Nature-based Urban Space Transformation

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Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action
TOWARDS POST-CARBON CITIES

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NATURE-BASED URBAN SPACE TRANSFORMATION

Dr.-Ing. Kristin Barbey  Karlsruhe Institute of Technology, Germany
Integrative Spatial Concept Climate Mitigation & Adaption

→ Nature-orientated, Climate-friendly Metropolitan Region 2050
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Integrative Spatial Concepts: Climate Mitigation & Adaption

→ Nature-orientated, Climate-friendly Metropolitan Region 2050
The Integrated Spatial Concept of Interacting Strategies Climate Mitigation & Adaption → Nature-orientated, Climate-friendly Metropolitan Region 2050

- **NATURE DEVELOPMENT** qualifying the ecological potentials
- **URBAN RESTRUCTURING** climate-friendly + water-sensitive urban development
- **ENERGY TRANSFORMATION** transformation to a regenerative energy supply

on every spatial level (Metropolitan Region + City + City-District + Quarter + House)
The Integrated Spatial Concept Climate Mitigation & Adaption → CONTENT BASIS
→ Nature-orientated, Climate-friendly Metropolitan Region 2050

The PROJECT NATURE

→ Qualification of ecological potentials
→ Stabilisation of ecosystems
→ Renewal of existential space substance

→ Concentration of spatial actions + protection of precious landscapes
+ Appreciation of nature in a cultural-aesthetical sense

Climate Change → Change Action
Focus of all Strategies Climate Mitigation & Adaption
Starting Point of Spatial Planning and Action: Natural Conditions
The Integrated Spatial Concept Climate Mitigation & Adaption → ROADMAP 2050

→ *Nature-orientated, Climate-friendly Metropolitan Region 2050*

• **NATURE DEVELOPMENT** qualifying the ecological potentials
• **URBAN RESTRUCTURING** climate-friendly + water-sensitive urban development
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NATURE DEVELOPMENT 1: Forest Transformation and New Forests

→ New forests in the Rhine valley, in the Kraichgau, as lowland forests along the Rhine, as urban forests and in the Odenwald → + 50.000 ha
NATURE DEVELOPMENT 2: Open Space Protection and Open Space Development

→ Keeping spaces of the Rhine valley, in the Kraichgau and in the building area free
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NATURE DEVELOPMENT 3: Development of Inner-City Green Spaces

- Interaction of local and regional green spaces
  and Etablierung of new urban forests, city parks and city gardens
- Network of inner-city green spaces for a climate compensating green space system
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NATURE DEVELOPMENT 4: Space for the River - New Retention Areas & Forests

- Keeping Spaces in the area of the previous floodplains of the Rhine free
- Establishment of new retention areas and creation of new floodplain forests
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NATURE DEVELOPMENT 5: Groundwater Protection

→ Conclusion of the strategies:
NATURE DEVELOPMENT – URBAN TRANSFORMATION – ENERGY CONVERSION
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NATURE DEVELOPMENT 6: Organic Agriculture

- 100% Organic Agriculture

- site-specific - 20-60%
- profit-based - 20-40%
Energy savings compared to conventional agriculture

- site-specific - 40-60%
- profit-based - 20-50%
CO2 savings compared to conventional agriculture

Source: BÖLW, 2009
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URBAN RESTRUCTURING 1: Inner Urban Development

- Development of inner-city spatial potentials

lower land requirements ca. -80%
cost savings ca. -75%
Energy savings + CO2 savings: due to less car kilometers

Source: 1. ÖKOinFORM, 2010 2. ECOPLAN 2000, IÖR, 2005
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**URBAN RESTRUCTURING 2:** Development of the existing building stock

- lower land requirements ca. -80%
- CO2 savings ca. -50%
- resource savings ca. -30%

→ complement, add, construct, remove, transform

Source: UBA, 2008
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URBAN RESTRUCTURING 3: Energetic Urban Renewal

→ Development of specific solutions for the quarters

heat demand ca. - 60%
CO2 savings ca. -50%

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URBAN RESTRUCTURING 4: Climate-Friendly and Water-Sensitive Urban Development

→ Development of climate-responsible conditions for the inner urban and green space development
→ Establishment of resilient spatial structures
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ENERGY TRANSFORMATION 1-5: Use of Renewable Energies

→ Energy self-sufficient electric power supply of the metropolitan region Rhein-Neckar

CO2 savings ca. - 100%
(Emissions caused by electric energy, exclusive manufacturing process)
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ENERGY TRANSFORMATION 1: Regional Spatial Concentration of Wind Energy Plants

→ Establishment of 5 wind power parks (building area + southern and western Rhine valley)
ca. 450 wind energy plants on ca. 11,450 ha, ca. 2% of the total area of the MRN (564,000 ha)

55.4% of the expected electricity demand in the MRN in 2050
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ENERGY TRANSFORMATION 2: Urban Use of Photovoltaik

→ in industrial and commercial areas, on roof areas and facade surfaces

12.9% of the expected electricity demand in the MRN in 2050
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ENERGY TRANSFORMATION 3: Use of Regional Potentials of Geothermal Energy

11.4% of the expected electricity demand in the MRN in 2050

→ 20 geothermal power plants
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ENERGY TRANSFORMATION 4 + 5: Use of Regional + Local Potentials Hydropower and Bioenergy

1.7% the expected electricity demand In the MRN in 2050

10.7% the expected electricity demand In the MRN in 2050

→ Use of the existing potentials hydropower and bioenergy
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ENERGY TRANSFORMATION 6: Expansion of the Public Transport System & Climate Neutral E-Mobility

→ Activation of the rail-bound local public transport network, and waterways as ‘guideline’ for climate neutral mobility

energy savings ca. - 50%
CO2 savings ca. -70%
with the use of renewable energies in E-Mobility

Source: Wuppertal Institut für Klima, Umwelt, Energie GmbH
ENERGY TRANSFORMATION 7: Expansion of the electricity network and energy storage

→ underground cables in connection to the transnational network
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NATURE DEVELOPMENT + URBAN RESTRUCTURING + ENERGY TRANSFORMATION

-70% CO2
-50% Energy
+100 % Renewable Energies (Electricity)

Nature-orientated, Climate-friendly Metropolitan Region 2050

Dr.-Ing. Kristin Barbey
WSBE 2017 Hong Kong
Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action
Concept Green Metropolis + Inner City Development + Energy Transformation

Nature-orientated, Climate-friendly Metropolis 2050
Concept Green Metropolis

• Concept Continuous Green Spaces - Establishment of parks and gardens
• Concept Urban Green Spaces and Urban Forests
• Development of characteristic Urban Green Spaces
• Establishment of a Differentiated Green Space Network
• Concept Green City Centre
• Concept Resilient Spatial Structures: Integration of heavy rain protection in the Green Space Concept of the City Multifunctional Use of Space
• Concept Organic Farming + Concept Urban Parks and Gardens
• Conversion to Green Spaces
• Concept Connection of the Green Metropolis with the Metropolitan Region - Optimisation of the Climatic Interacting Systems of Metropolitan Region and Green Metropolis

Nature-orientated, Climate-friendly Metropolis 2050
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Nature-orientated, Climate-friendly Metropolis 2050
Integrated Spatial Concept of Interacting Strategies Climate Mitigation & Adaption
→ Nature-orientated, Climate-friendly Metropolitan Region 2050
Integrated Spatial Concept of Interacting Strategies Climate Mitigation & Adaption

→ Nature-orientated, Climate-friendly Metropolitan Region 2050
CONDITIONS TO REALISE
→ Nature-orientated, Climate-friendly Metropolitan Region 2050

The Integrative Spatial Concept of Interacting Strategies Climate Mitigation + Adaption
NATURE DEVELOPMENT–URBAN RESTRUCTURING–ENERGY TRANSFORMATION
and the Principles of Connecting + Cooperating + Interacting

→ on the Essential Level of Preparation : CONCEPT
CLIMATE POLICY – SPATIAL CONCEPT – CLIMATE ECONOMICS
Presentation of POLITICAL COMMITMENT in SPATIAL CONCEPTS + Time Horizon of Realisation

→ on the Level of Planning & Realisation : PLAYERS
CITY + ENERGY PROVIDERS + PRIVATE COMPANIES + CITIZENS + PLANNERS + UNIVERSITIES

→ on the Spatial Level : SPACE
QUARTER + CITY, METROPOLIS + METROPOLITAN REGION,
METROPOLITAN REGIONS + COUNTRIES, METROPOLITAN REGIONS WORLDWIDE
Nature Development + Urban Restructuring + Energy Transformation are qualification processes, which can lead to an improvement of existing qualities.

Nature Development → Chance of ecologic (+ aesthetic) Qualification
Urban Restructuring → Chance of aesthetic (+ ecological) Qualification
Energy Transformation → Chance of sociopolitical (+ ecological) Renewal

In connection and interaction of the strategies
Nature Development + Urban Restructuring + Energy Transformation

Bundesministerium für Bildung und Forschung

Mehr über den Wettbewerb

Dr.-Ing. Kristin Barbey - WSBE 2017 Hong Kong - "Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action"
The Concepts of Sustainable Urban Development + Principles of Climate Protection and Adaption

GREEN CITY + GARDENCITY
GREEN SPACES - GREEN NETWORK, BIODIVERSITY

SOCIAL + PARTICIPATIVE CITY
SMART NEIGHBOURHOODS + PARTICIPATIVE ACTIONS
SOCIAL TOGETHER + HIGH LIVING QUALITY
HUMAN SCALE + HIGH SPATIAL QUALITY

COMPACT CITY
DENSITY + MIXITY: URBAN DEVELOPMENT „INSIDE CITY LIMITS“

CITY OF SHORT DISTANCES + SMART MOBILITY
INTEGRATED PUBLIC TRANSPORT SYSTEMS

RESOURCE + SPACE SAVING CITY
ENERGY EFFICIENCY + WASTE REDUCTION
USING ECO MATERIALS + RENEWABLE ENERGIES
ENERGY+ BUILDINGS +
RENEWING THE EXISTING BUILDING STOCK

REGENERATIVE CITY + BACK GIVING CITY
ENERGY+ CITY + RESILIENT CITY
(THE LIMIT OF DENSITY?)
CLIMATE PROTECTION + ADAPTATION
CHANGE OF LIFESTYLES

SYNERGETIC FUTURE CITY

The challenges in transdisciplinary planning and building processes:
is the equivalent combination of aesthetical, ecological & technological strategies to create convincing SPATIAL & LIVING QUALITIES as well as synergetic climate protection and adaption effects.

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SYNERGETIC FUTURE CITY

Dr.-Ing. Kris5n Barbey

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Inner Insulation & Energetic Urban Renewal
Solar Power Plants (Power-Heat Cogeneration)
Gardens & Water Collectors
Green Roofs
Pocket Parks

Tram-Stops
Concentrated Parking

Efficient Street Lighting Systems
Efficient Waste Management & Recycling Systems
Car Free Streets
New Trees & bike paths
Geothermal energy use
Decentralized Biogas Supply

K I C - i n n o E N E R G Y Urban Planning and Energy
stadt, land, fluss: L’Espace, Climat & Énergie, ENSA Strasbourg
Students: Magnitien, Nivière, Pinaud, Schwartzmann

WSBE 2017 Hong Kong
Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action
Quartier 2050 - Regenerative City   Harbour Transformation Strasbourg
Master Student Projects (2013/14)
ENSAS, École nationale supérieure d'architecture de Strasbourg
Atelier Master 1 - Urban and Architectural Design

Christophe Maignien, Marion Nivière
Integrative Spatial Concept Climate Protection & Adaption

→ Nature-orientated, Climate-friendly Megacity 2050

Transformative Research in Urban Planning

THE DELHI PROJECT

Housing & Urban Living Perspectives

Research Proposal by Dr.-Ing. Kristin Barbey
Karlsruhe Institute of Technology - Institute for Urban & Landscape Design - Urban Housing & Development

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THANK YOU!
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METROPOLREGION IM KLIMAWANDEL
Räumliche Strategien
Klimaschutz und Klimaanpassung

(→ http://digbib.ubka.uni-karlsruhe.de/volltexte/1000029071)