



Sustainable Urban Patterns - SUPat

National Research Program NRP 65
 "New Urban Qualities"



G. Schmitt | M. Bierlaire | A. Eisinger | A. Grêt-Regamey | R. W. Scholz | T. F. Rutherford
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"Continuous interactions among people and socio-economic and ecological variables generate increasingly complex and unsustainable environments, which impact human health, well-being and ecological quality."



NRP 65 | Sustainable Urban Patterns - SUPat

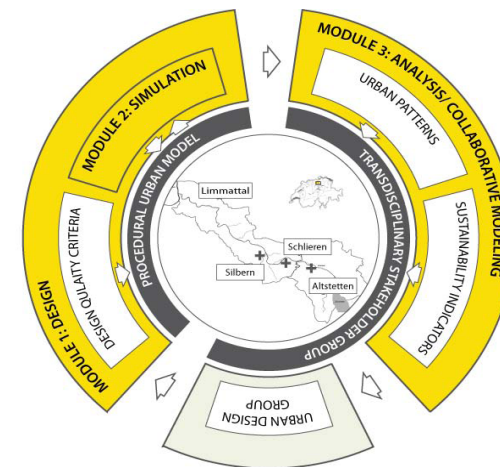
How to create *New Urban Quality*?

- **Processes:**
→ Analysis of possible processes
- **Exact Models:**
→ Quantitative, hard factors
- **Social Cohesion, Place Attachment:**
→ Qualitative, soft factors

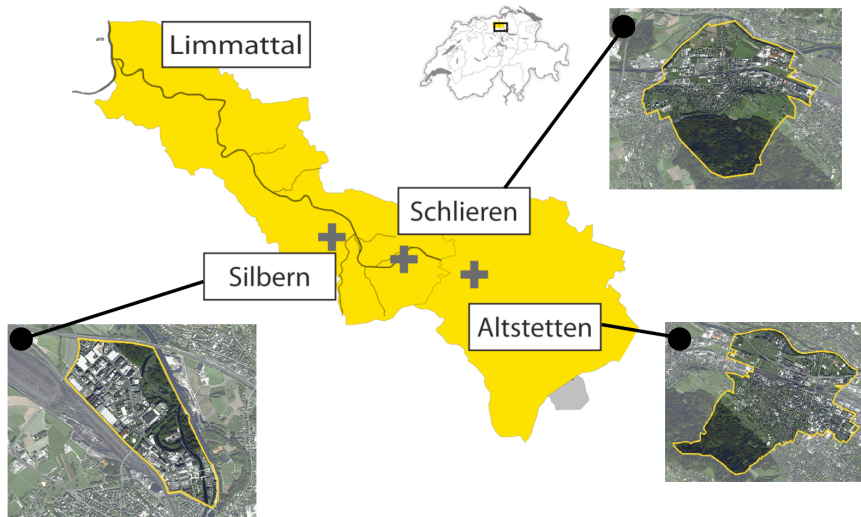
"Square with church and tavern does not work anymore"

→ **Which urban patterns are effective?**

Collaborative Urban Development Platform



Case Study



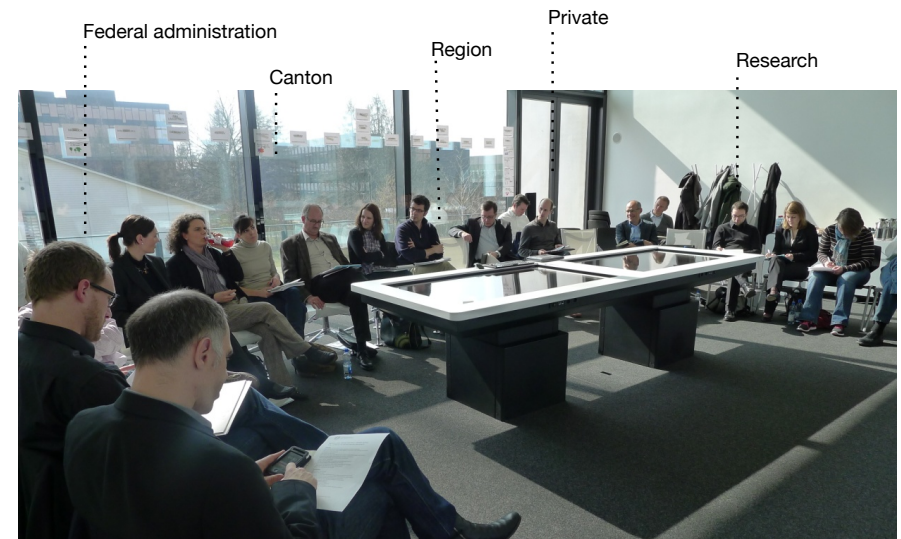
Key research questions

- How can quality criteria be made (inter-) operable?
- What are potential trade-offs, conflicts and synergies between the rules from different disciplines?
- Which urban patterns are possible in 2030 and 2050?
- Which of these urban patterns are the most sustainable?

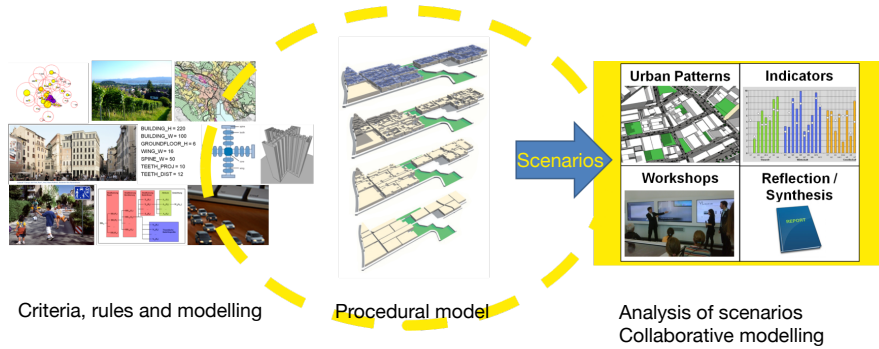
The Research Team



Stakeholder group

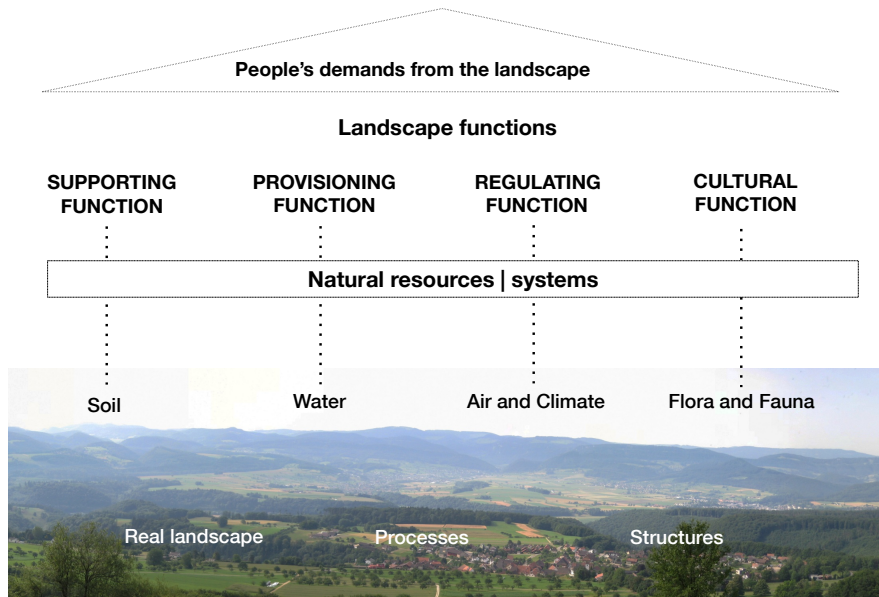
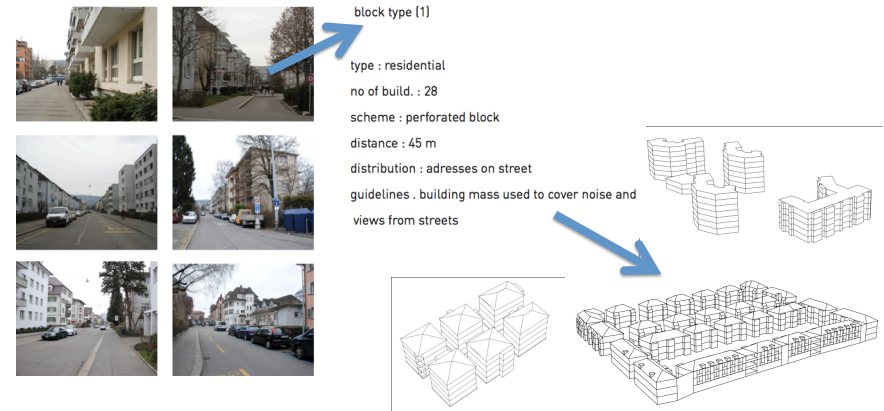


Preparing interdisciplinary rules for collaborative modelling



Urban Design Rules

Hard and soft rules → typology → smart code

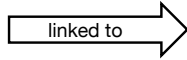


Urban Ecosystem Services

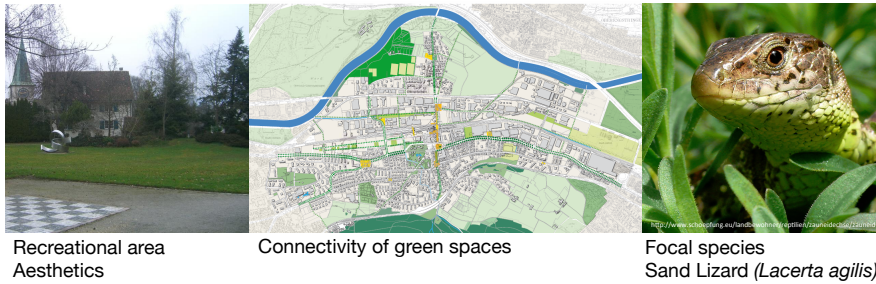


Ecological Rules

Required vegetation and landscape elements
 Required form
 Required area size
 Required spatial structure



Green space type



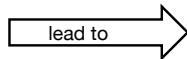
Social Rules

- Community interaction
 - Personal space
 - Defensible space
 - Utilization of public and semi-public space
- calculate → **Satisfaction of Needs Index**

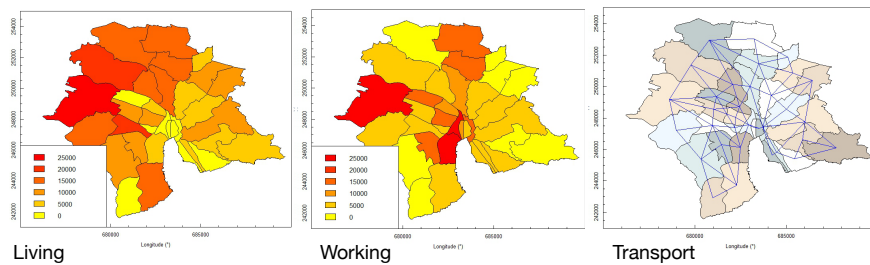


Economic Rules

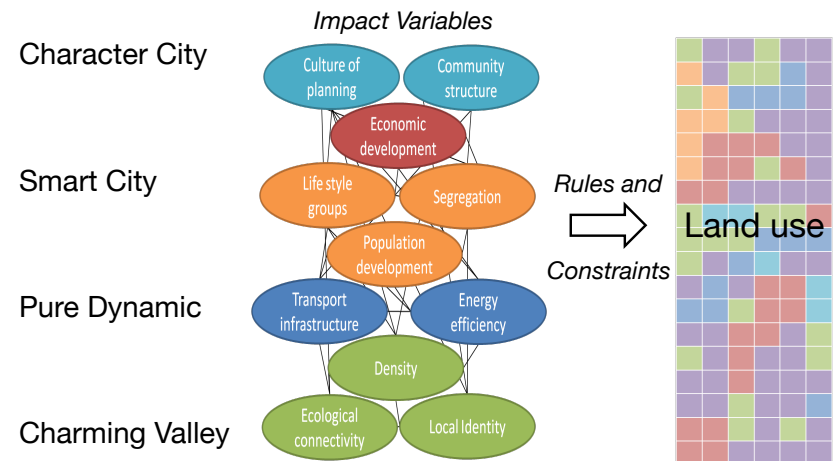
Living
 Working
 Transport



Changes in
 House prices
 Land use patterns
 Density
 Traffic and congestion times
 Degree of Accessibility

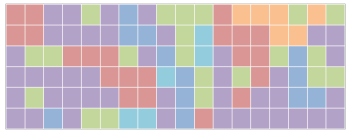


Scenarios of the Limmattal 2030 | 2050

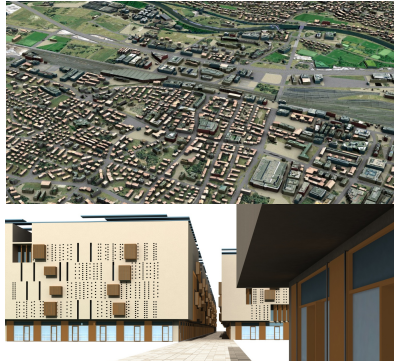


Urban Modeling

UrbanSim + MATSim / CGE Model

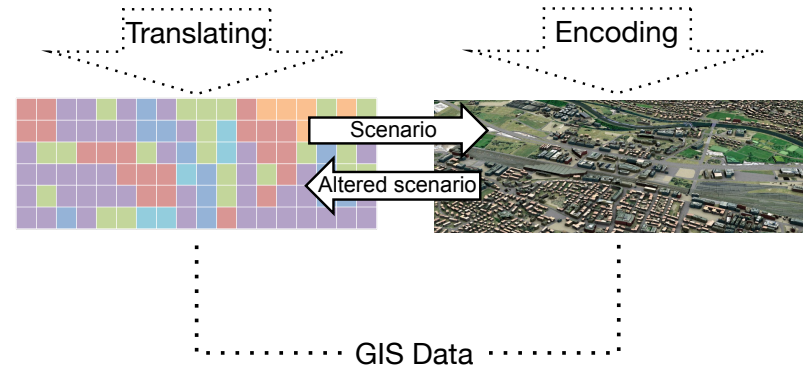


Procedural Urban Model



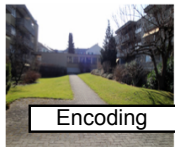
Interdisciplinary modelling

Rules & Constraints: Quantitative and Qualitative Data



Building / green space types as interface

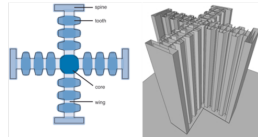
Urban Typology



Encoding

Procedural visualization

BUILDING_H = 220
 BUILDING_W = 100
 GROUND_FLOOR_H = 6
 WING_W = 16
 SPINE_W = 50
 TEETH_PROJ = 10
 TEETH_DIST = 12



Translating

Modelling in UrbanSim

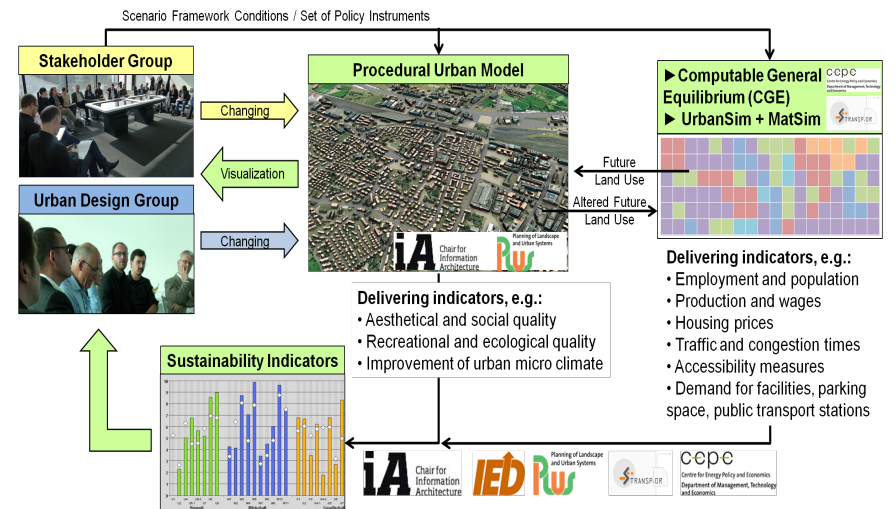
Building Types

The following tables describe the process of how the various building types used in the model are defined. These typologies are derived from actual use cases or building typologies.

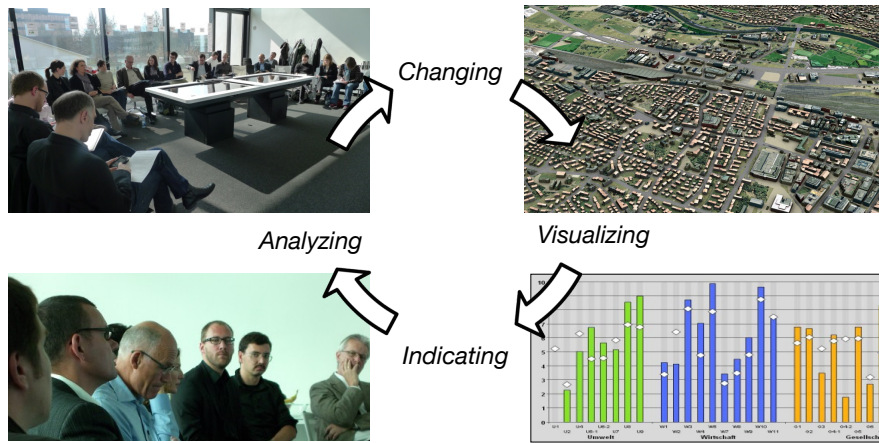
Column Name	Data Type	Required	Description
building_floor_id	Integer	Y	Unique id for building types
is_residential	Integer	Y	1 if residential, 0 otherwise
building_floor_name	String	Y	Short name of the building type
building_floor_area_sqm	String	N	Description of the building type
isf_name	String	Y	Used to demonstrate per_sqm variables like price. Values: building_height, price_sqm
generic_building_floor_id	Integer	Y	Unique id for generic aggregated building type
generic_building_floor_name	String	N	Description of the generic building type
generic_building_floor_area_sqm	String	N	Description of the generic building type in lower cases. e.g. government -> residential government jobs in the City
...

... modified: 19/10/2010

Collaborative Process



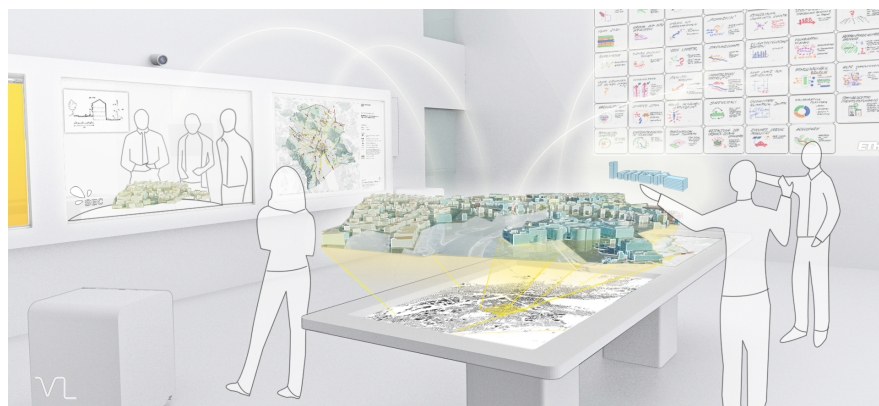
Iterative analysis of urban patterns



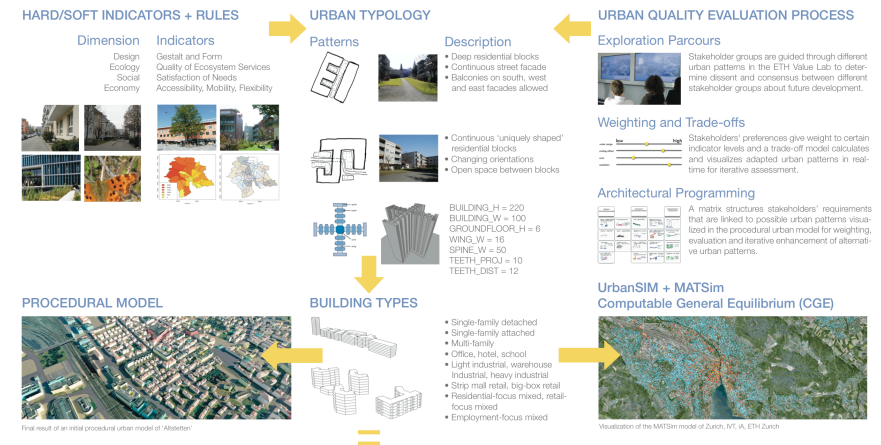
Indicators for urban quality

Dimension	Indicators
Design	Gestalt and Form
Ecology	Quality of Ecosystem Services
Social	Satisfaction of needs
Economy	Accessibility, Mobility, Flexibility

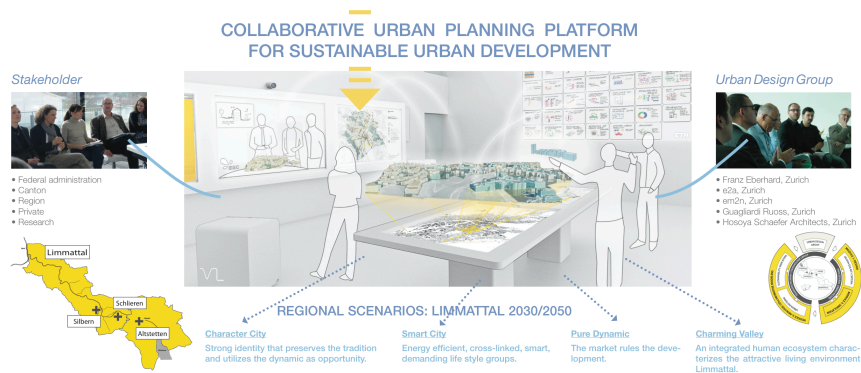
Concept of new urban quality



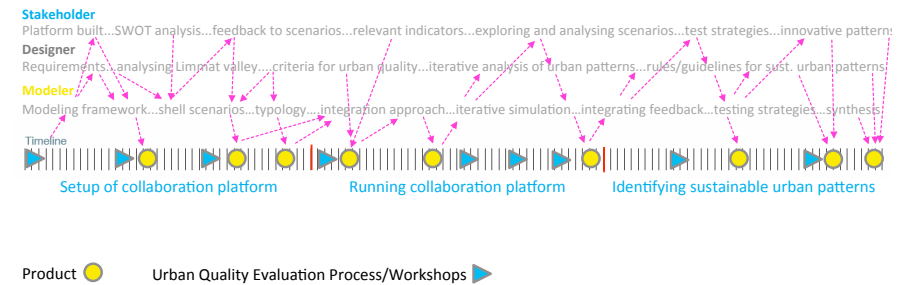
Cross-disciplinary collaboration



Cross-disciplinary collaboration



Cross-disciplinary collaboration



Collaboration with the Future Cities Laboratory

- Exchange of workflows
- Exchange of people
- Exchange of rules



未来城市实验室简介 FUTURE CITIES LABORATORY

www.futurecities.ethz.ch

Collaboration with SustainCity Prof. K. W. Axhausen, IVT, ETHZ

- Exchange on UrbanSim and MatSim
- Provision of SUPat-scenarios



<http://www.sustaincity.org/>

Collaboration with UrbanSim-Group UC Berkeley, Purdue University, ETH SEC

- Exchange on UrbanSim
- Exchange on City Modeling Language



<http://www.urbansim.org/Main/WebHome>

Collaboration with PhD-Students Prof. B. Scholl, Spatial Planning, IRL, ETHZ

- Exchange of Spatial Analysis Limmattal



<http://www.irl.ethz.ch/re/>

Collaboration with NRP65-Project Urban Potentials and Strategies in Metropolitan Territories Prof. M. Angélil, NSL, ETH Zurich

- Exchange of soft rules



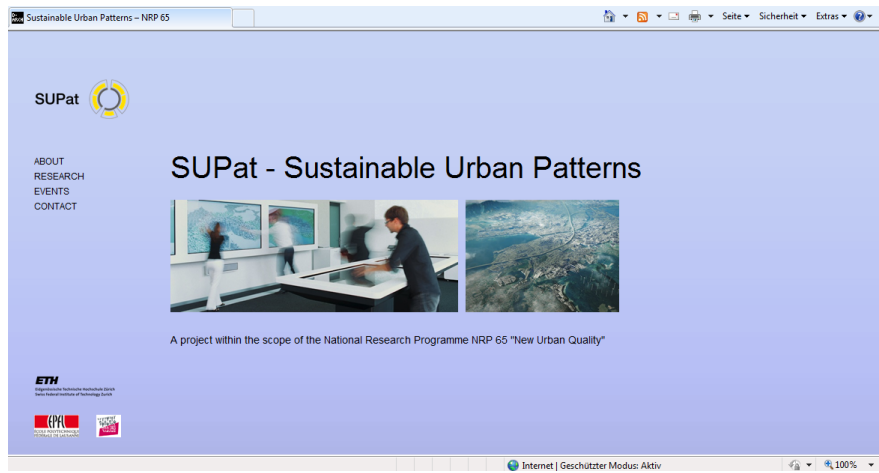
Source: SNF (2011): Porträt des Nationalen Forschungsprogramms (NFP65) Neue Urbane Qualität.
http://www.nfp65.ch/SiteCollectionDocuments/nfp65_programmportraet_d.pdf

Lessons learnt so far...

- **Typology:**
→ Linking quantitative and qualitative factors
- **Strong technical aspect:**
→ Interaction of all interdisciplinary partners
- **Stakeholder integration from the outset on:**
→ Input of people from the region
- **Modelling (of unexpected events):**
→ fast visualisation for detecting relationships



Website: www.supat.ethz.ch



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