

Nature-based Urban Space Transformation

Dr.-Ing. Kristin BARBEY, Karlsruhe Institute of Technology, Germany

Institute for Urban and Landscape Design (IESL), Prof. Markus Nepl, Chair of Urban Housing and Development

World Sustainable Built Environment Conference 2017 Hong Kong
Transforming Our Built Environment through Innovation and Integration:
Putting Ideas into Action



Organisers:



International Co-owners:



Sustainable Buildings
and Climate Initiative
Promoting Policies and Practices for Sustainability



Global Alliance
for Buildings and
Construction

TOWARDS POST-CARBON CITIES

SBE16 Torino 18-19 February 2016

NATURE-BASED URBAN SPACE TRANSFORMATION

Integrative Spatial Concept Climate Mitigation & Adaption

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

Prime Tower Zürich, Gigon / Guyer, Foto: Thies Wachter, Zürich



Integrative Spatial Concept Climate Mitigation & Adaption

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



Integrative Spatial Concept Climate Mitigation & Adaption

→ Nature-orientated, Climate-friendly Metropolitan Region 2050

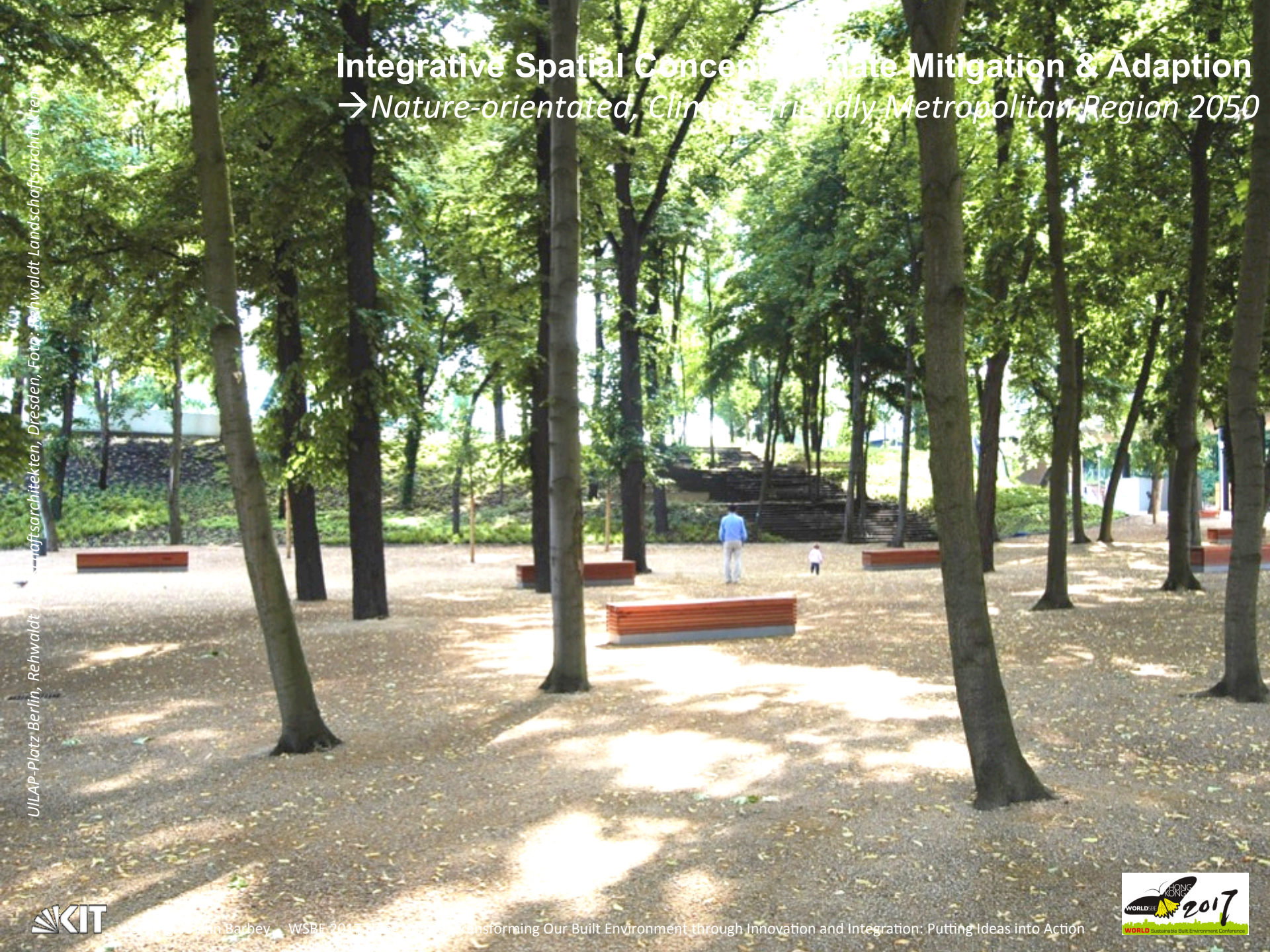
Caixa Forum Madrid, Herzog & de Meuron und Patrick Blanc, Foto: Roland Halbe

Herzog & de Meuron + Patrick Blanc, Caixa Forum Madrid, Herzog & de Meuron und Patrick Blanc, Foto: Roland Halbe



Integrative Spatial Concept for Climate Mitigation & Adaption → Nature-orientated, Climate-friendly Metropolitan Region 2050

ULAP-Platz Berlin, Rehwaldt Landschaftsarchitekten, Dresden, Foto: Schwaldt Landschaftsarchitektur



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

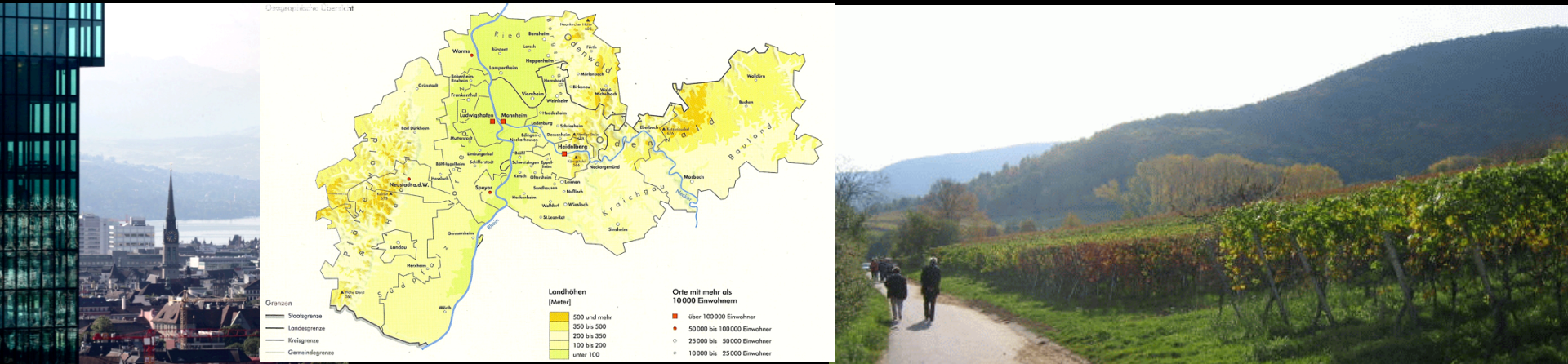
→ *Nature-orientated, Climate-friendly Metropolitan Region 2050*

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

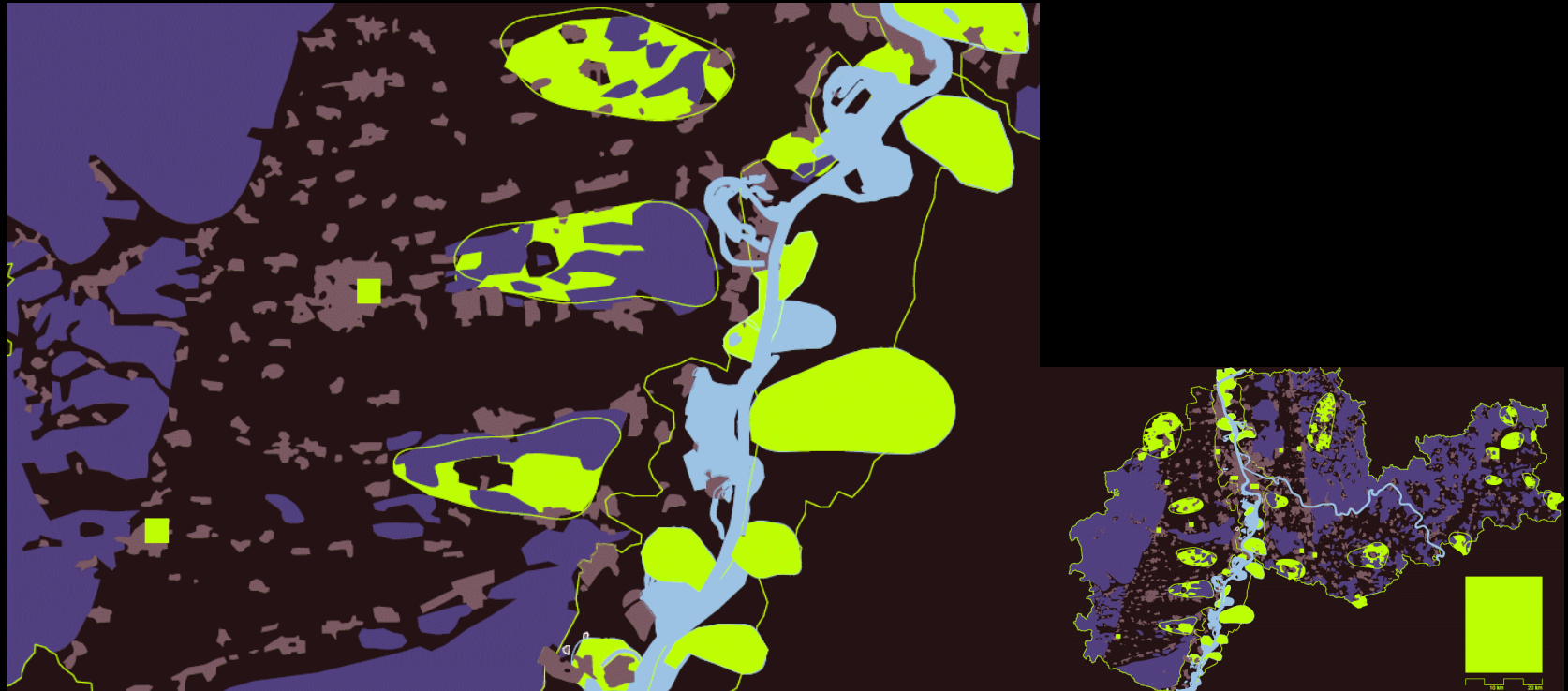
The Integrated Spatial Concept Climate Mitigation & Adaption → ROADMAP 2050 → Nature-orientated, Climate-friendly Metropolitan Region 2050



- **NATURE DEVELOPMENT** *qualifying the ecological potentials*
 - **URBAN RESTRUCTURING** *climate-friendly + water-sensitive urban development*
 - **ENERGY TRANSFORMATION** *transformation to a regenerative energy supply*
- on every spatial level (Metropolitan Region + City + City-District + Quarter + House)*

Integrative Spatial Concept Climate Mitigation & Adaptation

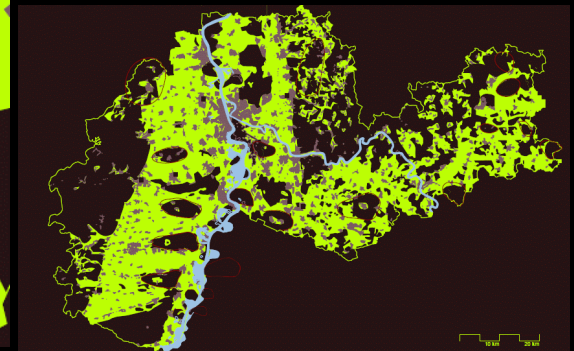
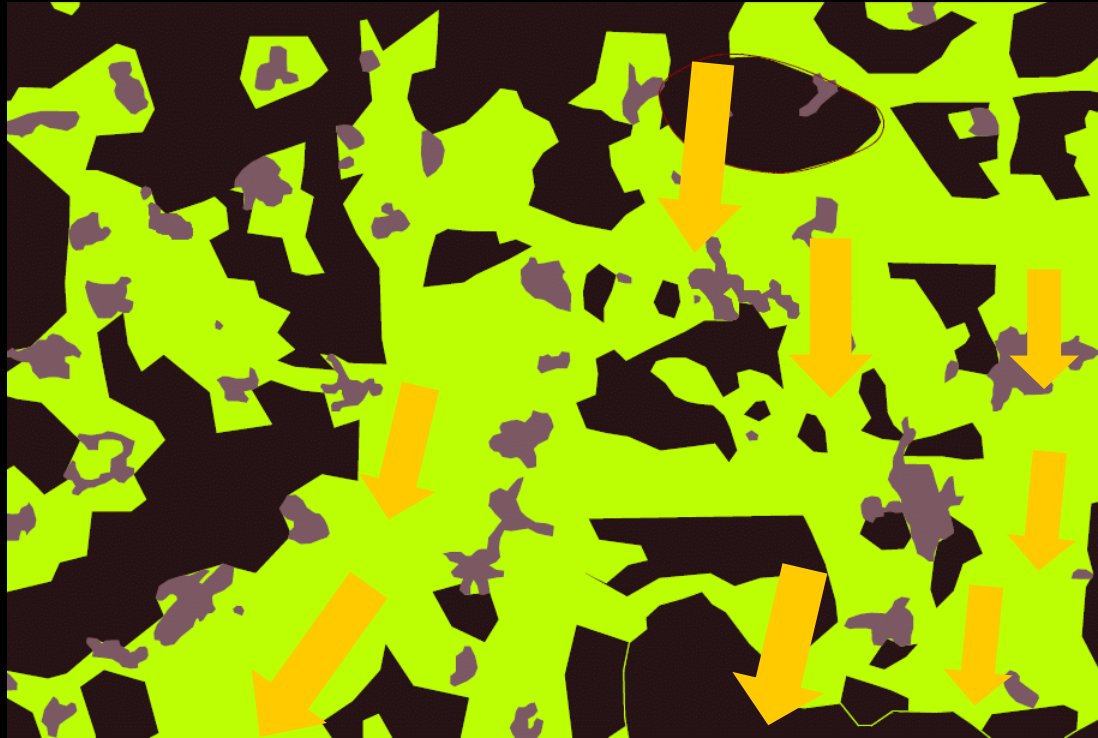
NATURE DEVELOPMENT 1: Forest Transformation and New Forests



→ 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

Integrative Spatial Concept Climate Mitigation & Adaptation

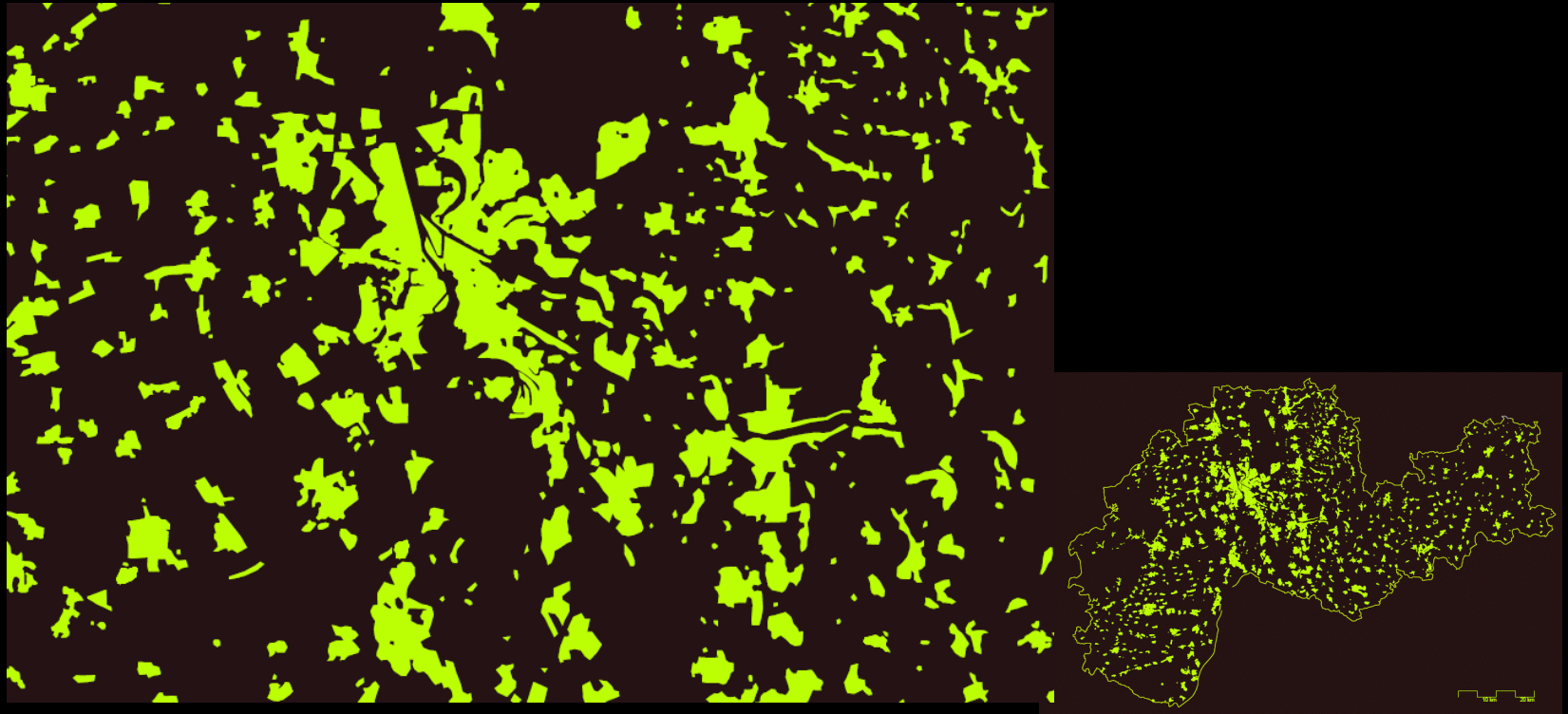
NATURE DEVELOPMENT 2: Open Space Protection and Open Space Development



→ Keeping spaces of the Rhine valley, in the Kraichgau and in the building area free

Integrative Spatial Concept Climate Mitigation & Adaption

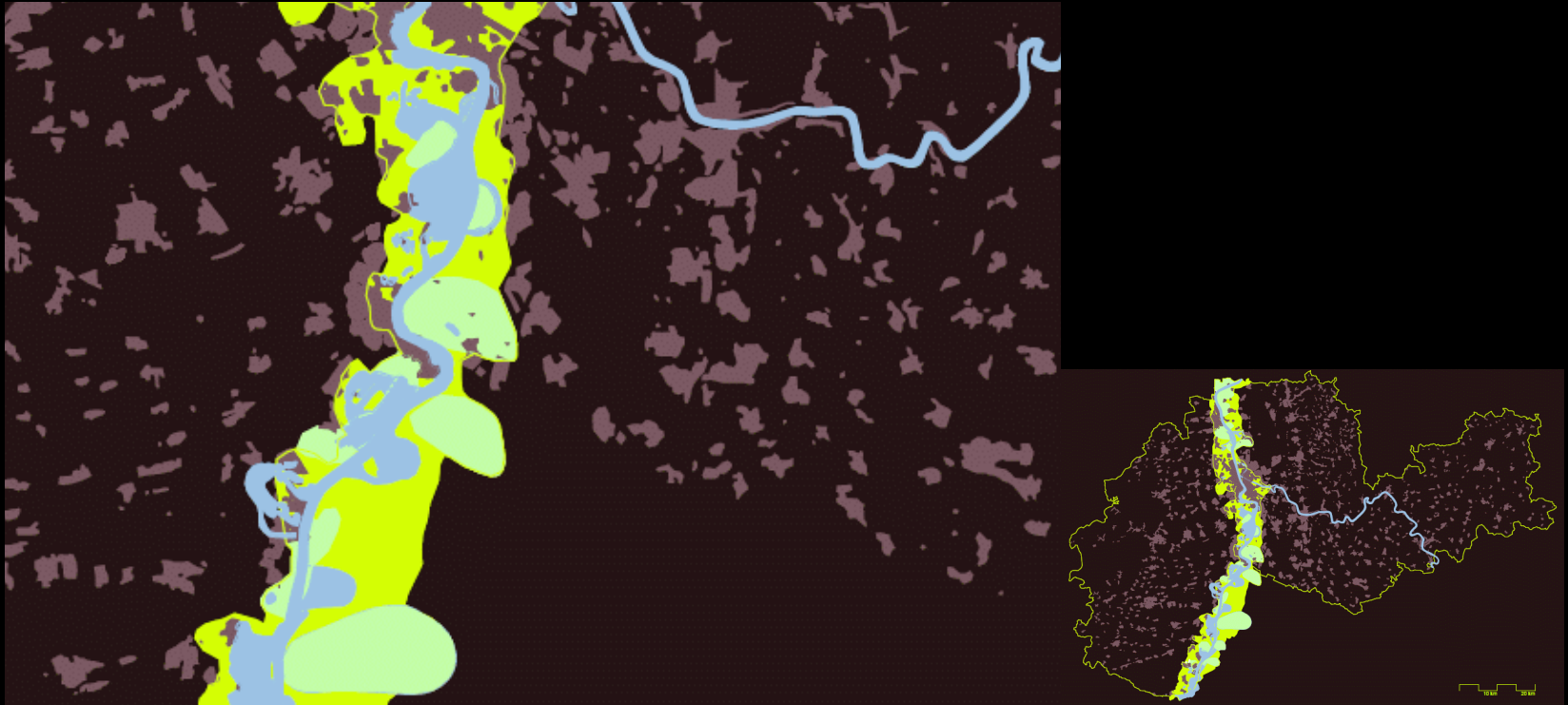
NATURE DEVELOPMENT 3: Development of Inner-City Green Spaces



- 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

Integrative Spatial Concept Climate Mitigation & Adaption

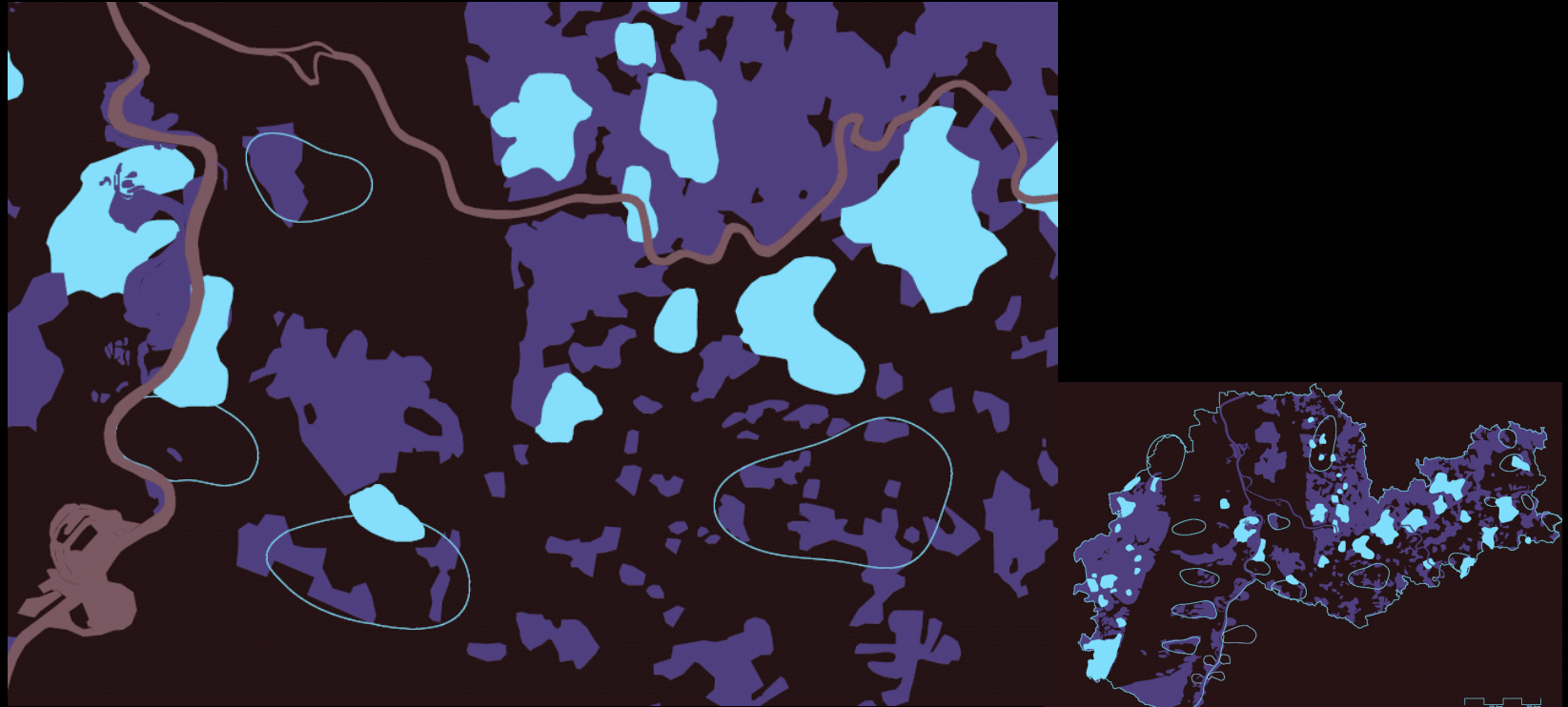
NATURE DEVELOPMENT 4: Space for the River - New Retention Areas & Forests



- Keeping Spaces in the area of the previous floodplains of the Rhine free
- Establishment of new retention areas and creation of new floodplain forests

Integrative Spatial Concept Climate Mitigation & Adaption

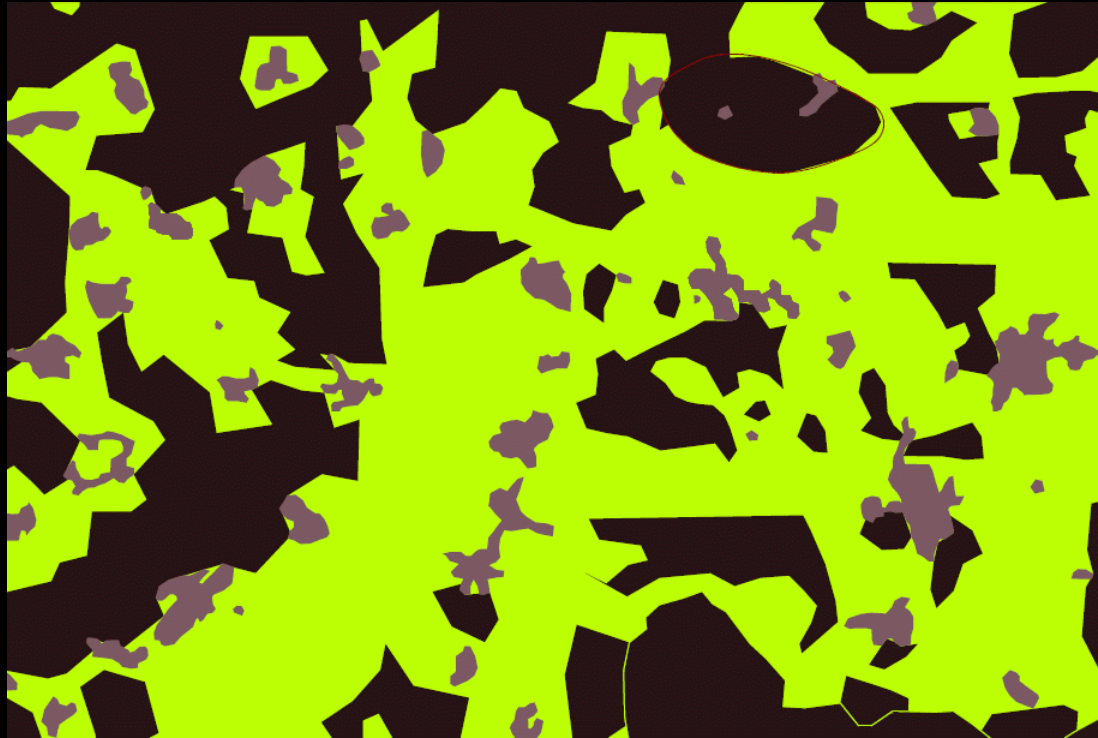
NATURE DEVELOPMENT 5: Groundwater Protection



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

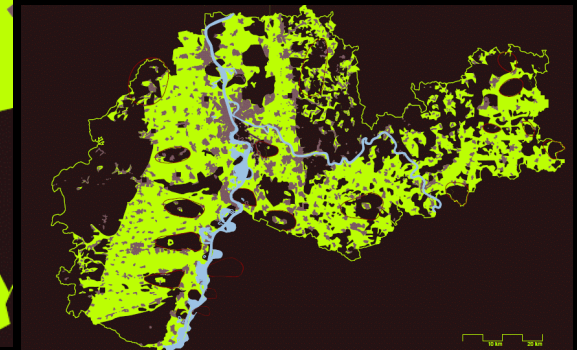
Integrative Spatial Concept Climate Mitigation & Adaption

NATURE DEVELOPMENT 6: 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

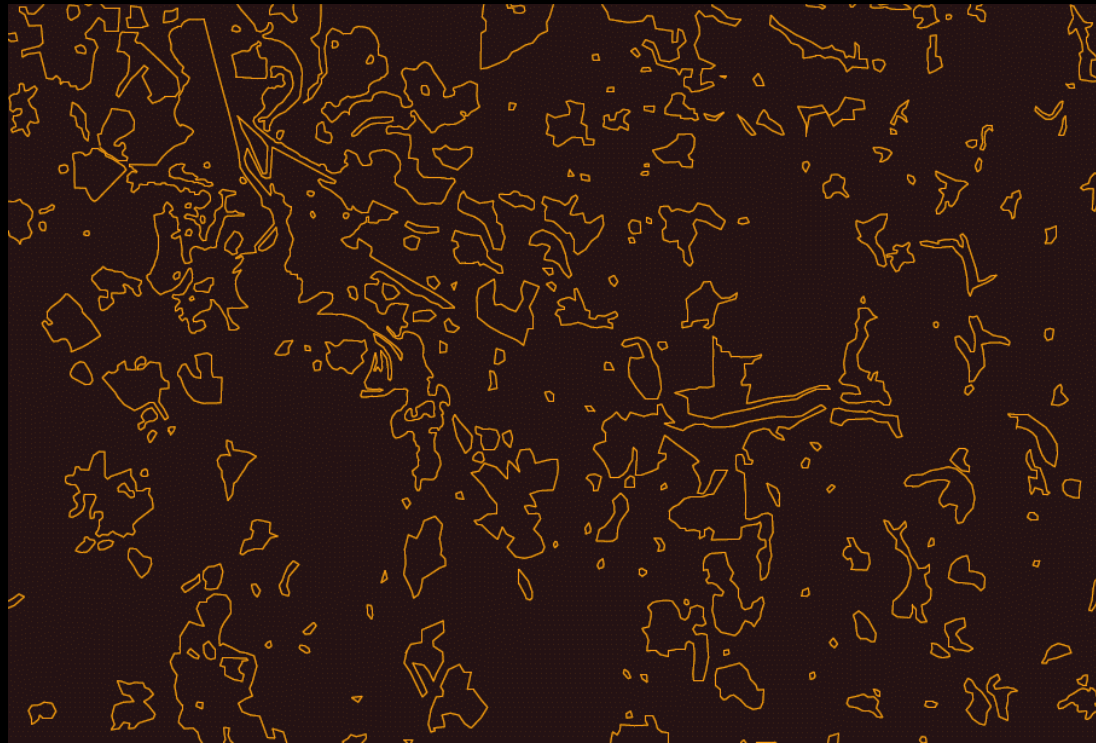


→ 100% Organic Agriculture

Source: BÖLW, 2009

Integrative Spatial Concept Climate Mitigation & Adaption

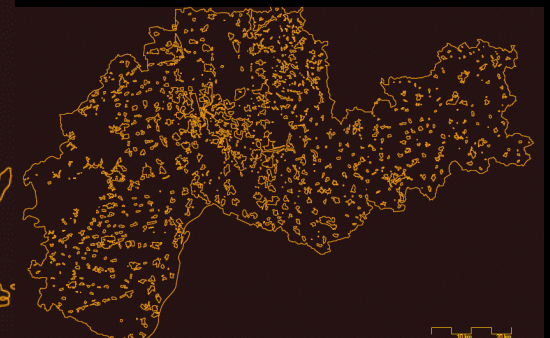
URBAN RESTRUCTURING 1: Inner Urban Development



lower land requirements ca. **-80%**

cost savings ca. **-75%**

Energy savings + CO2 savings:
due to less car kilometers

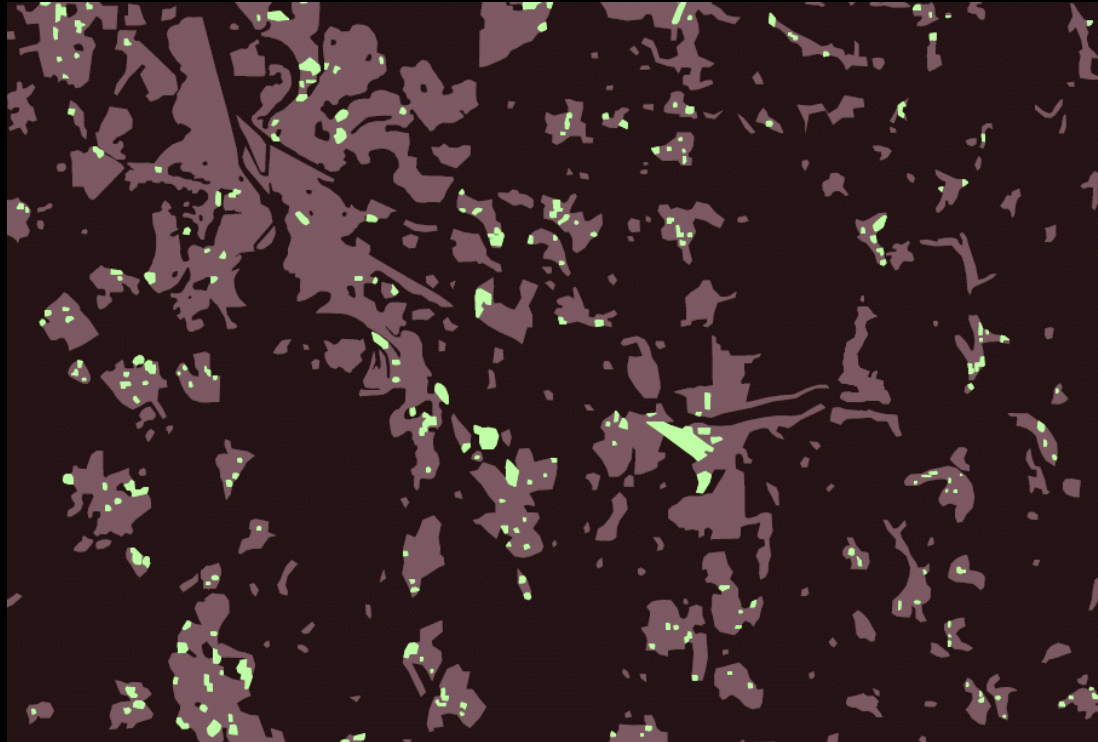


→ Development of inner-city spatial potentials

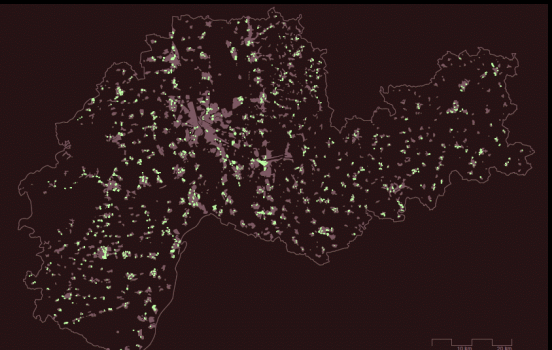
Source: 1. ÖKOinFORM, 2010 2. ECOPLAN 2000, IÖR, 2005

Integrative Spatial Concept Climate Mitigation & Adaption

URBAN RESTRUCTURING 2: Development of the existing building stock



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

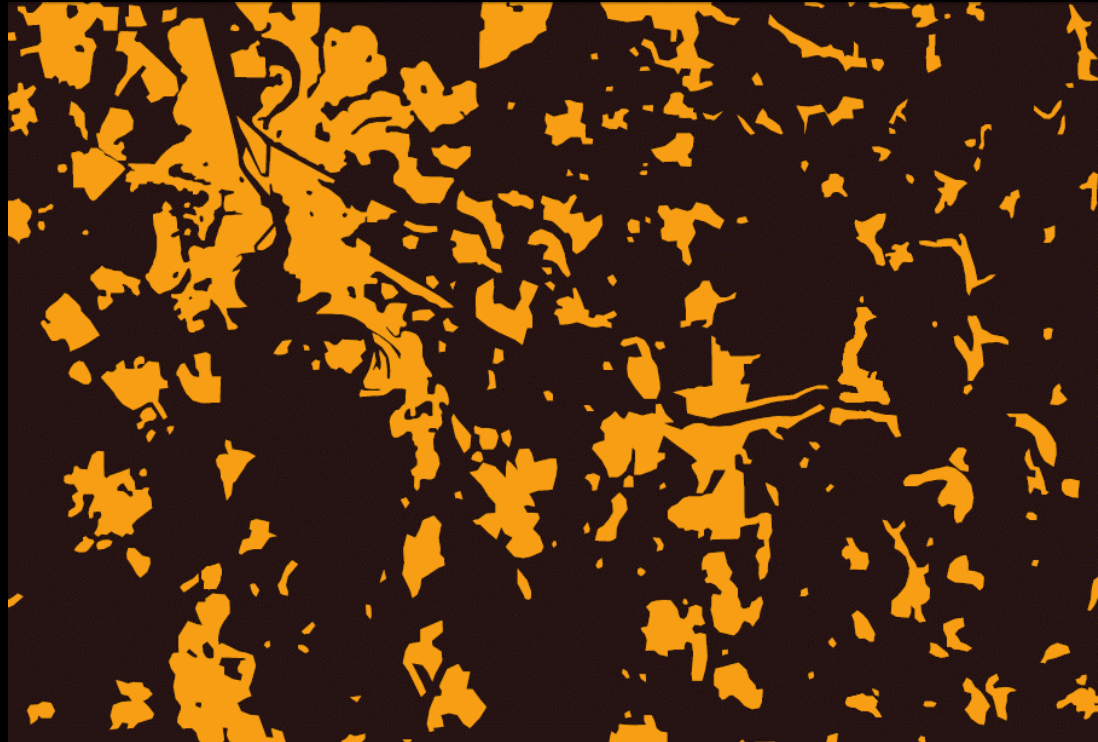


→ complement, add, construct , remove, transform

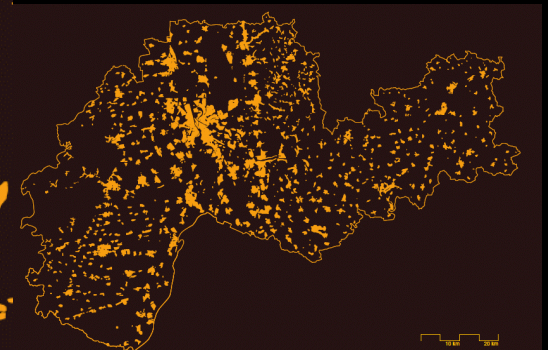
Source: UBA, 2008

Integrative Spatial Concept Climate Mitigation & Adaption

URBAN RESTRUCTURING 3: Energetic Urban Renewal



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

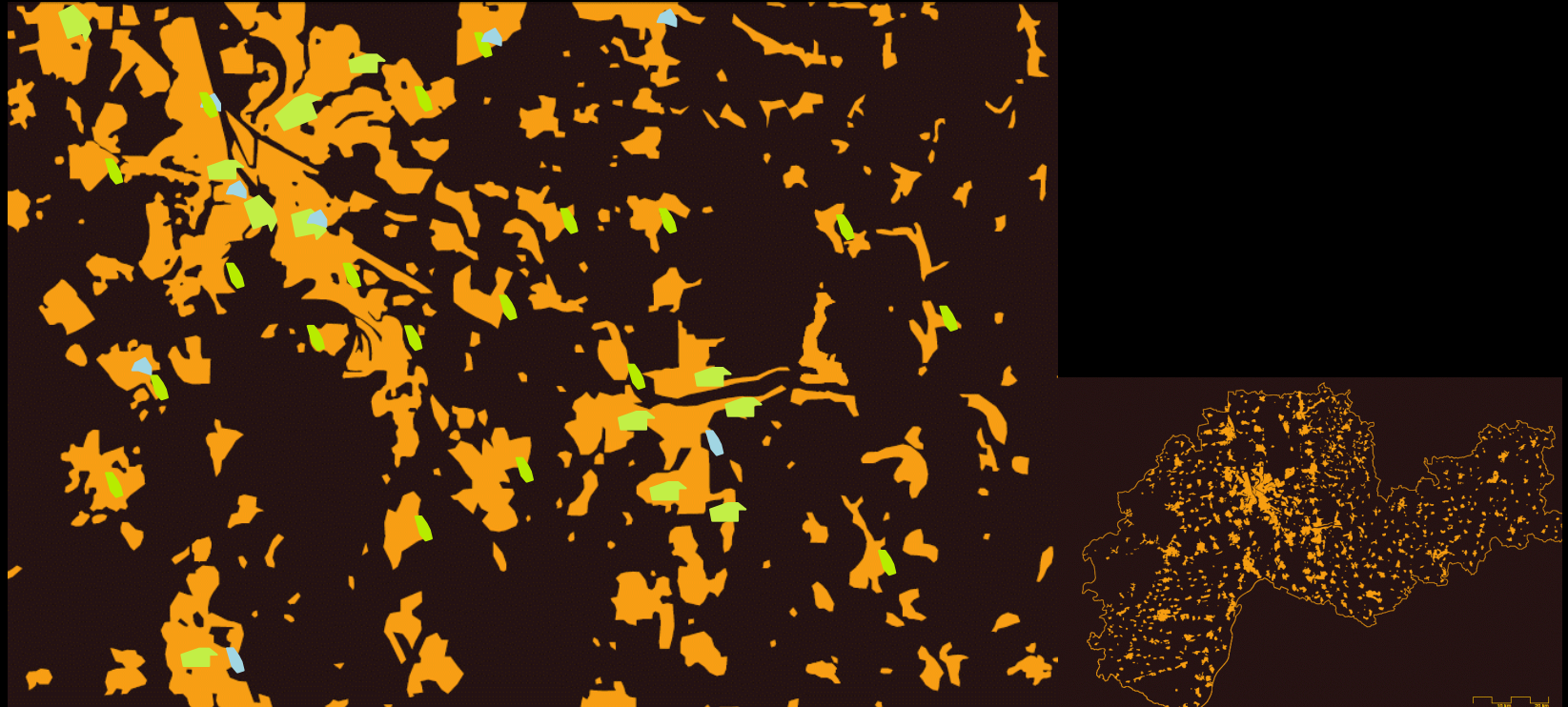


→ Development of specific solutions for the quarters

Source: 1. IBA- Hamburg 2010, 2. UBA, 2008

Integrative Spatial Concept Climate Mitigation & Adaption

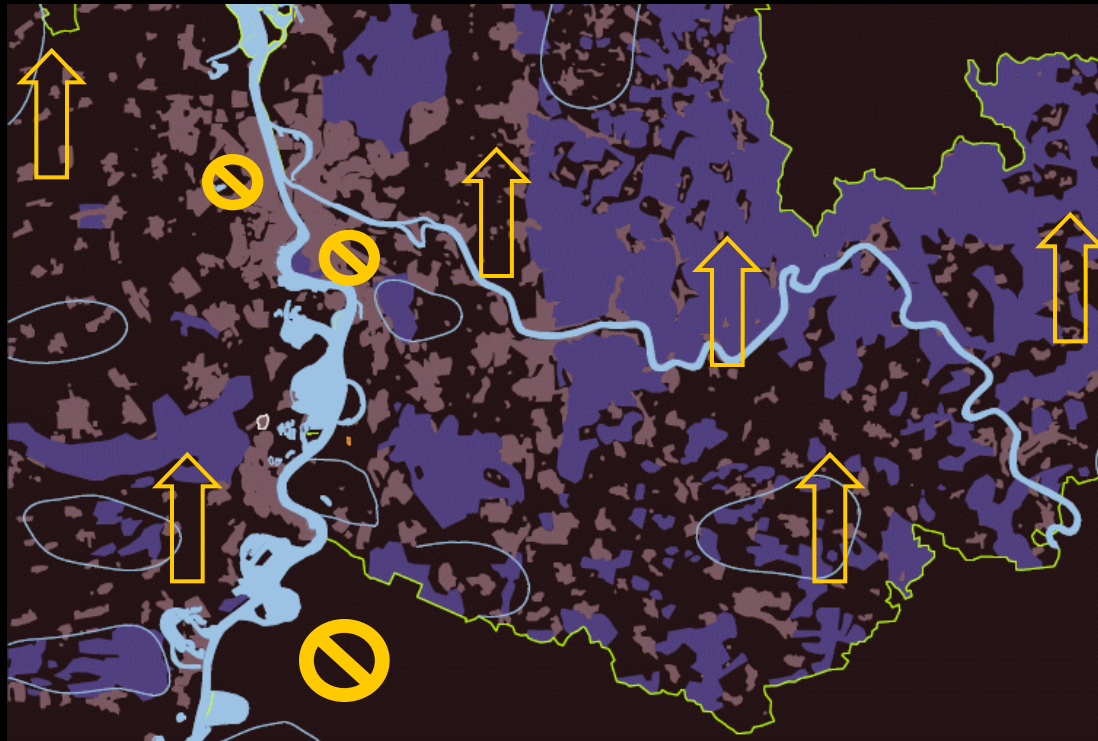
URBAN RESTRUCTURING 4: Climate-Friendly and Water-Sensitive Urban Development



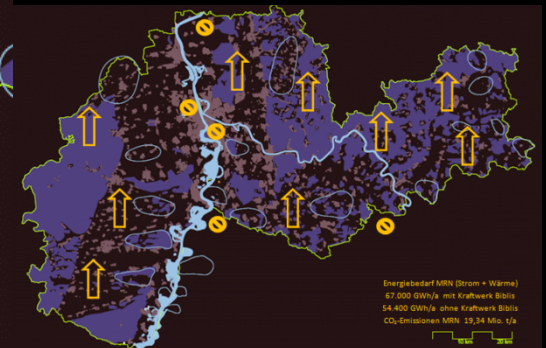
- Development of climate-responsible conditions for the inner urban and green space development
- Establishment of resilient spatial structures

Integrative Spatial Concept Climate Mitigation & Adaptation

ENERGY TRANSFORMATION 1-5: Use of Renewable Energies



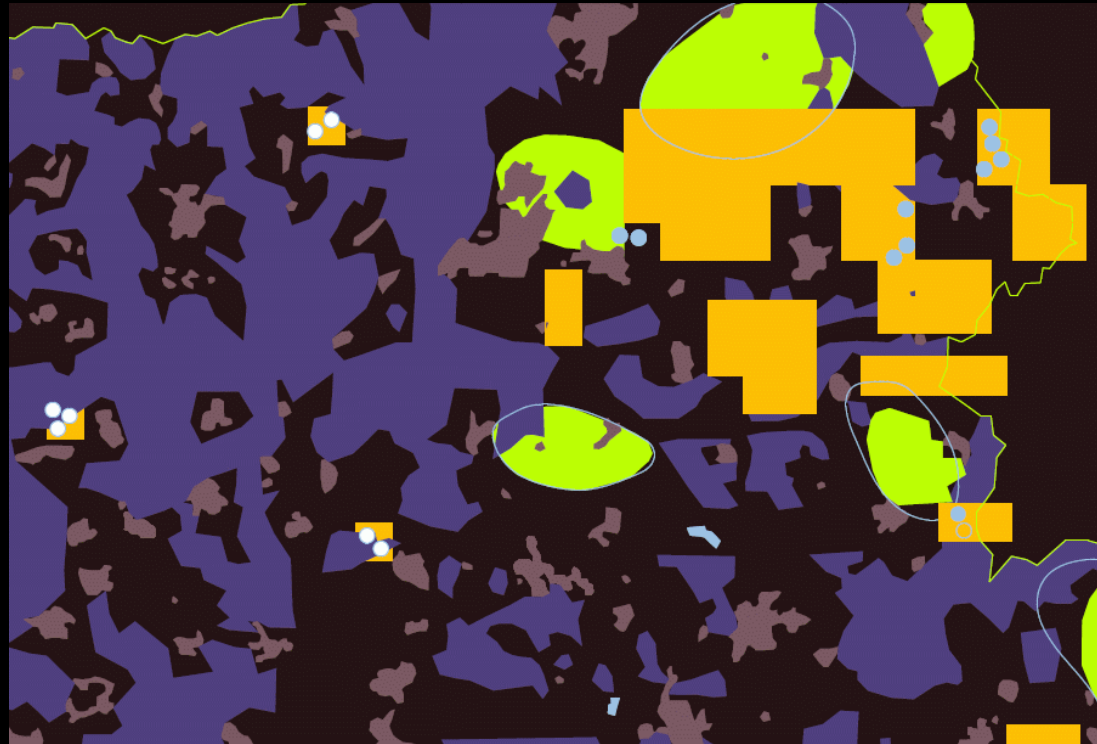
CO2 savings ca. - **100%**
(Emissions caused by electric energy,
exclusive manufacturing process)



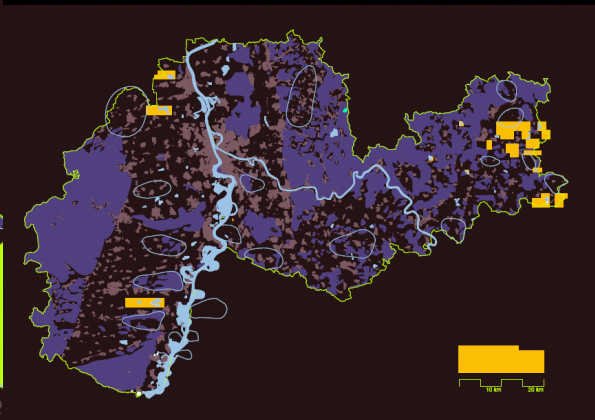
→ Energy self-sufficient electric power supply of the metropolitan region Rhein-Neckar

Integrative Spatial Concept Climate Mitigation & Adaption

ENERGY TRANSFORMATION 1: Regional Spatial Concentration of Wind Energy Plants



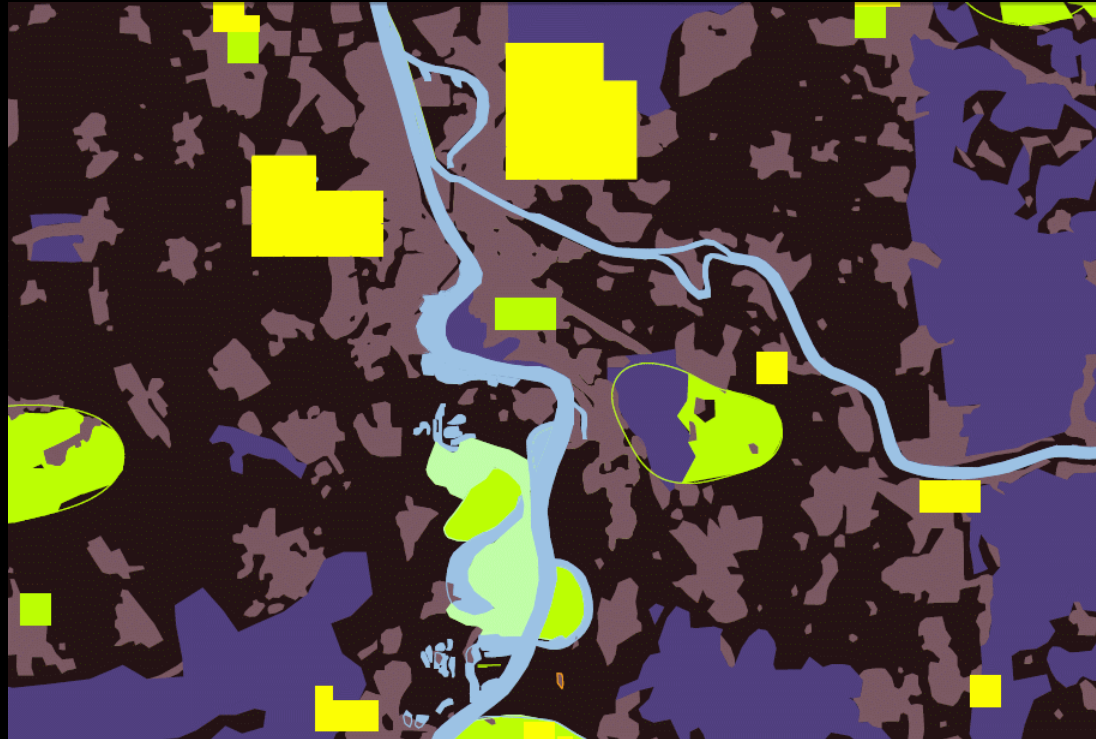
55,4%
of the expected electricity demand
in the MRN in 2050



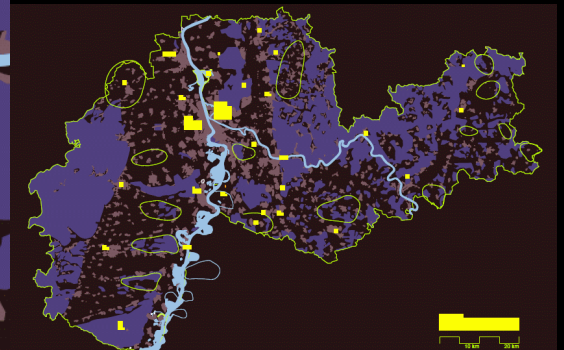
→ Establishment of 5 wind power parks (building area + southern und western Rhine valley)
ca. 450 wind energy plants on ca. 11.450 ha, ca. 2% of the total area of the MRN(564.000 ha)

Integrative Spatial Concept Climate Mitigation & Adaption

ENERGY TRANSFORMATION 2: Urban Use of Photovoltaik



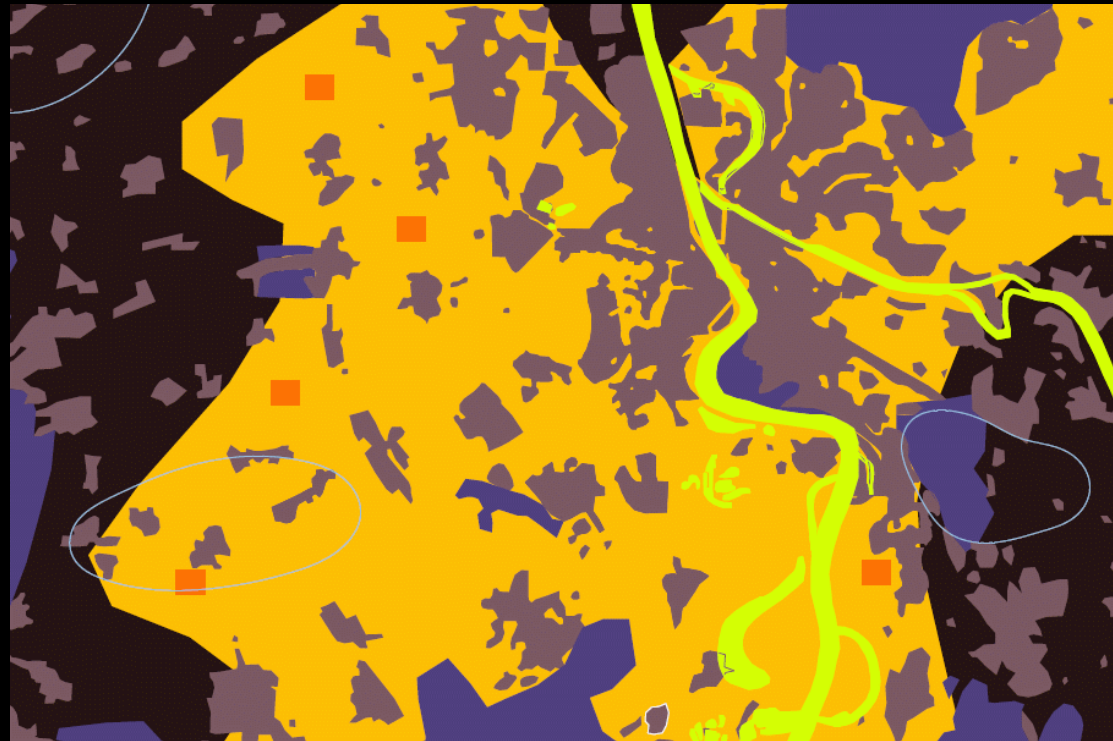
12,9%
of the expected electricity demand
in the MRN in 2050



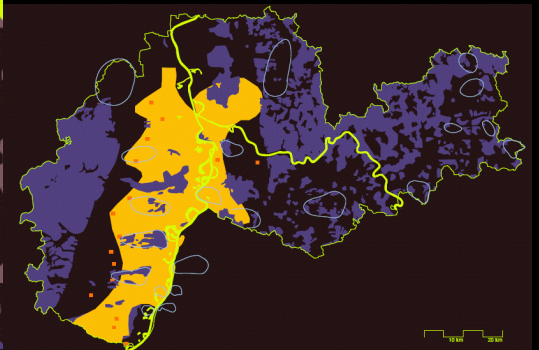
→ in industrial and commercial areas, on roof areas and facade surfaces

Integrative Spatial Concept Climate Mitigation & Adaption

ENERGY TRANSFORMATION 3: Use of Regional Potentials of Geothermal Energy



11,4%
the expected electricity demand
in the MRN in 2050



→ 20 geothermal power plants

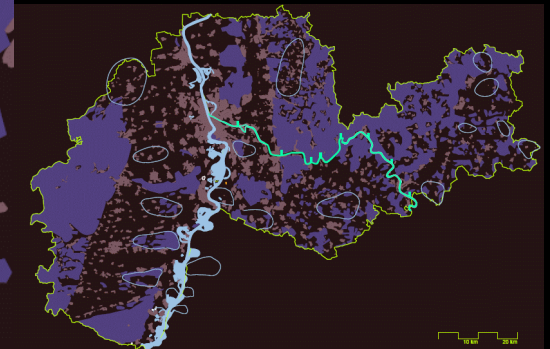
Integrative Spatial Concept Climate Mitigation & Adaption

ENERGY TRANSFORMATION 4 + 5: Use of Regional + Local Potentials Hydropower and Bioenergy



1,7%
the expected electricity demand
In the MRN in 2050

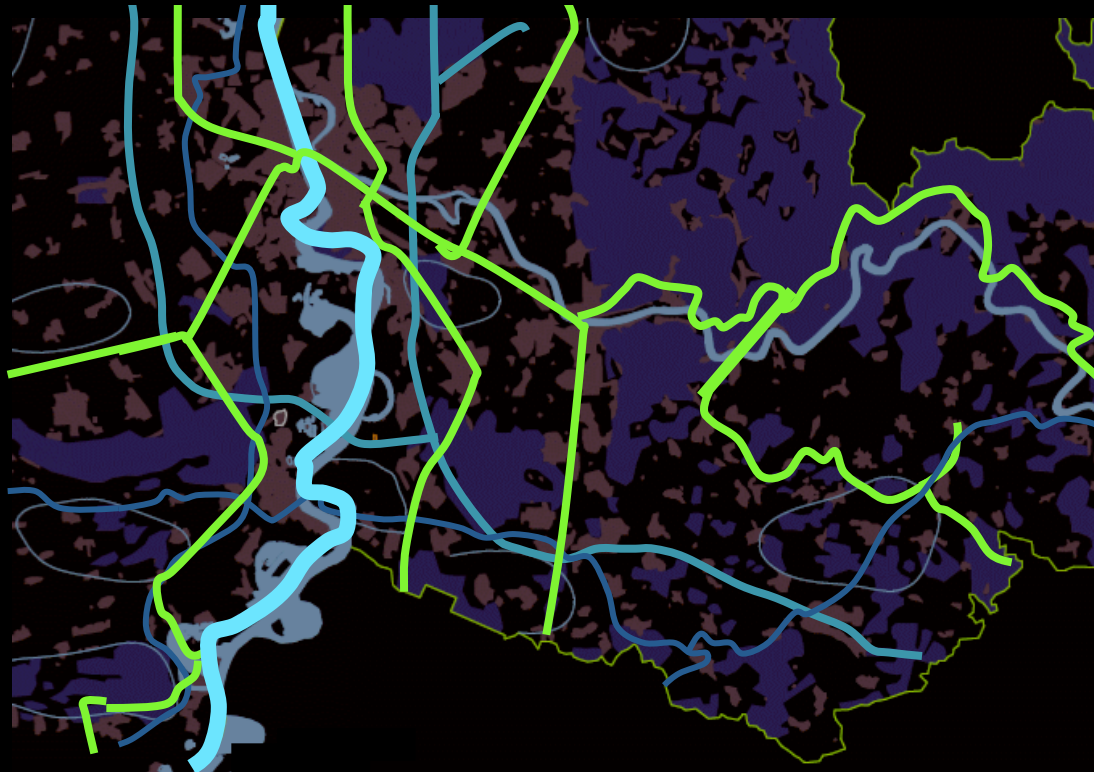
10,7%
the expected electricity demand
In the MRN in 2050



→ Use of the existing potentials hydropower and bioenergie

Integrative Spatial Concept Climate Mitigation & Adaption

ENERGY TRANSFORMATION 6: Expansion of the Public Transport System & Climate Neutral E-Mobility



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

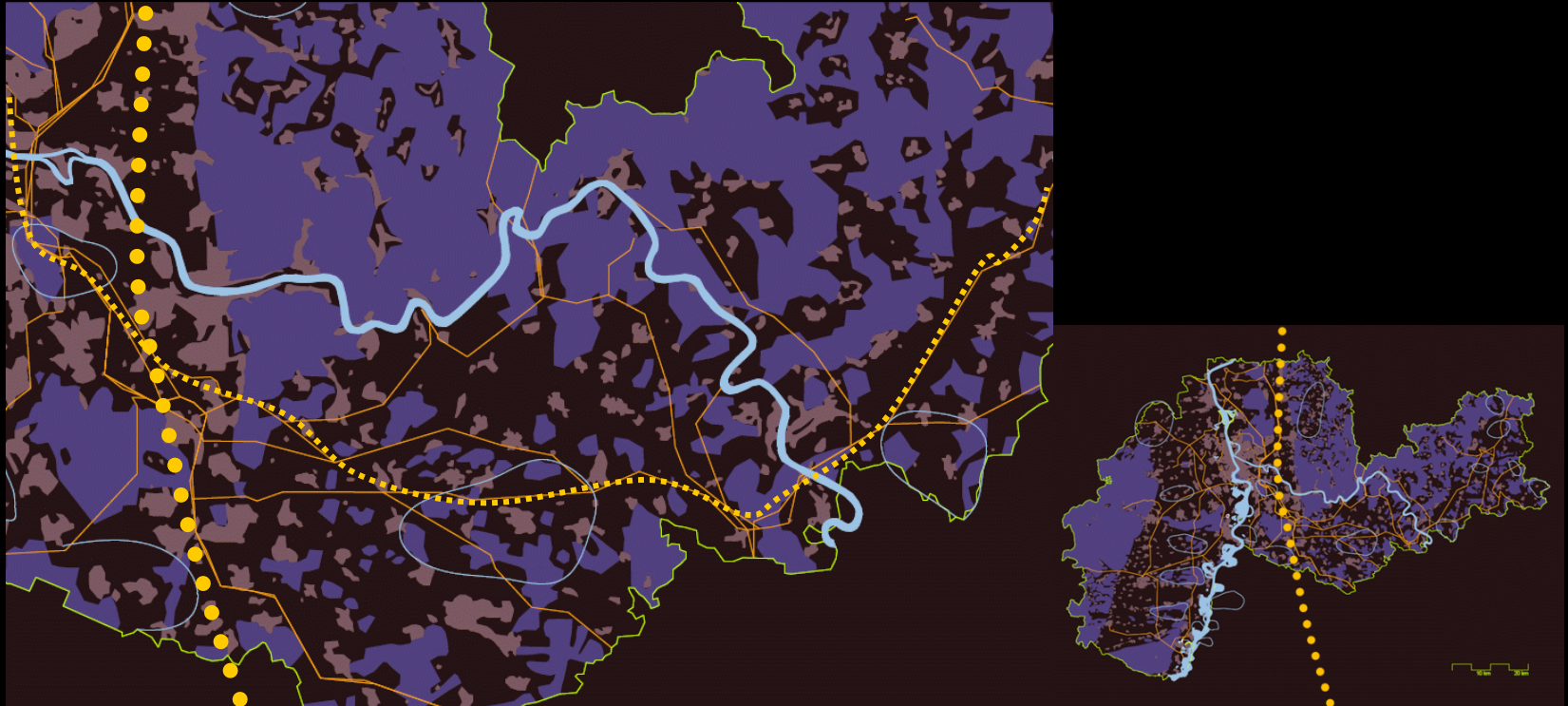


→ Activation of the rail-bound local public transport network, and waterways as 'guideline' for climate neutral mobility

Source: Wuppertal Institut für Klima, Umwelt, Energie GmbH

Integrative Spatial Concept Climate Mitigation & Adaptation

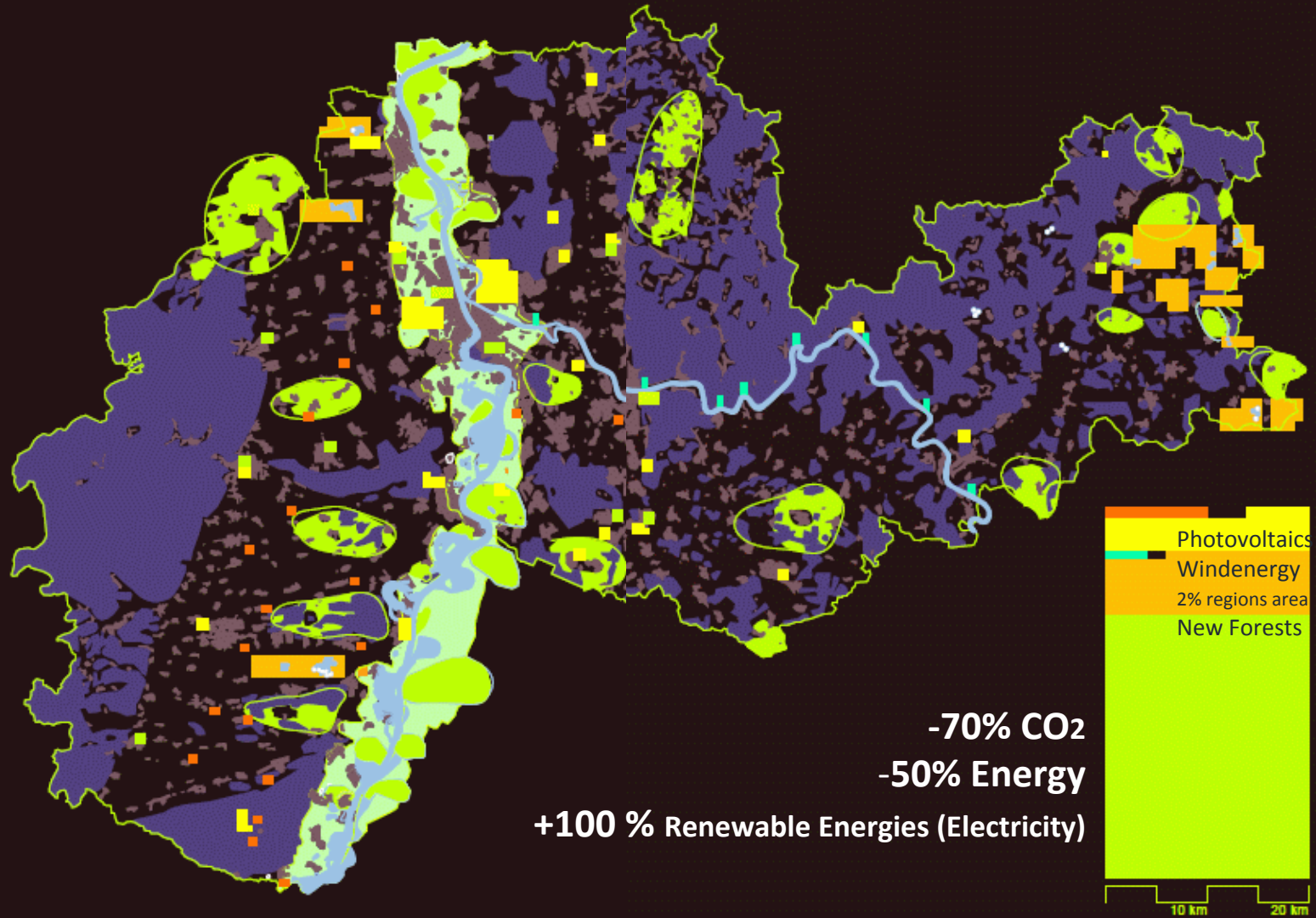
ENERGY TRANSFORMATION 7: Expansion of the electricity network and energy storage



→ underground cables in connection to the transnational network

Integrative Spatial Concept Climate Mitigation & Adaption

NATURE DEVELOPMENT + URBAN RESTRUCTURING + ENERGY TRANSFORMATION



➔ Nature-orientated, Climate-friendly Metropolitan Region 2050



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



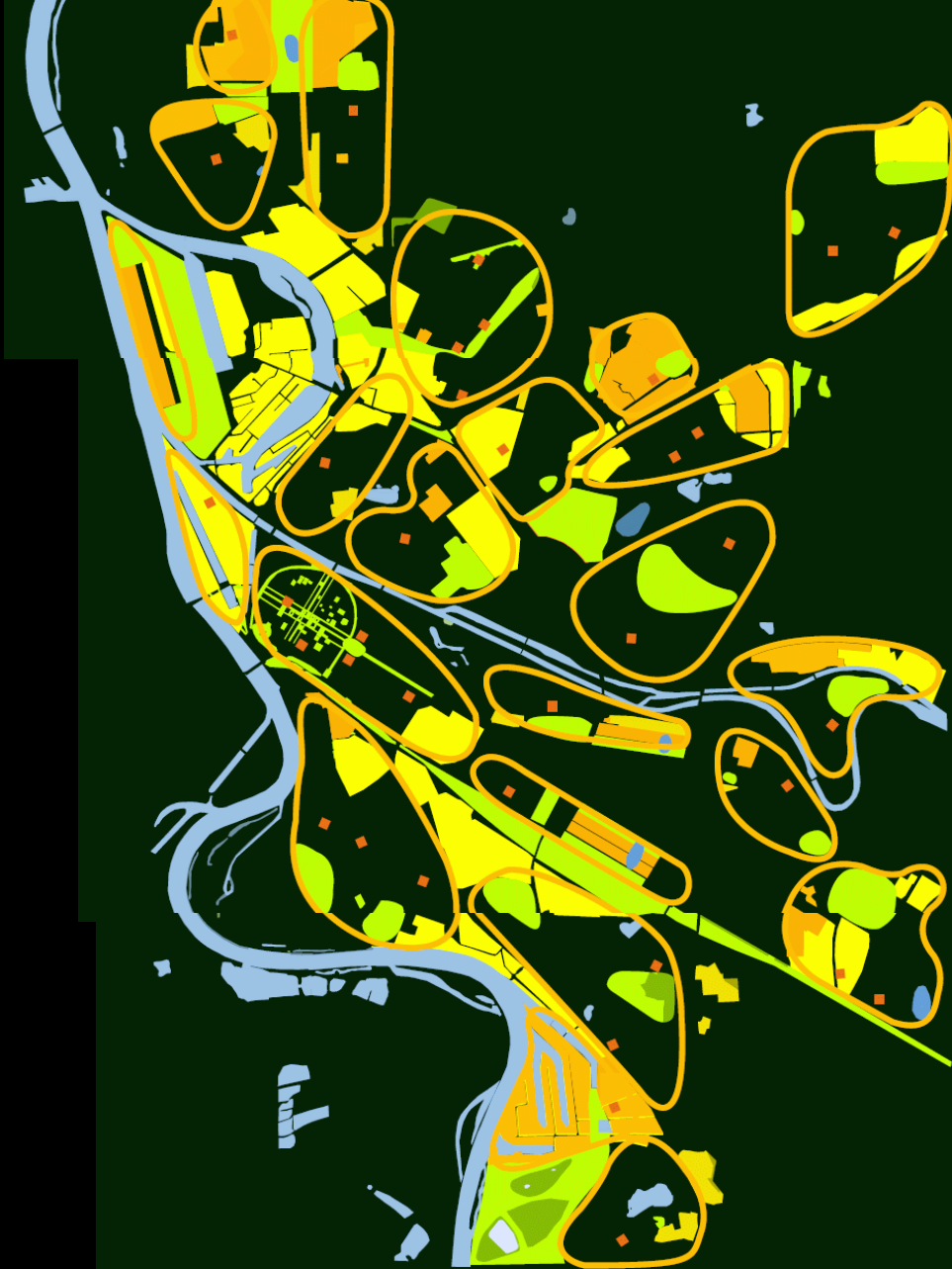
Nature-orientated, Climate-friendly Metropolis 2050




→ Nature-orientated, Climate-friendly Metropolis 2050



➔ Nature-oriented, Climate-friendly Metropolis 2050



 Nature-orientated, Climate-friendly Metropolis 2050

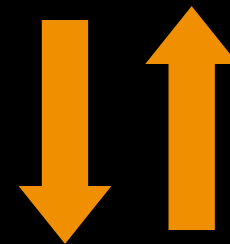


Dr.-Ing. Kristin Barbey WSBE 2017 Hong Kong Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action



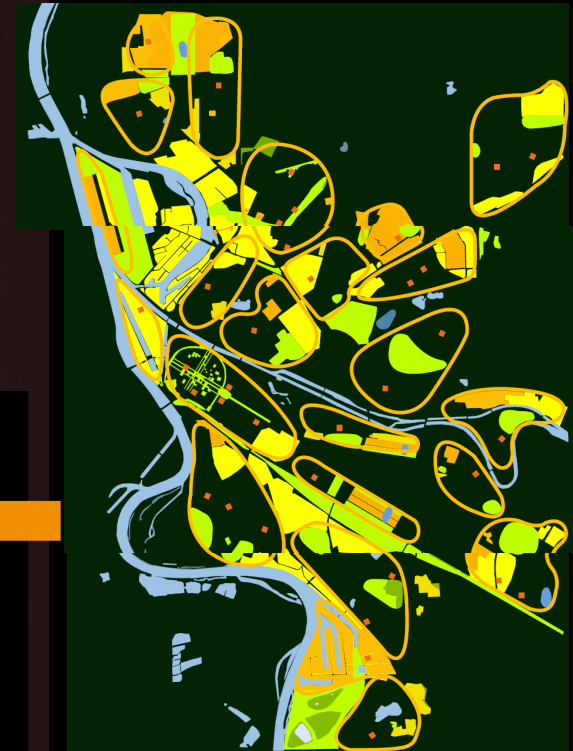
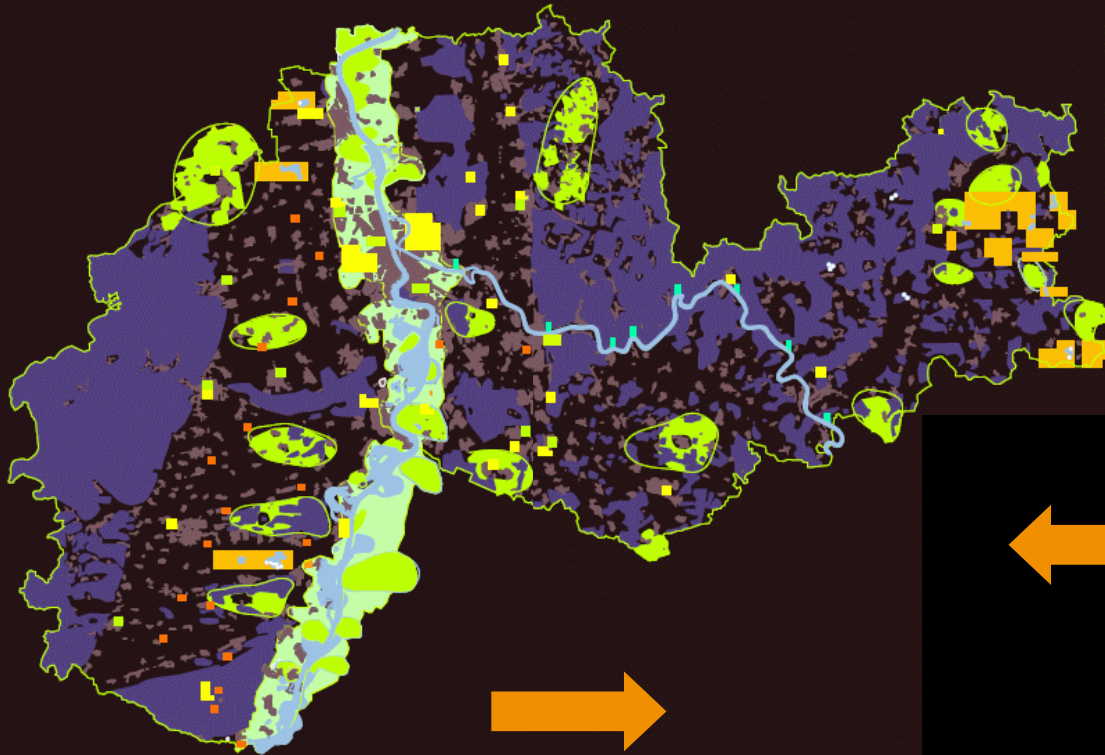
Integrated Spatial Concept of Interacting Strategies Climate Mitigation & Adaption

→ *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



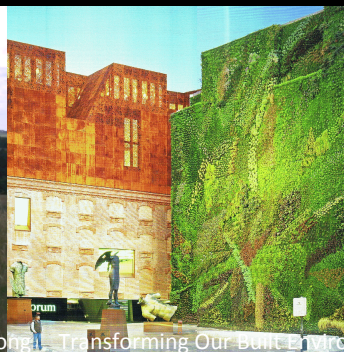
CHANCES

NATURE DEVELOPMENT + URBAN RESTRUCTURING + ENERGY TRANSFORMATION
are qualification processes, which can lead to an improvement of existing qualities.

NATURE DEVELOPMENT
URBAN RESTRUCTURING
ENERGY TRANSFORMATION

→ Chance of ecologic (+ aesthetic) Qualification
→ Chance of aesthetic (+ ecological) Qualification
→ Chance of sociopolitical (+ ecological) Renewal

In connection and interaction of the strategies
NATURE DEVELOPMENT + URBAN RESTRUCTURING + ENERGY TRANSFORMATION





GEMEINSAM FÜR DIE STADT VON MORGEN

Die Stadt – sie ist mehr als Straßen, Parks, Gebäude und Geschäfte. Die Stadt gestalten wir Menschen. Im Wettbewerb „Zukunftsstadt“ des BMBF werden ganzheitliche und nachhaltige Visionen für Städte, Gemeinden und Landkreise erarbeitet. [Bundesministerium für Bildung und Forschung](#)

[Mehr über den Wettbewerb >>](#)

DER WETTBEWERB

TEILNEHMENDE KOMMUNEN

NEUES ZUM WETTBEWERB

VERANSTALTUNGEN



NEUE IDEEN FÜR DIE INNENSTÄDTE VON MORGEN

Dr.-Ing. Kristin Barbey | WSBE 2017 Hong Kong | Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action



WETTBEWERB
Zukunftsstadt
2030+



KREATIVE IDEEN FÜR EINE NACHHALTIGE FLÄCHENNUTZUNG

Die Heimatkunde-Aktion
begeistert Jugendliche für
die Stadtentwicklung

[Zur aktuellen Meldung »](#)

Eure Stadt, eure Ideen

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.*



SYNERGETIC FUTURE CITY



Kilnnoass karistruine Stadt Karlsruhe, train betriebld kreuzung & outdoors

KIC_inno ENERGY Urban Planning and Energy

Dr. Ing. Kristin Barbey | WSBE 2017 Hong Kong | Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action





K I C - i n n o E N E R G Y Urban Planning and Energy



Dr.-Ing. Kristin Barbey WSBE 2017 Hong Kong Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action





K I C - i n n o E N E R G Y Urban Planning and Energy







Christophe Maignien, Marion Nivière

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



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

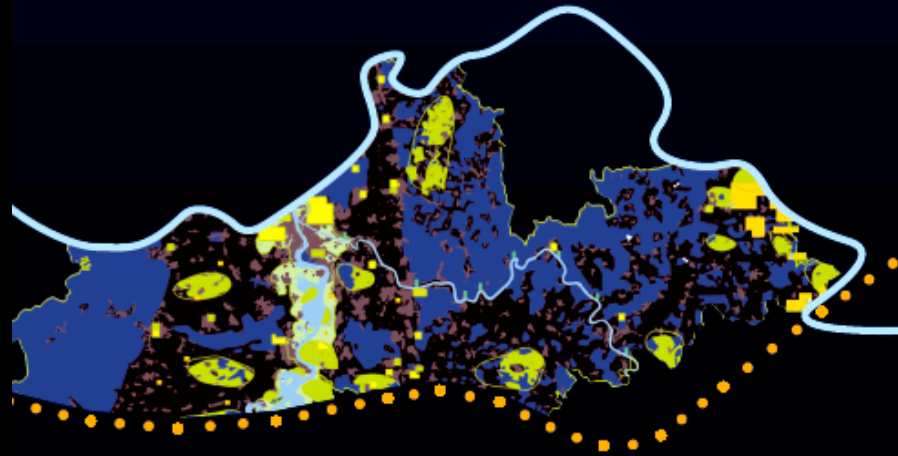
KRISTIN BARBEY

METROPOLREGION IM KLIMAWANDEL

Räumliche Strategien
Klimaschutz und Klimaanpassung

THANK YOU!

kristin.barbey@kit.edu



KIT Scientific
Publishing

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