Nature-based Urban Space Transformation

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ABSTRACT

Climate change and climate impacts require in consequence of their anthropogenic causes a changed handling of space and nature. The objective of this research project is to develop a consistent Integrative Spatial Concept towards a Nature-orientated, Climate-friendly Metropolises 2050, looking for the best place to implement most efficiently the different measures of Climate Protection and Adaptation in the urban and regional context. The Concept of Interacting Strategies: Nature Development and Urban Restructuring and Energy Transfor-mation and The Principles of Connecting and Interacting within a participative process present a path of spatial sustainability in an ecological, aesthetical and sociopolitical regard. The Project Nature is the content base of the Integrated Spatial Conception Climate Protection and Adaptation and the objective of all spatial decisions.

The special challenge in the realization of spatial strategies for Climate Protection and Adaptation and in the success of the transformation is about The Principles of Connecting, Cooperating and Interacting. The upcoming tasks will only be accomplished through a common Societal Act of Solidarity.

Finally the paper questions the transfer of the presented local and regional strategies to the mega-urban level and demands a new Transdisciplinary Thinking considering the entire body of a Megacity.

Keywords: *Integrative Spatial Concept Climate Protection and Adaptation, Project Nature*

1. INTEGRATIVE SPATIAL CONCEPT CLIMATE PROTECTION and ADAPTATION

Out of the overview of already established concepts in European metropolitan regions and due to the analysis of recent research results in climate change and spatial development, forestry and energy science, space and water management, planning theory and nature philosophy, The Concept of Interacting Strategies:

Nature Development and Urban Restructuring and Energy Transformation on every spatial level and scale: Region and City and District and Quarter and House is developed, including the essential theoretical basis for the spatial conception. (Barbey 2014, 50) Within the conception of The Integrative Spatial Concept, the question of the theoretical basis for spatial design and decision-making processes is fundamentally important as well as the definition of priorities and the consideration of spatial effects within the integrative setting of different strategies with the aim to achieve spatial sustainability even in an aesthetical sense. (Barbey 2012, 7-9)

1.1 The project nature

The content basis of the spatial concept, developed in this research project, is the Project Nature. The recognition of the anthropogenic responsibility for global warming and the related climate impact as observed by the IPCC 2007 and 2014 demand the change of the previous form of anthropogenic spatial use (e.g. CO_2 emissions → atmosphere) in expression (e.g. CO_2 emissions) and development (e.g. land use). Climate change and climate impacts require in consequence of their anthropogenic causes a changed handling of space and nature. (Barbey 2014, 50) The content basis of the spatial concept: the Project Nature, starts with the basis of the climate change problem: the way of handling nature. The anthropogenic (man-made) causes of climate change besides natural effects of loss of genetic diversity, species and ecosystems results in a major part on the ignorant way to treat nature: nature has to take up a central position within the discourse and the conception of future spatial development perspectives. (Barbey 2012, 8)

The Project Nature signifies the theoretical background and conceptual basis of the spatial concept and represents within the setting of the Spatial Strategies Climate Protection and Adaptation, the strategic objective for the spatial decision. All represented spatial strategies (Nature Development and Urban Restructuring and Energy Transformation) are orientated according to the Project Nature. In the process of the Integrated Spatial Conception, the orientation on the strategic aims of the Project Nature is of primary importance for the development of future

decisions in dealing with space. The Project Nature includes the qualification of ecological potentials, the stabilization of ecosystems and the renewal of existential space substance. The principle of the ruthless use of natural resources (e.g. CO_2 emissions → atmosphere), as the actual cause of the expected damaging effects of anthropogenic climate change, must be turned into the principle of saving, protecting and developing nature. It is the fundamental project to secure the human existence and maintain decent living conditions as well as to sustain actively Climate Protection and Adaptation. Climate protection, climate adaptation and energy transformation have to be placed on every spatial level and scale. To develop a Nature-orientated, Climate-friendly Metropolitan Region the following strategies are essential: Nature Development and Urban Restructuring and Energy Transformation. The Concept of Interacting Strategies: Nature Development and Urban Restructuring and Energy Transformation has to be developed in the local and regional context on all spatial levels: Region and City and District and Quarter and House. (compare Barbey 2014, 50)

The Project Nature is inspired by the german philosopher Gernot Böhme, who explains in "Die Natur vor uns" ("Nature ahead of us"): The challenge to mitigate climate change and to adapt to its impacts lies ahead of us, as well as "to recognize the state of nature as a common task". "This signifies not only the conservation of nature as something given, but rather the establishing [or development] of nature, even a state of nature, […] that provides a humane existence in foreseeable future. […] Nature lies ahead of us: as a challenge", "Nature has become finally […] a project." (Böhme 2002, 10-26-28)

The process of urban development, which usually begins by the setting of building - and Infrastructure into the open space, should now start from the consideration of the natural conditions (invers). Urban development should be orientated, adapted and integrated to the natural, climatic, and geographical conditions of the site in the local and regional context. The globally accepted philosophy of sustainable development does not provide a profound response to the quintessence of the essential question of our century: the human relation to nature. The fundamental philosophical and ethical basis for a changed handling in respect of nature is needed to give a contemporary societal orientation by a forward-looking explication of the human relation towards nature. Essential aspects of "the respecting appreciation in contrast to the annexation or exploitation of nature" are mentioned e.g. by the German philosophers Martin Seel and Jürgen Habermas, who describes "the immediate aesthetical perception of nature as the essential premise of the potential appreciation of nature". (Habermas 1997,99)

1.2 Aesthetical principles

With the intention of combining ecological and aesthetical aspects in the spatial qualification of the metropolitan area, aesthetical principles are defined in addition to the mentioned ecological principles of the Project Nature, which are in the consideration of the integrative spatial concept of adequate relevant importance. These aesthetical principles orientate the design and the decision making process of the spatial setting to a substantial aesthetic level and represent basically the spatial principles of Concentration and Protection as well as the paradigm of the 21st century towards a sustainable development related to a changed handling of space and nature: Ressource Saving and Energy Efficiency. (Barbey 2014, 50)

2. NATURE-ORIENTATED, CLIMATE-FRIENDLY METROPOLITAN REGION

Applying this content basis and reflecting the particular site-specific consideration such as natural geographical and urban spatial, climatic and energetic parameters, the Integrative Spatial Concept is developed for the metropolitan region Rhine-Neckar with a view to achieving a Nature-orientated, Climate-friendly Metropolitan Region Rhine-Neckar 2050 (Figure 1). This research project is an exemplary attempt to develop a consistent spatial concept relating to the Metropolitan Region Rhine-Neckar (5.640 km^2, 2,4 Mio. inhabitants, the warmest region in the south-west of Germany with projections of increasing heat, rain and flood events, dense polycentric urban structure of cities as Heidelberg, Mannheim and Ludwigshafen and villages in a diverse open space and landscape structure, important universities and highly industrialized urban poles situated in a beautiful Rhine-valley landscape framed by hilly Palatinate and Odenwald forests, confluence of Rhine and Neckar) and the City of Mannheim (145 km^2, 300.000 inhabitants) looking for the best place to implement most efficiently the different measures. As an informal planning instrument, the Integrative Spatial Concept could be the basis for discussions and civic participation with the intention to support the spatial realization of the climate protective and adaptive transformation. (compare Barbey 2014, 50-51)

The design and the decision making process of the spatial concept is furthermore based on the results of different regional studies and some interesting aspects in existing urban and regional concepts. Combining the knowledge and database of transdisciplinary regional research (climatic, demographic and spatial development, forestry and energy science, space and water management, planning theory and

Nature Development 1	*Forest transformation and forest development*	*Climate Adaptation and Protection*
Nature Development 2	*Protection & development of open space*	*Climate Adaptation*
Nature Development 3	*Development of inner-city green space*	*Climate Adaptation*
Nature Development 4	*Room for the river*	*Climate Adaptation*
Nature Development 5	*Groundwater protection*	*Climate Adaptation*
Nature Development 6	*Organic farming*	Climate Protection & Adaptation
Urban Restructuring 1	*Development of the inner-city*	Climate Protection & Adaptation
Urban Restructuring 2	*Development of the existing building stock*	Climate Protection & Adaptation
Urban Restructuring 3	*Energetic urban renewal*	Climate Protection
Urban Restructuring 4	*Climate-friendly and water-sensitive urban development*	Climate Protection & Adaptation
Energy Transformation 1	*Spatial concentration of wind turbines*	Climate Protection
Energy Transformation 2	*Urban concentrated use of photovoltaic*	Climate Protection
Energy Transformation 3	*Use of regional potentials → geothermal energy*	Climate Protection
Energy Transformation 4	*Use of regional and local potentials → bioenergy*	Climate Protection
Energy Transformation 5	*Use of regional potentials → hydraulic energy*	Climate Protection
Energy Transformation 6	*Expansion of public transport & climate neutral mobility*	Climate Protection
Energy Transformation 7	*Expansion of the electricity network and energy storage*	Climate Protection

Table 1: Spatial strategies, principles and synergies climate protection & adaptation

nature philosophy) as well as discussing and verifying the most efficient position (even in an aesthetical sense) for every measure in the local and regional context (compare Barbey 2012, 7-8-9), the spatial concept shows, which appropriate strategies for climate protection and adaptation should be placed where and at which place such measures could be concentrated to advance Climate Protection and Adaptation and to realize the processes Nature Development and Urban Restructuring and Energy Transformation actually on a grand scale. The catalogue of strategies, which could be considered as a kind of Roadmap 2050 Climate Protection and Adaptation for the Metropolitan Region Rhine-Neckar, is considered to be forward-looking. (compare Barbey 2014, 51)

2.1 Recommendation for actions in metropolitan regions

In the sum of the interactive strategies Nature Development and Urban Restructuring and Energy Transformation, for which the effects can be approximately valued on the results of recent scientific reports, 50% energy can be saved, 70% CO_2 emissions can be reduced and 100% of the electricity demand can be covered by renewable energies in 2050. The Integrative Spatial Concept shows the potentials of Climate Protection and Adaptation, the focus of strategies and the combination of measures and their interacting effects and synergies. It represents concentrated activity of priority action areas as well as challenges of local and regional interaction. It locates the objectives Climate Protection and Adaptation and formulates the idea Nature-orientated, Climate-friendly Metropolitan Region 2050 as a common task for local stakeholders and the metropolitan society with a concrete time frame. In the general view of the integrative spatial concept a self-evident picture is developed within the implementation of the different measures. The conception of the spatial setting of the strategies in the plan seems partly self-evident, which is caused by the exact consideration of the site-specific geographical reference and about the Where and How of the integration of measures in the spatial context. The spatial effects of the strategies serve besides Climate Protection and Adaptation to substantial improvement of ecologic and spatial aesthetic qualities. (compare Barbey 2014, 51)

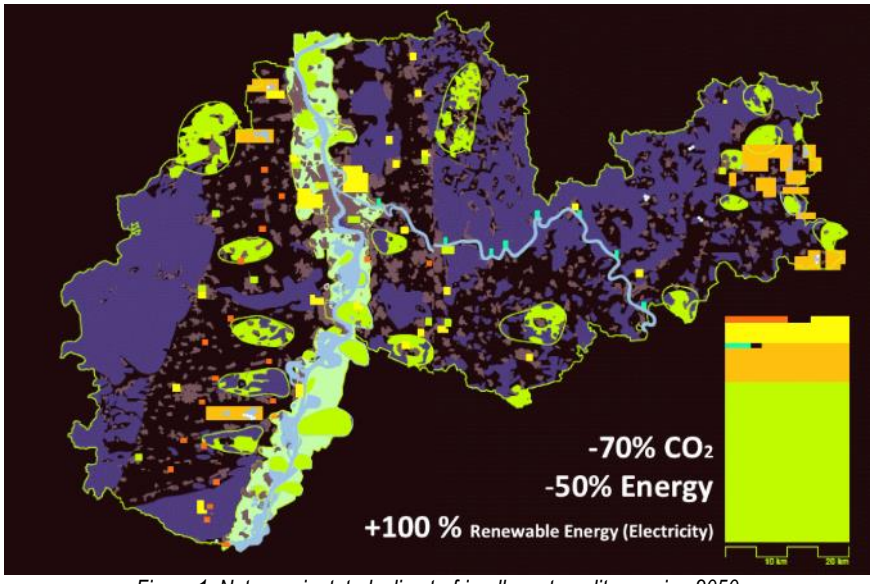

Figure 1: Nature-orientated, climate-friendly metropolitan region 2050
legend: green: new forests, orange: wind energy, yellow: photovoltaics, turquois: hydroenergy red: geothermal energy

The strategies are located within the conceptual designing and decision-making process in Figures 1 and 2 according to the analyzed specific characteristics and abilities of the particular spaces and describe the spatial potentials for Climate Protection and Adaptation in metropolises and metropolitan regions. The overall view of the integrative concept shows the synergetic principle of the interaction of Nature Development and Urban Restructuring and Energy Transformation for Climate Protection and Adaptation. This approach is explicitly oriented to the spatial possibilities and geographical as well as natural conditions of the sites and the existing urban building stock. In the setting of the measures the spatial aesthetic principles mentioned above, have been applied under the title: Concentration and Protection or rather keeping free, which will be explained here with a few examples:

***The principle of emphasizing the natural characteristics**:* The Rhine valley is emphasized as landscape-park with new forests and retention areas. The Palatine and the Odenwald forests are kept free of energy-related interventions. They are protected and presented as specific natural treasure of the metropolitan region. ***The principle of integration in the environmental context**:* New forests are integrated in the sparsely wooded Rhine valley, in the Kraichgau, in the landscape along the Rhine and as urban forest in the cities and additional forest in the Odenwald forest. ***The principle of spatial concentration of structural, natural and energy-technical interventions as well as the continuance of existing potentials**:* Five wind parks are concentrated and connected to existing wind parks and existing networks. According to the priority positioning of the strategy *Nature Development*, the construction of wind energy plants in the Palatine forest and Odenwald forest is a taboo – environmental and landscape protection play the major role in decision-making. ***The spatial characterized choice of location (choice of the adequate location, by weighing up climate protection, climate adaptation and spatial aesthetics)**:* Industrial and commercial areas have the greatest potentials for generating solar power compared to other urban space typologies, because of their large roof structures, as well as façade surfaces. In these areas the energy yield is the highest. For this as well as for aesthetic and practicable reasons (simplified realization of civic power plants), an urban concentrated use of photovoltaics is recommended.

Table 2: Examples of spatial aesthetic principles and their application (Barbey 2014, 51-52)

3. NATURE-ORIENTATED, CLIMATE-FRIENDLY METROPOLIS

The regional strategies: Nature Development and Urban Restructuring and Energy Transformation are transferred to the local level: Green Metropolis and Inner City Development and Energy Efficiency and Energy Generation and the concept Nature-orientated, Climate-friendly Metropolis Mannheim 2050 (Figure 2) is developed to show in addition to the regional (Figure 1), the urban spatial potentials of Climate Protection and Adaptation. Only in the

interaction of integrated regional and local urban strategies the spatial ambition: Nature-orientated, Climate-friendly Metropolitan Region 2050 could be realized. (Barbey 2014, 52)

3.1 Recommendation for actions in metropolises

The following recommendations for actions in Metropolises are derived from the conception Nature-orientated, Climate-friendly Metropolis Mannheim 2050 (Figure 2):

1. Consideration of the natural green space as starting point in urban planning processes and as basis of future urban development:

Establishment of a continuous green space system to develop a resilient spatial structure, which connects the different quarters of the city

Development of the individual urban districts as nature based objects on the ground of the natural green space

2. Development of the individual urban districts as functional clusters of Climate Protection and Climate Adaptation:

Interaction of the concepts Green Metropolis and Inner City Development and Energy Efficiency and Energy Generation, which in total creates a Nature-orientated, Climate-friendly and Water-sensitive Metropolis 2050

3. Nature-orientated, Climate-friendly and Water-sensitive urban development including in every quarter: Concept of Green Metropolis and Concept of Inner Urban Development and Concept of Energy Efficiency and Energy Generation with the aim to develop Spatial Qualities and Spatial Sustainability in the City. (Barbey 2014, 52-53)

4. PRECONDITIONS FOR CLIMATE PROTECTION AND ADAPTATION

The Concept of Interacting Strategies

The Concept of Interacting Strategies Climate Protection and Adaptation:

Nature Development and Urban Restructuring and Energy Transformation and The Principles of Connecting, Cooperating and Interacting must be developed on the essential level of preparation: Climate Policy – Spatial Concept – Climate Economics, on the level of realization: City – Energy Providers – Entrepreneurs – Citizens – Planners – Universities and on the spatial level: Quarter and City, Metropolis and Metropolitan Region, Metropolitan Regions and Nations, Metropolitan Regions Global

Metropolises and Metropolitan regions are important global players towards Climate Protection and Adaptation. Only in the global network of metropolises and metropolitan regions and their interacting spatial strategies, the essential effects of climate protection and climate adaptation can be developed on a global level and the aims of Climate Protection and Adaptation can be reached. (compare Barbey 2012, 340-341)

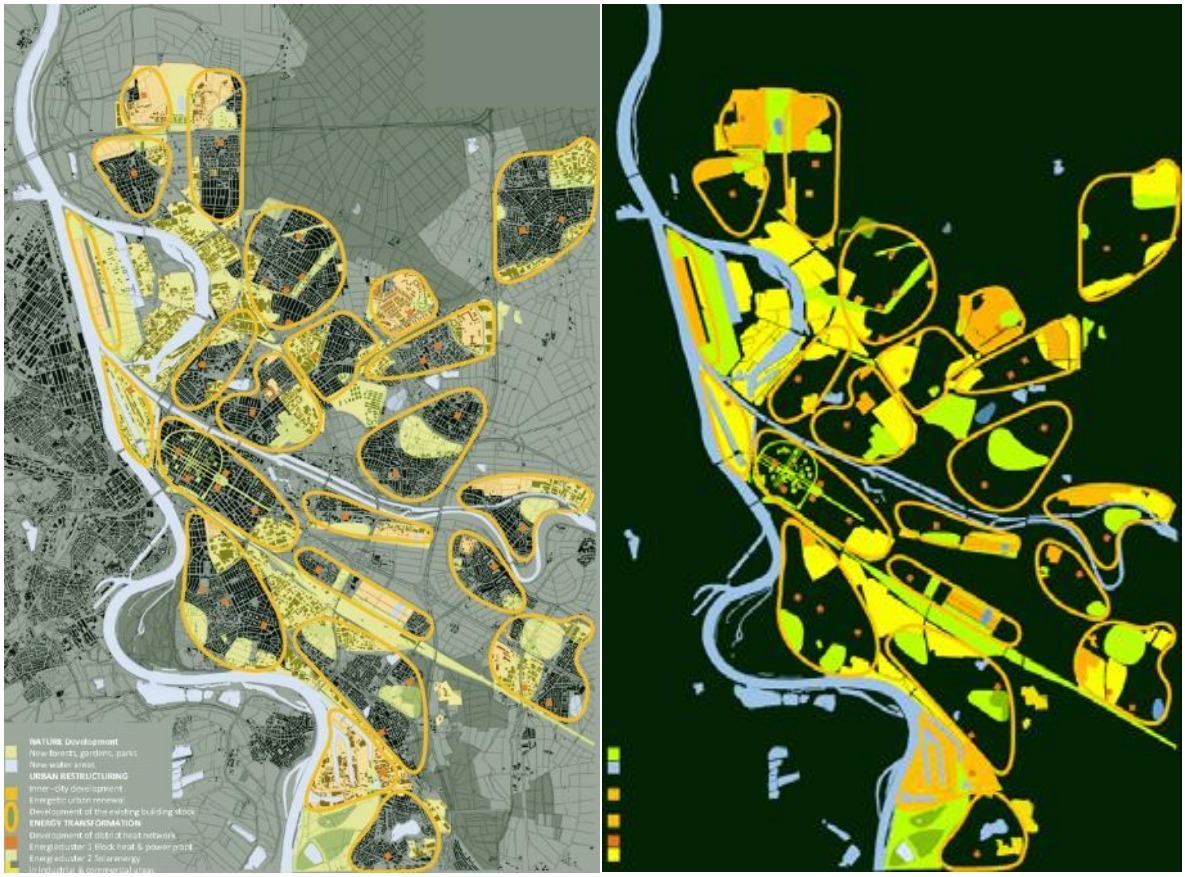

Figure 2: Nature-orientated, climate-friendly and water-sensitive metropolis 2050
Legend: nature development / green metropolis: green: new forests, gardens, parks, blue: new water areas urban restructuring / inner city development: orange: inner–city development, energetic urban renewal, orange line: development of the existing building stock energy transformation / energy efficiency and energy generation: development of district heat network, red: energy cluster 1 block heat and power plant, yellow: energy cluster 2 solar energy in industrial and commercial areas

Political commitment Climate Protection and Adaptation

First experiences in the implementation of the mentioned international examples point to the essential role of political commitments for the spatial implementation of the formulated political aims. Political commitments have to be represented in spatial concepts with a concrete time horizon of realization. They have to correspond to the space and its specific conditions. (Barbey 2014, 53)

The Principles of Connecting, Cooperating and Interacting

The special challenge in the realization of spatial strategies for Climate Protection and Adaptation and in the success of the transformation is about The Principles of Connecting, Cooperating and Interacting. The upcoming tasks will only be accomplished through a common Societal Act of Solidarity. The Concept of Interacting Strategies Climate Protection and Adaptation on the societal level points to the potential to realize appropriate strategies as well as to achieve an appropriate impact of Climate Protection and Adaptation by the societal network of a cooperating citizens and stakeholders. (Barbey 2014, 53) The Interaction of political commitment and civic participation is a key condition to realize Climate Protection and Adaptation. Politicians, citizens, entrepreneurs, planners, architects, engineers, economists, sociologists and artists have to work together to create intelligent solutions for a sustainable urban development. The consistent Integrative Spatial Concept Climate Protection and Adaptation could be the basis for discussions and civic participation with the intension to support the spatial realization of the climate protective and adaptive transformation.

4. CHANCES

Nature Development – Urban Restructuring – Energy Transformation

are qualification processes, which can lead to an improvement of existing qualities.

Nature Development → Chance of ecological (+ aesthetical) Qualification

Urban Restructuring → Chance of aesthetical (+ ecological) Qualification

Energy Transformation → Chance of sociopolitical (+ ecological) Renewal

In connection and interaction of these strategies a development path of sustainable spatial development will be developed in an ecological, aesthetical and sociopolitical regard. (Barbey 2014, 53)

5. NATURE-ORIENTED, CLIMATE-FRIENDLY MEGACITY 2050?

The presented Integrative Spatial Concept sets an example of a possible path towards a Nature-based, Climate-friendly Metropolitan Region 2050. Every mentioned Spatial Strategy and Principle for Climate Protection and Adaptation is generally applicable in every City and Metropolitan Region in Europe and beyond. In addition the described Process of Conception is generally transferrable to every City and Metropolitan Region in the world, always supposing that the selection, the dimension and the combination of strategies are well adapted to the site-specific spatial, energetical, climatical and cultural conditions. After focusing Spatial Strategies Climate Protection and Adaptation on the level of the Metropolitan Region and the Metropolis, the open question is now: will it be possible to transfer the presented strategies even to the level of Megacities? The overview of existing social and ecological problems in Megacities demands the creation of new ideas and new planning strategies - the responsible view towards a Nature-orientated, Climate-friendly Megacity challenges certainly an Integrative, Transdisciplinary Thinking to figure out possible solutions at the local mega-urban level, considering imperatively the entire body of a Megacity. The fundamental question of all mega-urban development is the Project Nature, i. e. the consideration of the natural conditions. The urban development and restructuring of Megacities must be orientated, adapted and integrated to the natural, climatic and geographical conditions of the local and regional context. The essential question of our century: The Human Relation to Nature is drastically present facing existing and future societal and environmental phenomena of mega-urban development worldwide. A changed handling in respect of Nature and Humanity is needed to give liveable perspectives on a global level.

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