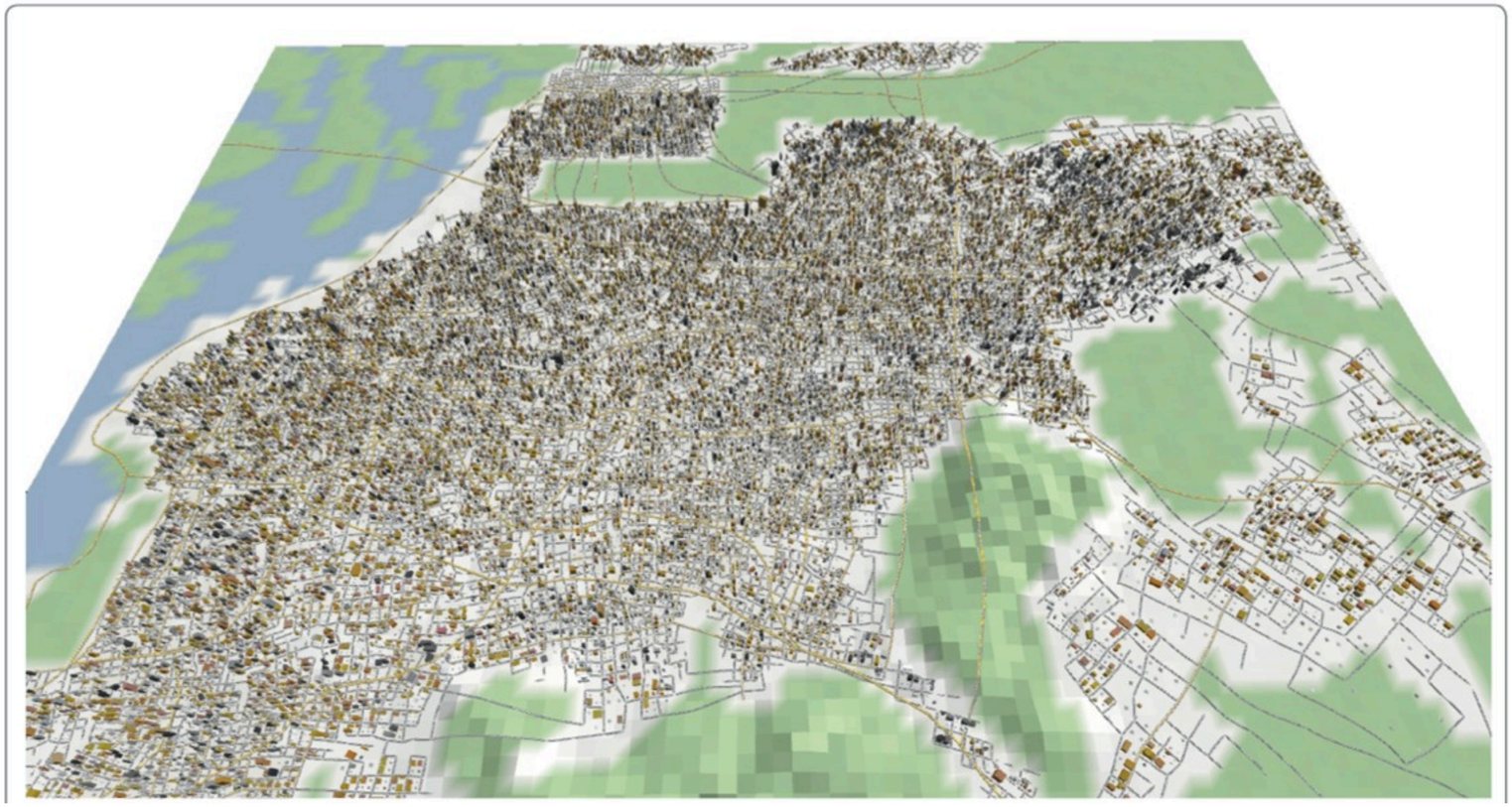
INTERACTIVE PROCEDURAL MODEL

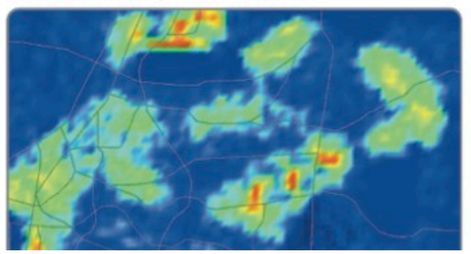
MODELO PROCEDURAL URBANO ESTIMADO | FORECASTED PROCEDURAL URBAN MODEL



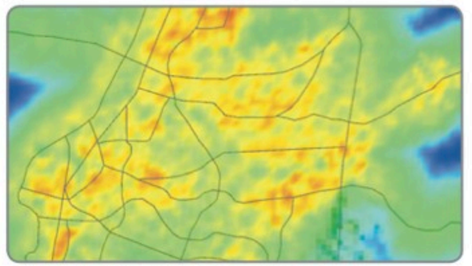
MAPAS BASE | INPUT MAPS

TOPOGRAFIA E RODOVIAS | TERRAIN AND HIGHWAYS

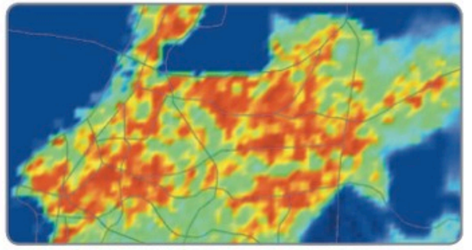
ÁREAS DE RESTRIÇÃO | RESTRICTED AREAS



MAPAS RESULTANTES |OUTPUT MAPS



ACESSIBILIDADE | SIMULATED ACCESSIBILITY



PROJEÇÃO DA POPILAÇÃO | SIMULATED POPULATION

Carlos Vanegas

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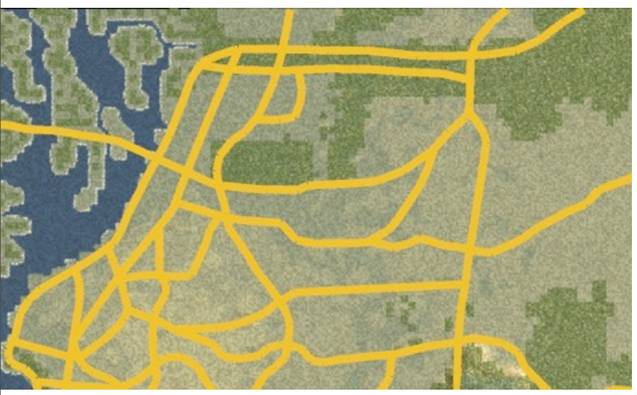
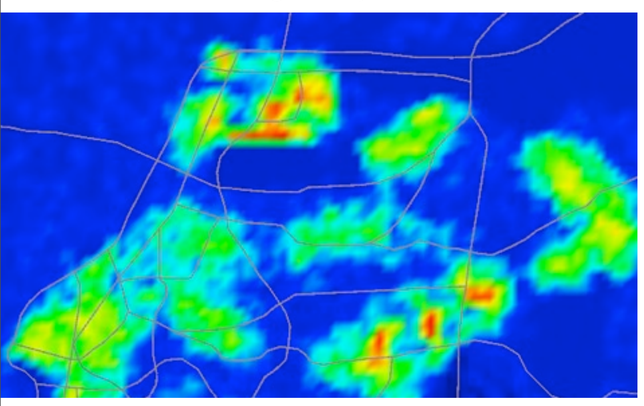
SIMULATION MODULE

Interactive procedural urban model

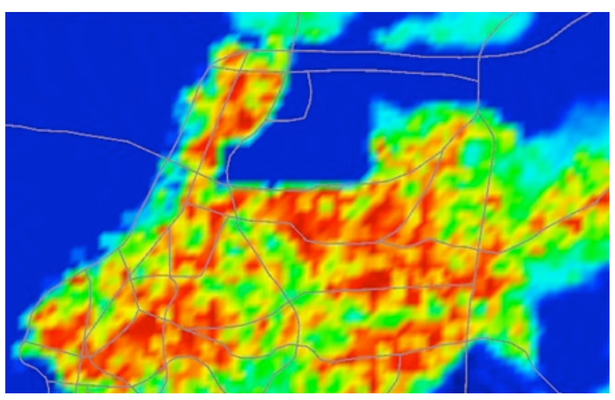


Terrain and Highways

Restricted areas



Planned employment



Simulated population

Definition of street network and accessibility (PurdueSim)

Evaluation and optimization (PurdueSim)

Image source: Carlos Vanegas

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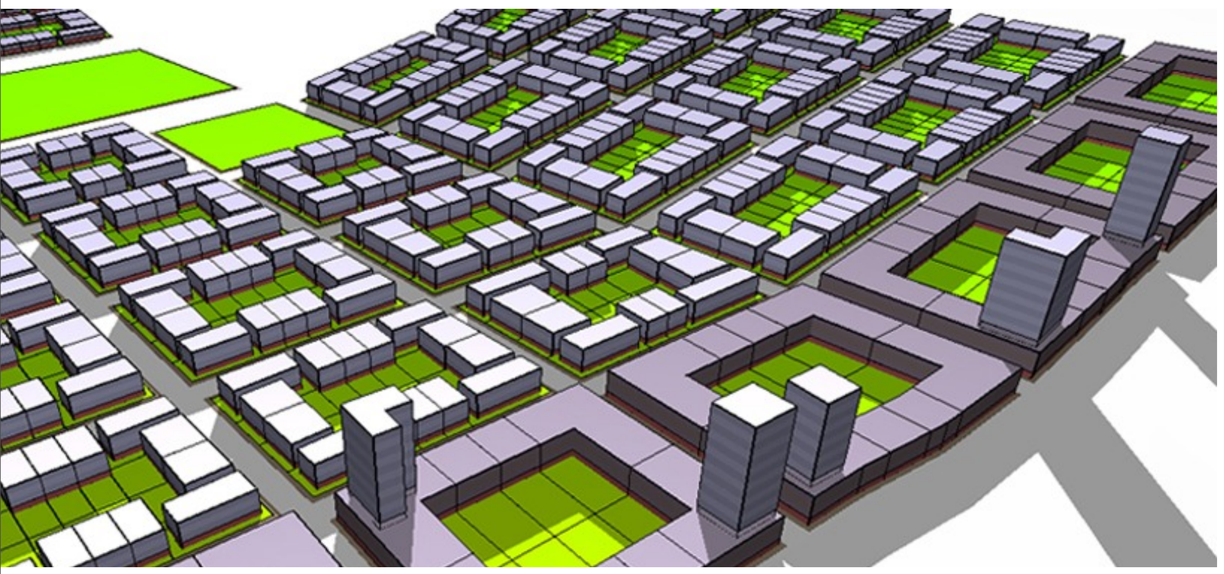
Accessibility, AxiMagic



Shadings, CityZoom

SIMULATION MODULE

Definition of street network and accessibility (AxiMagic).

Evaluation and optimization (AxiMagic).

Assessment (solar radiation, shadings, e.g.) (CityZoom).

Image source: Pablo Colossi Grazziotin, Vaneska Paiva Henrique, Karen Paiva Henrique

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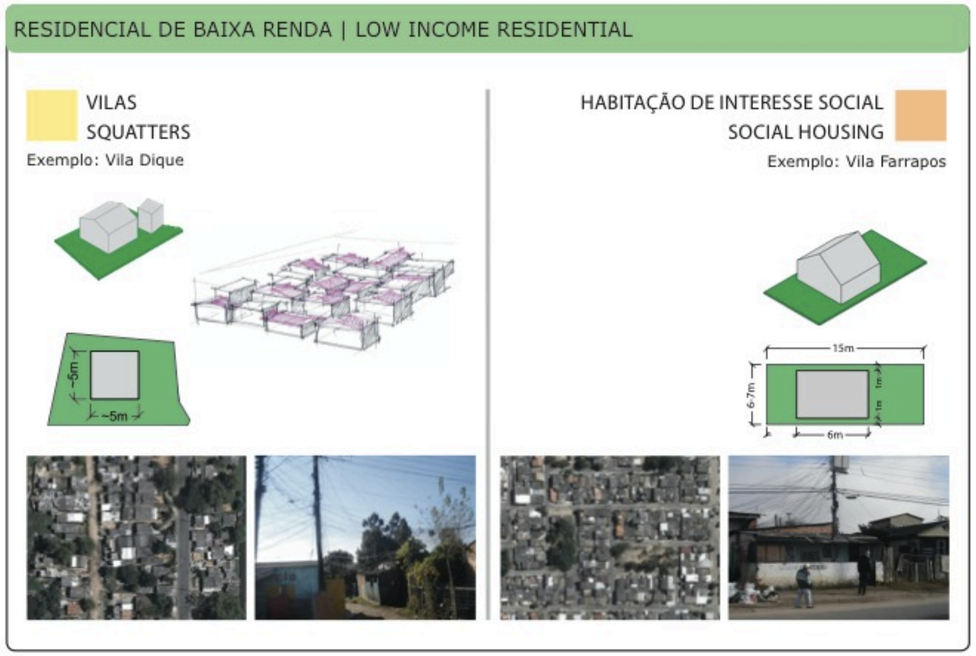
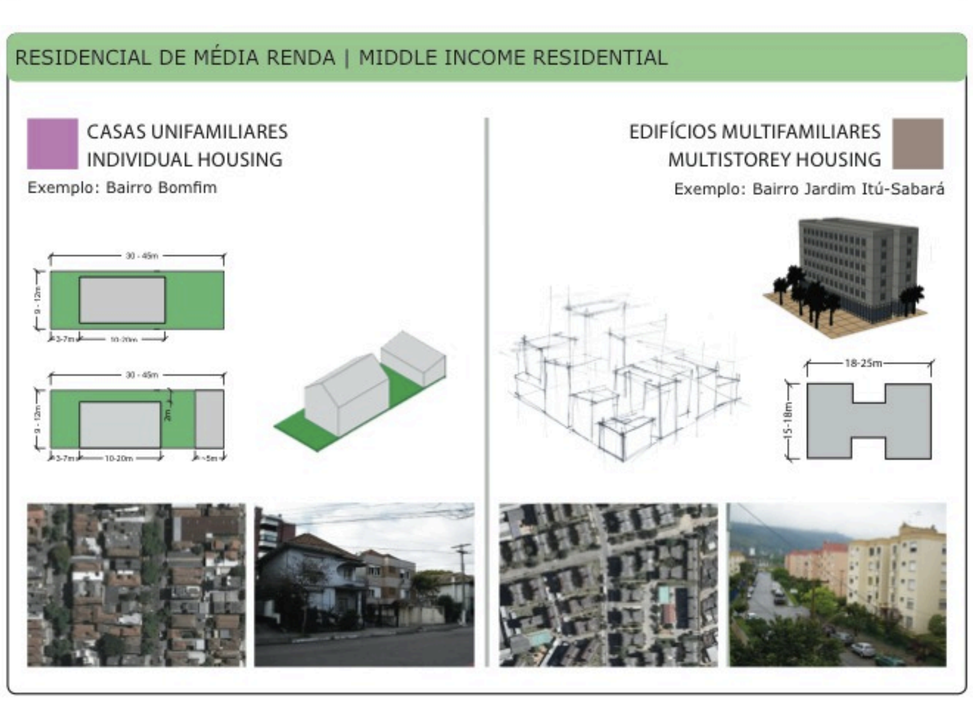
DESIGN MODULE

Definition of building types and urban patterns





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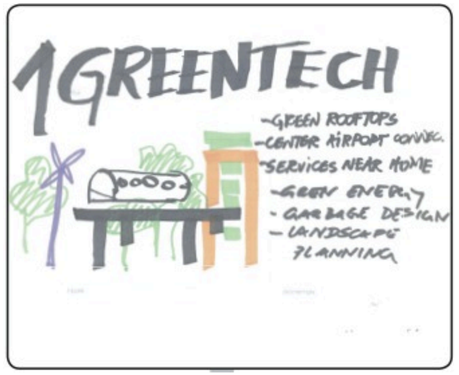
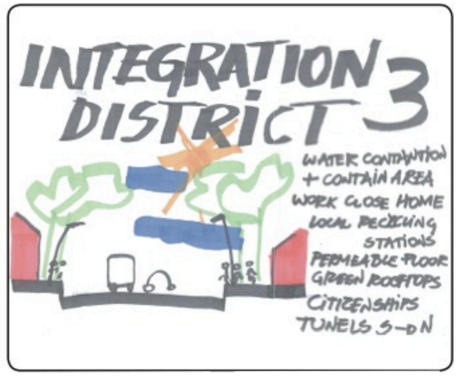
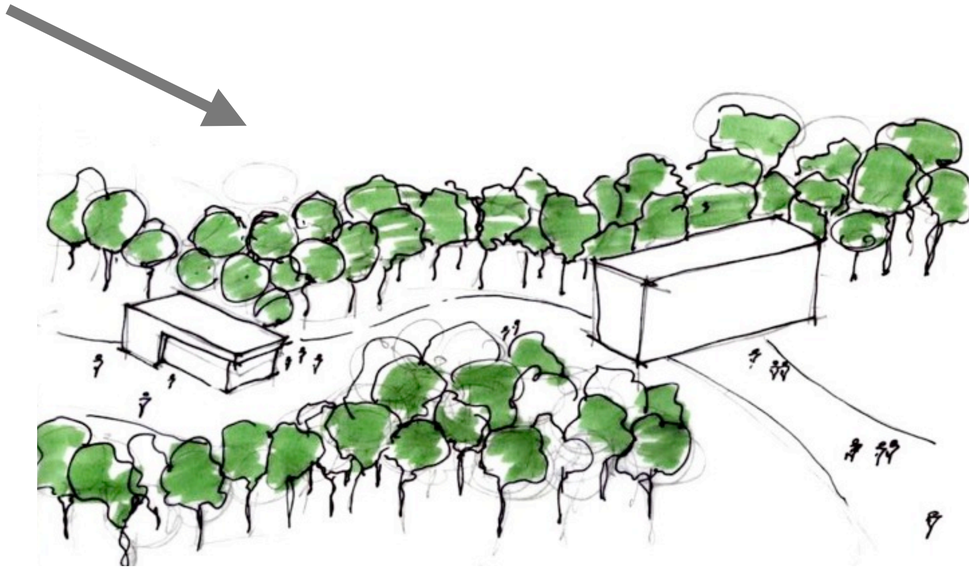
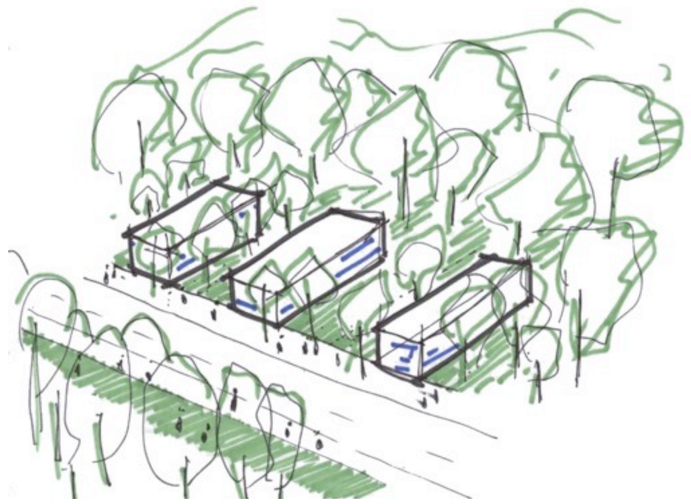
DESIGN MODULE







Definition of building types and urban patterns



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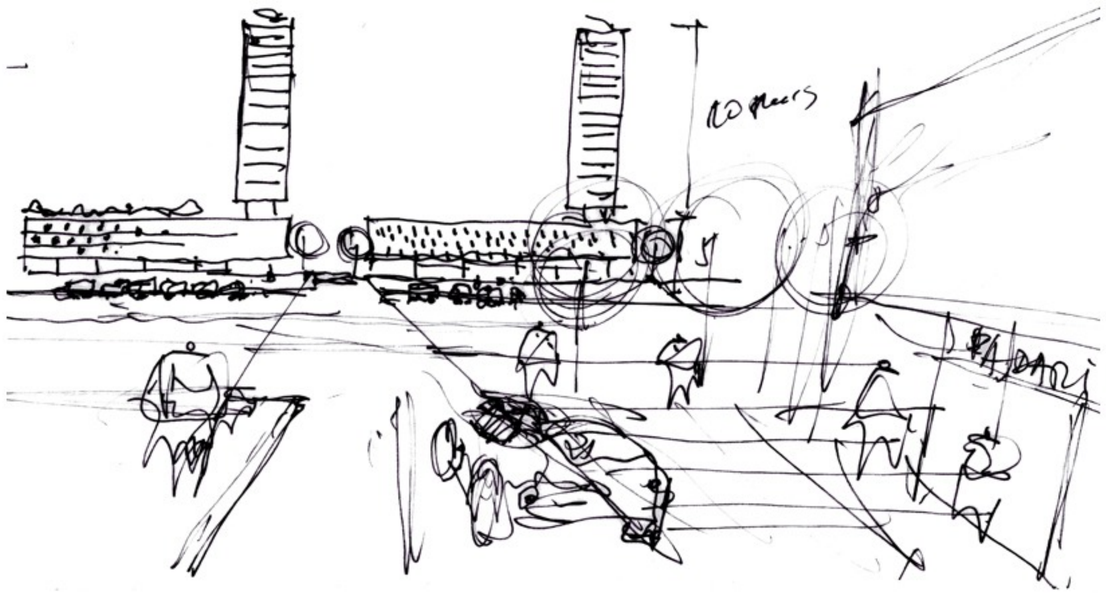
DESIGN MODULE



Implementation of building types and urban patterns in a procedural model (CityEngine)

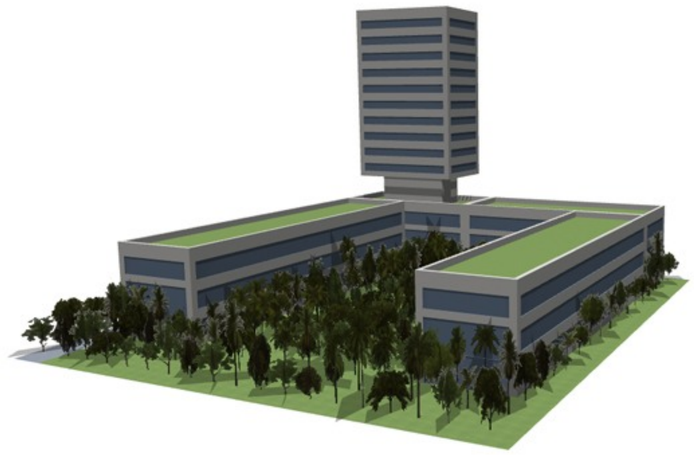


Image sources: Benamy Turkienicz, Jan Halatsch

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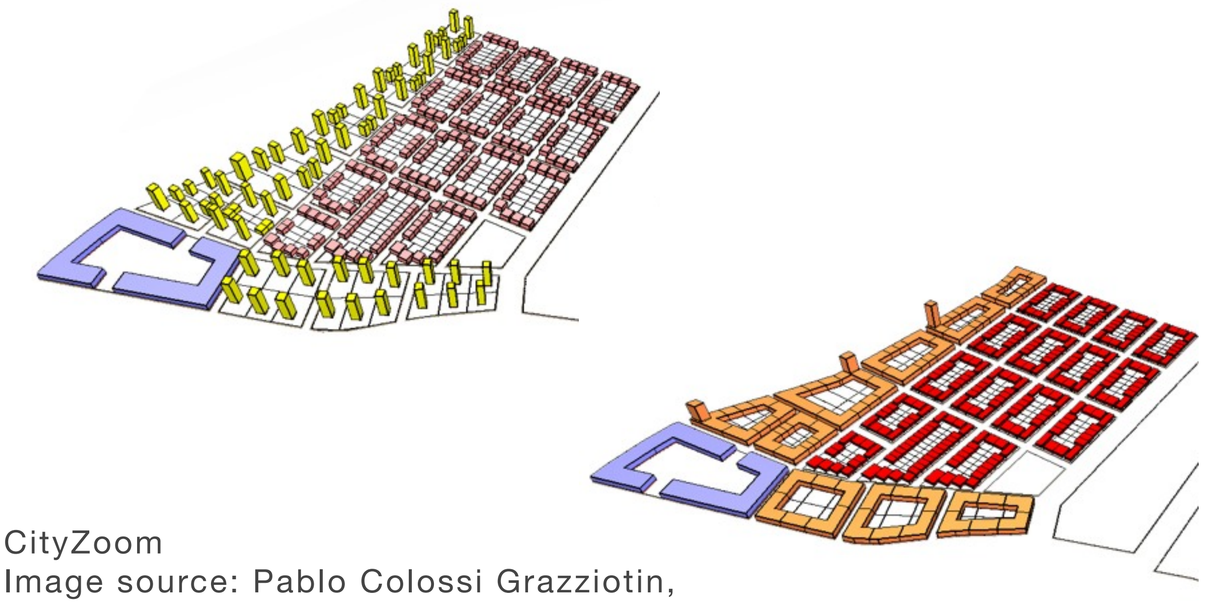
DESIGN MODULE



CityZoom
Image source: Pablo Colossi Grazziotin,
Vaneska Paiva Henrique, Karen Paiva Henrique

Definition of the grid style, plot subdivision, implementation of building types and urban patterns (CityEngine)

Development of different urban design scenarios (2014, 2025, 2050), reporting, final renderings (CityEngine, CityZoom, E.on software Vue)

Final rendering of the urban design scenario
Image source: Jan Halatsch, Matthias Bühler

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CONCLUSION

Conceptual participatory design framework for urban planning

which integrates various forms of available knowledge and provides support for stakeholder participation at crucial decision-making phases in urban planning.

Initial vision of the possibilities that the combined use of planning and simulation tools can bring.

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FUTURE WORK

Image source: Lukas Treyer

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CONCLUSIONS

Conceptual framework for the formulation of stakeholder requirements into urban patterns for the procedural modeling of sustainable future cities.

Adaptation and implementation of the presented workflow into an interactive digital workflow linking the assessment of the AP with a procedural model from the very beginning.

THANK YOU!

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