cities fit for climate change

Guiding Urban Concepts and Climate Change in Germany's Urban Planning Practice

A review of the recent academic discourse

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Preface

Dear readers,

The reality and fast speed of climate change becomes more evident to the world every day. The scientific community recently declared the 1.5°C goal – an effort formulated in the Paris Climate Agreement – as, from now on, nearly unachievable. As a solution, the New Urban Agenda of the UN Habitat III process states that sustainable cities must play a lead role in reducing emissions from energy and building resilience. While debated on international agendas, this often abstract phenomenon becomes very tangible to citizens, especially in cities, when extreme heat and flooded streets affect everyday lives. This has been experienced in the summer of 2017 in Germany, which was particularly extreme in terms of weather. The German Meteorological Service declared the month of July in 2017 as the rainiest month in German history since measurements started in 1881. Nevertheless, the summer was on average about one degree warmer than usually. In future years, summers in Germany and abroad will be a mixture of hot, humid days and extreme precipitation.

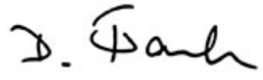
Reacting to this unprecedented global challenge, German cities as well as cities in other parts of the world have initiated projects, strategies and instruments that aim at making urban planning and related investments resilient to climate impacts while at the same time promoting low-carbon development. This effort is supported by overarching guiding urban concepts for urban planning that incorporate climate aspects by providing a framework and vision for the development of a city. Germany has a long tradition of implementing such guiding urban concepts. Therefore, the Cities Fit for Climate Change (CFCC) project commissioned this study to shed light on the academic discourse on the various existing guiding principles in Germany and how they are applied in the context of climate-proof urban development.

CFCC is a project implemented by GIZ on behalf of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), that aims to develop integrated instruments which enable a new approach to climate-proof urban development. In this way, the project promotes innovative solutions for urban planning and makes cities 'fit for climate change'. The partner cities Santiago in Chile, eThekwini (Durban) in South Africa and Chennai in India are supported in further developing their strategies and financing opportunities in a climate-friendly manner. The project aligns itself with the Leipzig Charter on Sustainable European Cities and the BMUB Memorandum on Urban Energies.

This study aims to specifically support the knowledge exchange between Germany experience and the partner cities of the CFCC project. The high uncertainty posed by future climate change impacts needs to lead to a global effort to develop towards a sustainable future, as stated by the United Nations member states in the Agenda 2030. Hence, international cooperation and knowledge sharing are indispensable.

I would like to thank the author, Franziska Laue, for her devoted effort in conducting such a comprehensive analysis. Moreover, I would like to thank the BMUB and in particular its urban development division (SWI1) headed by Dr. Oliver Weigel for their ongoing support.

Through this study, I hope to give you valuable and enriching insights into the significant topic of climate-proof urban development and wish you an inspiring read.



Dr Daphne Frank

Head of the Cities Fit for Climate Change project

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'Liebesinsel', Pegnitz river, Nuremberg

List of abbreviations

Abbreviation	English translation	German translation/original term
BBSR	Federal Institute for Research on Building, Urban Affairs and Spatial Development	Bundesinstitut für Bau-, Stadt- und Raumforschung
BMBF	Federal Ministry of Education and Research	Bundesministerium für Bildung und Forschung
BMUB	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit
BMZ	Federal Ministry for Economic Cooperation and Development	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung
CFCC	Cities Fit for Climate Change	Cities Fit for Climate Change
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol	Vertragsstaatenkonferenz des Kyoto Protokolls von 1997
COP	Conference of the Parties to the 1992 United Nations Framework Convention on Climate Change (UNFCCC)	Vertragsstaatenkonferenz der Klimarahmen-konvention der Vereinten Nationen von 1992
DAS	German Strategy for Adaptation to Climate Change	Deutsche Anpassungsstrategie an den Klimawandel
DST	Association of German Cities	Deutscher Städtetag
EXWOST	Experimental Housing and Urban Design	Experimenteller Wohnungs- und Städtebau
FES	Friedrich Ebert Foundation	Friedrich Ebert Stiftung
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
IBA	International Building Exhibition (in Germany)	Internationale Bauausstellung
ICLEI	Local Governments for Sustainability (International Council for Local Environmental Initiatives)	Verband von Städten, Gemeinden und Land-kreisen für Umweltschutz und nachhaltige Entwicklung
IPCC	Intergovernmental Panel on Climate Change	Zwischenstaatlicher Ausschuss für Klimaänderungen
KARS	Climate Change Adaptation in the Stuttgart Region	Klimaanpassung Region Stuttgart
SDG	Sustainable Development Goal(s)	Ziele für nachhaltige Entwicklung
SWOT	Strengths, Weaknesses, Opportunities and Threats	Stärken, Schwächen, Chancen und Bedrohungen
UNEP	United Nations Environment Programme	Umweltprogramm der Vereinten Nationen
UNFCCC	United Nations Framework Convention on Climate Change	Klimarahmenkonvention der Vereinten Nationen
WBGU	German Advisory Council on Global Change	Wissenschaftlicher Beirat der Bundes-regierung Globale Umweltveränderungen

Executive summary

Cities in Germany are directly experiencing the impacts of climate change. Its consequences put human health at risk and affect urban microclimate and infrastructures, among other impacts. The German government recognises climate change as one of three transformational challenges the country is currently facing, besides demographic change and economic and structural change (BBSR 2016: 12). This serves as the basis for developing planning and development efforts on the regional and local scales. However, there is a need for defining specific ways to translate climate change adaptation and mitigation policies into practical urban planning approaches. This study aims at understanding this theory-to-practice process by looking into the current academic discourse on Guiding Urban Concepts (in German, 'Leitbilder'). Concretely, this is done by analysing to what extent guiding concepts are part of research within the German academic landscape and to what extent they incorporate theoretical approaches such as sustainability and resilience by developing new guiding concepts or revising the existing ones, with a view to interlinking urban and spatial development with responses to climate change.

A guiding concept in urban planning is a tool to translate the need to organising a city's development in its entirety and can be considered a characterisation of a desired state (Brunotte et al. 2002: 325, Greiving et al. 2011: 45) or a goal to be achieved (Lendi 1995: 624), providing orientation and prioritisation. Characteristics of guiding concepts have evolved and diversified along history, determined by political and societal processes. Today, only a few concepts refer to mere spatial aspects and urban form. A large part of existing guiding concepts already considers complex spatial and non-spatial realities, e.g. societal and economic aspects. This is of particular importance when discussing climate change impacts in planning. Furthermore, the inclusion of ecological aspects in urban planning exists since the beginning of the 20th century. Climate change, however, became an urban planning concern only in the beginning of the 21st century. The increasing relevance on the global scale is reflected by realities and initiatives on the local level dealing with the immediate impacts of climate change. Hence, discussion and application of long-term urban planning strategies will require the inclusion of guiding urban concepts that provide an answer to these challenges.

An increasing number of research projects seek solutions for the impacts of climate change in urban settlements in Germany covering a variety of findings related to geographical and topographic settings, as well as to the city size and the rural-urban continuum. Regarding resilience, Godschalk's 2003 assessment criteria served as a basis for various research projects that cut across urban development and climate change impacts in Germany. The guiding concepts that were under investigation by these research projects included various models. According to the KARS project on Climate Change Adaptation in the Stuttgart Region, the 'compact city' and 'axial' concept match with the largest part of the resilience criteria (Korbel and Kurth 2016: 56). The Klimzug Nord project added the concept of 'decentralised concentration' to that list as a suitable one (Knieling et al. 2012: 54). However, all concepts respected the need of open space for fresh air corridors, as well as the need to limit urban sprawl. Lastly, due to its mono-functional structure, the 'perforated model' is considered a less suitable model (Korbel and Kurth 2016: 58).

Nevertheless, none of the models exclusively serves as one-size-fits-all recipe to guaranteeing mitigation, adaptation and resilience in their entirety or combined (Greiving and Fleischhauer's 2009: 17, Knieling et al. 2012: 56, Korbel and Kurth 2016: 60). As a solution, some researchers suggest formulating a new guiding concept. However, the academic community is divided in that question since other researchers (e.g. KARS and Klimzug) suggest further developing existing concepts or combining them. Furthermore, the choice of guiding concepts should be adapted to the context of each city.

Given that cities are key locations to address global challenges, guiding concepts need to be embedded into sustainable urban development and urban resilience (cf. WBGU Summary, 2016: 26). However, the concept of urban resilience for climate-proof planning has its limitations. On the one hand, it has an ecosystem focus that, if translated into a guiding concept, may provide a one-sided interpretation of climate adaptation (Korbel and Kurth 2016: 60). On the other hand, the concept of the 'resilient city' already crosscuts various criteria of the four preceding guiding concepts. Hence, it is recommended that the term 'resilient city' serves as an overarching paradigm rather than as a guiding concept.

Besides, the concept of sustainability entered the discourse of guiding models in urban development in the 1990s (WBGU 2016: 65). The UN's non-binding, voluntarily implemented action plan Agenda 21 for Sustainable Development (1992) marked a milestone in the creation of the idea of sustainability, promoting the slogan 'think global, act local'. In contrast to some previously mentioned guiding concepts, there is no singular set but rather a spectrum of aspects describing a sustainable urban development. There are different models that aim at achieving urban sustainability such as the 'ecological and resource-saving city' (Rogers, 1997), the 'resilient city' (Jabareen, 2013) and the 'low-carbon city' (UNEP, 2013b). Spatially, in order to achieve urban sustainability, elements of preceding guiding concepts can be used and applied in a contextual manner. The 'sustainable urban development' paradigm remains valid for formulating or adjusting guiding concepts. With its non-spatial elements, such as participation and commitment, good governance, mixed mobility modes, greening and sustainable energy, it serves as the overarching frame to embed guiding concepts. In addition, it has the potential to adjust guiding concepts to the very context where they will be applied.

In addition, the latest global initiatives shaping the response to the climate challenges are the Agenda 2030 (2015), the Paris Agreement (2015) and the New Urban Agenda (2016). These initiatives tackle both strategic planning and design tools, as well as identify pathways towards urban resilience. Both the Paris Agreement and the New Urban Agenda entail the confirmation that contextualised planning and management, as well as the reconsideration of existing planning tools can foster climate-friendly and climate-proof urban development. Hence, these processes bring a great potential to further developing guiding concepts with a view to resilience and climate-proof planning.

The 'resilient city' could be seen as one guiding concept among others, hence not as an umbrella term. However, it is an essential concept in combination with existing guiding concepts, paired with a contextualised elaboration of a planning toolbox for climate-proof planning.

Lastly, guiding concepts can play a crucially complementary role in climate-proofing processes. In its final chapter, the study aims at zooming out to different scales, and zooming in into more concrete starting points to contribute to the adjustment of planning with adjusted or newly developed guiding principles. While concepts require modifications, tools and measures require adjustments for their translation into tangible results. This also requires adapting the scales for guiding concepts across municipal borders. Moreover, smaller and localised images help to develop and communicate guiding concepts across all urban actors. Finally, a local and regional planning and administration framework needs to accommodate adjusted guiding concepts.

Neigbourhood Festival, Sendlingen, Munich

About the project "Cities Fit for Climate Change"

The global project Cities Fit for Climate Change (CFCC) is commissioned by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). It forms part of the International Climate Initiative (IKI).

What we do

How can cities cope with the risks of climate change and become custodians of a liveable climate? The CFCC global project is focused on finding answers to this question. Because there are no universally applicable solutions, existing concepts for resilient low-carbon urban development are analysed and compiled in a sourcebook. The CFCC partner cities, Chennai, eThekwini, and Santiago de Chile are supported in developing case specific climate-friendly strategies. The important issue of securing financing for required sustainable investments are also addressed. In the process, these steps facilitate the development of a climate-proof urban development approach, which promotes a new urban design. The lessons and insights from the work are made available at international conferences and as part of global exchange.

How we do it

In order to work effectively together with our partners on climate-friendly urban development, this global project is divided into different components:

- **Component I: Analysing pioneering approaches to climate change:** In this module, good practice examples from around the world are collected and assessed. Descriptions of these projects will be compiled in a sourcebook, which focuses on instruments used and guidelines produced. The sourcebook will also incorporate learnings from the partner cities' projects.
- **Component II: Developing climate-proof city approaches in our partner countries:** The second work package focuses on the partner cities. The local situation is investigated, and available instruments, urban development policies and existing climate change mitigation and adaptation plans are examined. The cities receive advisory services on climate-appropriate urban strategies and are supported in developing their own climate-proof urban development approach. Financing options for the realisation of measures are identified according to local requirements. In all three cities, cross-departmental cooperation is strengthened for more integrated approaches towards climate-friendly urban development.
- **Component III: Contributing to the international discourse on urban transformation:** The third module focuses on supporting the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) on disseminating the knowledge gained in work packages I and II, and thereby influencing relevant international discourses. For example, the project was involved in the international process leading to the formulation of the New Urban Agenda. It now supports its implementation as well as the implementation of the Agenda for Sustainable Development and the Paris Agreement within the United Nations Framework Convention on Climate Change (UNFCCC).

Link to CFCC project video:

Introduction

Climate change brings complex challenges resulting from an unpredictability of its various impacts. However, it also brings opportunities to pursue comprehensive, anticipatory and responsive action, including mitigation and adaptation efforts.

Urban planning and development increasingly integrate climate change scenarios into its academic discourse, as well as into the practical field of planning. Key words are 'climate-sensitivity' (IPCC) or 'climate-proof' urban planning and development. With a view to current and future urban development, urban planning approaches undergo assessment and revision. For instance, the development of long-term guiding concepts aims to foster a sustainable and resilient development of human settlements. This study presents a brief analysis of guiding urban concepts ('Leitbilder') with a view to fostering urban resilience and climate-proof cities.

The first chapter presents the climate change situation and responses in German cities. The German government recognises climate change as a transformational challenge the country is facing. This entails the potential to assess existing guiding concepts and revise new concepts to interlink urban and spatial development with responses to climate change.

The second chapter provides an insight into the concept of urban form and their spatial logic developed throughout centuries. Furthermore, it introduces the current definition and aspects of guiding concepts, which can be understood as the translation of the need to organising a human settlement's development in its entirety.

The third chapter presents the scientific research on guiding concepts particularly in Germany and Europe. Moreover, the chapter introduces a selection of projects of climate change research in the field of urban development, which assessed existing guiding concepts.

The fourth chapter starts with the introduction of David Godschalk's resilience criteria, which have been adjusted by the above mentioned research projects to match to the context of urban resilience and climate-sensitive planning and development. The chapter furthermore presents an assessment of the four concepts based on preceding research projects and presents a brief summary of the current state of discussion on the topic of how guiding concepts are reflected in relation to the climate change discourse. The assessed models are 'compact city model', 'de-concentrated, perforated model', 'axial city model', and 'organised and loosely structured cityscape model'.

Lastly, the fifth chapter presents a brief summary of the current state of discussion on the topic of renewing or adjusting urban planning instruments with a special focus on how guiding concepts are being integrated into the climate resilience and sustainability discourse, presenting suggestions by scholars and research projects.

Box 1: Definition of 'Climate-Proofing'

Building on the analysis of the word 'climate-proofing' in international and national documents, Birkmann and Fleischhauer developed an initial definition (2009: 118) for climate-proofing in connection with spatial planning and spatial development as follows: 'Climate proofing' includes methods, instruments and procedures that ensure that plans, programmes and strategies, as well as the associated investments to-wards the current and future impacts of climate change will be made resilient and adaptable, and that they also aim for the corresponding plans, programmes and strategies to take into account the aim of climate change mitigation.

1 Climate Change Challenges and Responses in Germany

Multiple effects of a changing global climate are noticeable in central Europe. The 2015 Monitoring Report of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) includes 15 indicators to explain in which ways climate change affects Germany and provides solutions on how to adapt to it. These effects include rising temperatures, erratic precipitation such as "more humid winters" (BMUB 2015: 16) and "more frequent extreme weather events" (BMUB 2015: 17). This chapter expands on the impacts of climate change in Germany and the responses to it.

Climate Change Challenges in German Cities

Within Germany, cities are particularly affected by the impacts of climate change. The Association of German Cities (Deutscher Städtetag – DST) points out that climate change poses "risks to their inhabitants, municipal infrastructure and green spaces will continue to rise as a result of midsummer extreme temperatures, heavy rainfall, periods of drought and storms" (DST 2012: 2). However, impacts vary from one city to another, depending on the regional and geographic context, as well as each city's specific urban layout and infrastructure.

Furthermore, current (and future) vulnerabilities to climate change impacts can stem from the city's spatial, physical or administrative development along history, from its planning and governance status, as well as from its commitment and involvement in anticipatory planning.

Responses to Climate Change Challenges in Germany

The responses of the German Government to climate change include commitments to mitigate and adapt to its impacts nationally and internationally. Its climate policy is based on the pillars of "ensuring that average global warming does not exceed the two-degree mark" and recognising risks and preparing "for the inevitable effects of climatic changes that will occur with even a moderate degree of global warming" (BMUB 2014: 9).

Since the 1990s, Germany shows progress in climate change mitigation, e.g. by "decoupling economic growth from greenhouse gas emissions" (BMUB 2014: 11) and meeting its targets of reducing CO_2 emissions by 4.2%, pledged through the signing of the Kyoto Protocol. Moreover, in 2014 BMUB set a new interim target of reducing "greenhouse gas emissions by at least 40% on 1990 levels by 2020" (BMUB 2014: 11).

In addition, the German government has recognised climate change as one of three transformational challenges the country is facing, besides demographic change and economic and structural change (BBSR 2016a: 12), and has introduced a set of programmes to tackle the issue. In 2009, the Climate Mitigation Programme was launched (Ger.: 'Klimaschutzprogramm'). The German term 'Energiewende' describes Germany's 'energy transition policy' preparing a gradual phase-out of nuclear energies. The 'Energiewende' gained further

momentum by the events in Fukushima, Japan. It contains promotion of renewable energies, as one main objective within the 'Energy Concept' in 2010 (BMUB 2014: 10). Another step towards responsive climate policies was 'The German Government's Climate Action Programme 2020' of 2014 (Ger.: 'Aktionsprogramm Klimaschutz 2020'). This programme mainly aims at mitigating CO_2 emissions, while recognising the need for adaptation.

Tackling Climate Change in German Cities

German cities are subject to strategic mitigation and adaptation planning, both complying with national policy and creating own initiatives. BMUB's monitoring report on climate change impacts dedicates two indicators to the human settlement context: 1) construction and 2) spatial aspects of living [heat island effect] (BMUB 2015: 42–50), regional and spatial planning and urban land use planning (BMUB 2015: 206–219).

Mitigation has been the primary response to climate change by German cities so far, particularly through implementing energy-saving measures in the field of retrofitting and public transport (DST 2012: 2). However, the discourse around adaptation has gained attention at a later stage (KARS 2016: 17, Beckmann 2013, BBSR 2015). The increase of extreme weather events happening in Europe during the last two decades, such as the 2003 heat wave and the 2006 extreme precipitation in the federal states Bavaria and Baden Wurttemberg, have raised a sense of urgency to act among both policy makers and civil society. Consequently, cities are implementing strategic measures in spatial planning and urban development in order to adapt to the changing climate and reduce vulnerabilities.

Against this backdrop, in 2008 the 'German Strategy for Adaptation to Climate Change' (Ger.: 'Deutsche Anpassungsstrategie' – DAS) was formulated. It is a compendium of general guidelines for various actors on state, regional and local levels, where settlements and urban development play a crosscutting role for different sectors (DAS 2008: 42).

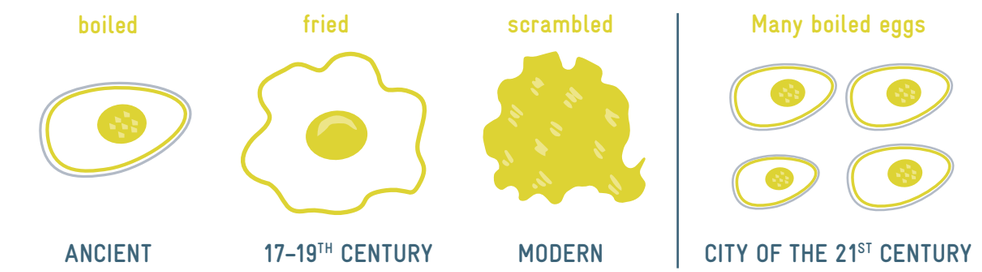
BMUB's monitoring report ('Monitoringbericht zur Deutschen Anpassungsstrategie an den Klimawandel') identifies two umbrella aspects for human settlements and living: urban green spaces as an element to tackle the heat island effect (BMUB 2015: 46); and adaptive buildings to increase thermal comfort. Consequently, retrofitting buildings, in conjunction with respective policies, has become part of the set of its recommendations. In addition, BBSR's 2016 report on adaptation in the urban context describes recent efforts in the field of climate change adaptation in the context of urban and regional planning. The report presents various resources including a toolbox of measures to develop adaptation strategies, focusing on five thematic areas: concern, threats, measures, application, monitoring and evaluation. It furthermore emphasises the crosscutting and prevention-oriented role of planning to facilitate adaptation (e.g. by strategically allocating and securing space for adaptive uses) (BBSR 2016c: 9).

According to the DAS (2008: 40), there is a need to consider and develop guiding concepts and models (Ger.: 'Leitbilder') for an adaptive, climate-proof and resilient city. Such guiding concepts can provide the basis for translating climate change adaptation and mitigation policies into practical urban planning approaches.

2 From Urban Form and Spatial Organisation to Guiding Urban Concepts

Human settlements have developed patterns and spatial logic throughout millennia, experiencing continuous transformation, innovation, growth or shrinkage. Urban form can be organic (grown, e.g. old towns) or planned (following strategic principles and objectives). Largely, both forms exist simultaneously within an urban setting. Historic and political eras have shaped urban form of settlements and serve as "time [that] can be read in space" (Schlögel 2003, quoted in WBGU flagship report 2016), as well as being "critical to both our daily lives right now, and our interpretations of past cultures" (Muscato n.d.). Using another approach, Cedrick Price and Kees Christianse (Fig. 1) describe a city's transforming character through the firmness or dissolution of its borders to (rural) vicinities, making an analogy between a city and an egg.

Figure 1: Evolution of Urban Forms – From Urban Demarcation to Rural-Urban Continuum



Source: Kees Christianse 2010, based on Cedrick Price's 'The city as an egg'

Additionally, Kunert and Zimmermann formulated a system of type identification that serves as a basic systematisation of urban form, based on research by Albers (Albers 1974a: 80, in Kunert and Zimmermann 2012: 148). These can be described by three basic (spatial) elements: point (also understood as anchor, spot or centre); band (line or strip), and space (plane or surface). In contrast to that, Kevin Lynch identifies five ideal-typical urban patterns: 'dispersed sheet', 'galaxy of settlements', and 'core city, i.e. outlined by the urban 'star', and 'ring', axiality', 'constellation', and 'grid' (Lynch 1961: 81) (Fig. 2). These theorisations of 'settlement structures' (Ger.: 'Siedlungsstruktur) have served as a basis for development and adjustment of guiding concepts throughout the decades.

Figure 2: Kevin Lynch's Patterns of a Metropolis

Source: Kevin Lynch 1961

The spatial structure of the 'European City' and of German cities

The idea of the European city and the theoretical normative concepts deriving from it are strong, having gone through continuous reflection. Max Weber coined the term 'Occidental city' in 1921 in opposition to the oriental city, referring largely to the medieval roots of European cities (Häussermann and Haila 2005: 43). He considers the 'Occidental city' as an 'association' that is politically, economically and administratively autonomous, emphasising on self-governance and locally controlled independent markets. Furthermore, the "contract between the city and the countryside was clearly defined" (idem: 51) due to walled demarcations.

In subsequent years, Weber's concept has turned obsolete, with European cities losing their identities in favour of nation states (idem: 43).

German towns follow similar patterns and their development has been shaped by contextual dynamics. For instance, traditional urban forms feature the characteristics of the (medieval) 'European city', i.e. the compact city (see chapter 4.3). Moreover, newly planned or modernist urban forms feature characteristics of contemporary paradigms and guiding concepts (e.g. 1938 Wolfsburg and Salzgitter, Eisenhüttenstadt).

Guiding Urban Concepts and 'Leitbild'

One tool to harmonise and organise human settlements' development is that of formulating a 'vision', a 'guiding principle' or 'guiding concept', in Germany referred to as 'Leitbild'. Guiding concepts are part of urban planning since the mid-19th century (Ringler 2015: 21) and of strategic urban development planning since the 1960s.

Definition of the term 'Leitbild'

The term 'Leitbild' is a German compound word, consisting of 'Leit' (Engl.: steering, guidance) and 'Bild' (Engl.: image, concept or principle). There is a wide range of nuances when it comes to defining this term, also within the context of urban planning. Nevertheless, this study will adopt the translation of the research project 'StadtKlimaExWoSt' (Greiving et al. 2011), which refers to 'Guiding (Urban) Concepts' as legally non-binding 'conventional terms' (Dittrich 1962 in Ringler 2015: 33). Dittrich suggests to always attach a clear description to the very concept, given that it may wear out more meanings associated with it. Dehne (2005, 2009) and Benzel et al. (2011) have opposed the concept of 'guiding concepts' to the term 'strategy'. A 'guiding concept' can be considered a characterisation of a desired state (Brunotte et al. 2002: 325, Greiving et al. 2011: 45) or a goal to be achieved (Lendi 1995: 624), providing orientation and prioritisation.

The German Advisory Council on Global Change (WBGU) refers to "guiding models in urban development" as "important anchor points in the search for a consensus" (WBGU 2016: 64). Moreover, a guiding principle "represents the values of a city or town and functions as an orientation when implementing strategic goals", which should develop itself within a participatory public process (citizens and political and municipal actors). Certain terms, such as 'sustainability', 'compact', 'green', 'urban', and 'city of short distances' may qualify as guiding concepts or principles without actually comprising an elaborated concept (Ringler 2015: 27). Having this in mind, guiding concepts can be coined as metaphors[1] (Picket et al. 2004), which may act as powerful tool "for seeking connections between planning and the science of ecology" (Pickett et al. 2004: 372).

1 For instance, the 'Garden City' can be regarded as a metaphor in planning.

Differences and Commonalities

Guiding concepts have developed differently throughout history based on their underlying principles. Some guiding concepts focus on formalistic spatial aspects and urban form, whereas other concepts include societal (power relations, coexistence, security, etc.), structural and economic aspects.

Nevertheless, according to Greiving et al. (2011: 45) all spatial guiding concepts have certain characteristics in common. Concretely, they are all applied through a consensus-based and coordinated process to change from a status quo into a desired state. Furthermore, they are a) abstract and universal descriptions, b) provide (framed) orientation to develop goals and objectives, c) are applicable (not based on utopia), d) refer to prevailing societal and political values, e) based on the consensus of different concepts, and f) summarise several goals and objectives and serve as derivate for new objectives. Lastly, guiding concepts may have reactive and proactive elements to ensure adaptation in human settlements (ibidem, cf. Benzel 2014).

Streetview at sunset, Leipzig

Evolution of Guiding Urban Concepts in Europe

European cities have undergone various stages of development, growth and shrinkage throughout the centuries, as summarised in the following table:

Box 2: Towards Formulating Guiding Urban and Spatial Planning Concepts in Europe – Historic Overview

- Roman and Celtic eras (e.g. Augsburg, Bonn, Cologne, etc.): following the orthogonal street grid system of the Hippodamus (complex underlying motives).
- 10th cent. A.D.: Autonomous town privileges allowed further growth, governance and secularity.
- 12th cent. A.D.: Preconceived (protective/mitigating) planning of cities and towns.
- 15th cent. A.D.: First theorisations on city and town planning.
- 18th and 19th cent. A.D.: Urbanisation and densification due to industrialisation, as well as urban agglomerations of several towns. (New challenges (e.g. rapid population growth, congestion, social and hygienic issues) emerging, new urbanism concepts were called for (e.g. 'Hobrecht'-plan for Berlin 1862, Garden city concepts by Howard).
- 20th cent. A.D.: Variety of concepts, e.g. early and newer 'Axial Models' (1920s and onward), Organised and Loosely Structured Cityscape (1940s), Socialist City (1950), Automotive City (1957), Urbanity through Densification (1960s), Compact City (1980), Decongested/Perforated city (1980s/1999s), 'Zwischenstadt'/'Edge city'.
- 21st cent. A.D.: Adjusted discourse with view to ecological and climate change related concerns – Sustainable City, Resilient City, Smart city/Future city, Post Carbon City.

Source: assembled by the author with reference to Ringler 2015, Melhorn 2012, Luica 2010

Since the 19th century, European towns dealt with conflicting visions. The use of guiding concepts has been part of urban planning since then (Ringler 2015: 21) and of strategic urban development planning since the 1960s. Throughout history, as categorised by Mehlhorn (2012: 9), guiding concepts were formulated 1) as ideal (utopian) and imaginative visions (e.g. Jerusalem, antique Rome) for newly founded cities and towns; 2) as application-led concepts (e.g. replicating Rome or Paris); or 3) as abstract concepts (e.g. ecologist, individualist, mechanistic and scientific understanding of history as part of planning). Most modern guiding concepts follow abstract concepts, which are in line with an increasing complexity of an urban reality.

Ecological aspects entered city planning in the early 19th century (see Box 1) responding to health concerns caused by industrial activity (e.g. Frankfurt). Since Ebenezer Howard's garden city concept in 1898, ecological aspects became an integral part of city planning. This continued with further concepts, some of which developed merging into a multi-layered constellation of ideas about how an urban entity should develop (Mehlhorn 2012: 9). In 1967, Le Corbusier criticised the growth of cities and calls upon more conscious planning. Planning, ever since, shaped and steered urban development and settlement forms.

References on cohesion discourses in European cities emerged in the early 20th century: Le Corbusier's 'La Ville Contemporaine' of 1922 entails elements of dispersion, yet compactness. His visions shape the 1933 Athens Charter, which describes the contemporary city – determined by a healthy living environment – as a reaction to the un-healthiness of cities since the industrialisation. References on adjusted discourses in European cities include the 1992 Agenda 21. Furthermore, the 1998 New Athens Charter redefines the Athens Charter by promoting the idea of a connected city (e.g. by time, society, environment, space, and 'character'). Adding to the debate on European cities, the 2007 policy document of the Leipzig Charter on Sustainable European Cities formulates objectives of sustainable cities and integrated urban development. Lastly, the 2010 Toledo Declaration aims at "an intelligent, sustainable and social city" (Luică 2010).

Box 3: Guiding Urban and Spatial Planning Concepts Worldwide

Guiding urban and spatial planning concepts are evident worldwide and, in parts, show high complexity, across continents. Even within one nation, each city's timeline reveals its very specific local history of urban evelopment and application of guiding concepts. For instance, guiding concepts can be determined by a multitude of factors – be it ideological, imported (e.g. colonial models), administrative, political, religious, strategic, etc. Some cities continue to be exposed to the challenges of the different social layers today.

South Africa's urban and settlement history looks back to a complex and superimposed confluence of pre-colonial settlements, colonial (European) city models, segregation planning ('Apartheid city'), and post-apartheid city (Heineberg 2016).

Indian settlements have conceptual roots and references to ancient times, e.g. to Vedic (holistic) village and settlement planning. These concepts adopt high symbolism according to the size and spiritual importance of places and locations. This resulted in various settlement shapes based on swastikas, bows or squares. Indian cities also developed according to colonial city models (European and compact city) and modernist expansions.

Chilean cities look back long to pre-colonial settlement patterns (e.g. by the Inca civilisation). Chilean settlement and town planning was influenced by Spanish colonialism. During the 20th century, larger Chilean cities were subject to modernist (mostly European, i.e. Hausmannian) town planning and urban renewal concepts (UN-Habitat 2009: 52) as a reaction to the high urbanisation of the 20th century.

In Brazil, cities count with pre-colonial settlement patterns, overlaid with colonial town planning (Portuguese) planning and modernist planning (e.g. Brasilia's strong formal image, referring to an eagle's wings, resembles the axial model).

Source: assembled by the author with reference to Heineberg 2016, UN-Habitat 2009

View on the city hall of Hamburg

Overview of Contemporary Guiding Urban Concepts in Europe and Worldwide

The following table summarises contemporary guiding concepts, of which four will be discussed throughout this study:

Table 1: Overview of selected Guiding Urban Concepts in Spatial and Urban Planning

Category cluster	English term	German term(s)	Since	Example cities	Resilience assessments
Punctiform City	Compact City/ European City	‚Stadt der kurzen Wege/Kompakte Stadt'	1960s onward	Tübingen	✓
	New Urbanism (Anti-Sprawl movement)	–	1990s	USA	–
	Deconcentrated/ perforated City	‚Entdichtete perforierte Stadt'	1990s	Leipzig	✓
Point-axial City	Axial models/corridor Cities	‚Achsenmodelle'	Early 20th cent.	Hamburg	✓
	Newer Axial (Axial) Models	‚Neue Achsenmodelle'/punktaxiale Stadt	1990s	Hamburg, Copenhagen	✓
	Regional City	–	–	–	–
Decentralised concentration	Decentralised Concentration	‚Dezentrale Konzentration'	1980s	Berlin-Brandenburg	✓
	Sustainable Social City	–	–	UK	–
Decentralisation	In-between City	‚Zwischenstadt'	1990s	Frankfurt/ Rhine/Main area	✓
	Net City based on In-between City	‚Netzstadt', based on ‚Zwischenstadt'	1990s	Frankfurt Rhine-Main	✓
	Edge City	‚Randstädte'	1990s	Detroit	(✓)
	Organised and Loosely Structured Cityscape or Deconcentrated Cityscape through decentralisation	‚Gegliederte und aufgelockerte Stadt'	1950s	Districts in Berlin	✓

Source: Spiekermann (1999), Greiving et al. (2011), Knieling et al. 2012. Summarised by F. Laue 2016

Guiding concepts have developed throughout history. Today, only few concepts refer to mere spatial aspects and urban form, and consider complex spatial and non-spatial (e.g. social, environmental and economic) aspects instead. Furthermore, ecologic aspects have been part of urban planning for a long time. Climate change, however, became an urban planning concern only in the beginning of the 21st century. Global-scale challenges, as climate change and its impacts, find responses on the local level. Hence, discussion and application of long-term urban planning strategies will require the inclusion of guiding urban concepts that respond to the new scenario. The table above presents a selection of guiding concepts that have been subject to academic discourse in relation to an environmental assessment. Those concepts that were subject to or were included in specific (climate) resilience assessments are highlighted with the help of the last column.

Green balcony in Frankfurt a.M.

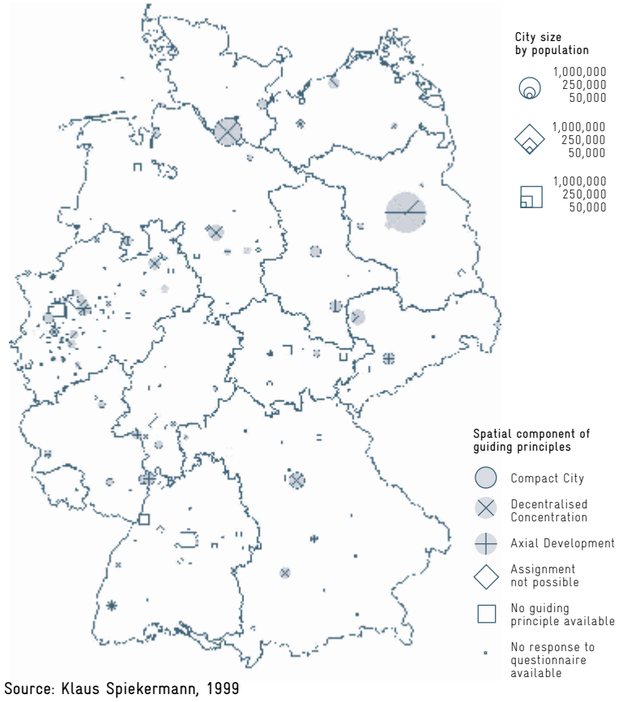
3 Guiding Urban Concepts in Germany

Guiding Urban Concepts in German Cities and Towns

Around 74% of the German population lives in urban areas, a share that is expected to reach 85% by 2050. Germany is characterised by topographic and geographic diversity and a moderate, yet regionally varying, climate. Most cities in the country follow the European city model, shaped by dynamic "territorial fragmented development" (WBGU 2016: 62) throughout centuries. Largely, German cities went through several phases dominated by different guiding concepts in planning and urban development.

Underlying Research on Guiding Urban Concepts in Germany

Figure 3: Analysis of Guiding Urban Concepts in Germany



Source: Klaus Spiekermann, 1999

General Analytical Research of Existing Guiding Urban Concepts

In 1999, Klaus Spiekermann (TU Dortmund) conducted a study on guiding concepts in spatial planning in Germany, which marked a milestone for future research. In his study, Spiekermann mapped the existence of three guiding urban concepts in 194 German cities and towns: 'compact city', 'decentralised concentration', and 'axial city' (Fig. 3). 70% of the cities appeared to have a guiding concept. Spiekermann concludes that the age of guiding concepts relates to the size of the city: the larger a city is, the older are the concepts (1999: 19). As each concept has its strengths and weaknesses, a selected combination of some qualities are recommended to respond to increasingly complex urban realities, for instance compactness and decentralisation can be considered feasible.

The map reveals that one city can comprise multiple guiding concepts. The development of a guiding concept in practice can be either a combination of several guiding concepts, or an iterative process of discussion among different disciplines, including the participation of policy makers and citizens. During this process, "the concepts are tested and developed, taking into consideration existing urban structures, historic and topographic conditions" (Spiekermann 1999: 40). Despite the fact that a guiding concept is not a static medium within the planning toolbox, no update is available on Spiekermann's analysis.

Analytical Research of Existing Guiding Urban Concepts as Part of Climate Change Research

As stated in Germany's 'Climate Action Programme 2020', climate change and the responses to it are assessed in two major ways. The first way would be transition research, which "is concerned with technical and social innovations that promote the development of climate-friendly alternatives to existing technology" (BMUB 2014: 65). The second would be energy research, which "focuses on research, development and demonstration of new technologies along the entire energy chain" (ibidem).

Within the German context, climate change-related research is undertaken in four different fields: prevention of climate change, progress with the energy transition (Ger.: 'Energiewende'), socio-environmental research and urban research (BMUB 2014: 67). Concretely, the 'Climate Action Programme 2020' acknowledges that the "building and urban design sectors play an outstanding role in this context" (BMUB 2014: 65), inter alia providing "appropriate advice and support to make decisions about climate change mitigation" (BMUB 2014: 65). For over three decades now, research has taken place at the interface between ecology and human settlements. Projects on that scale cover the expertise by spatial planners, geographers and urban planners and, to some extent, architects. One major discourse critically investigated is on the future of guiding concepts in spatial planning.

In recent years, the German Ministry of Education and Research (BMBF) has launched several programmes for research on both mitigation and adaptation, including the framework programme FONA (Ger.: 'Forschung für nachhaltige Entwicklungen') which funded projects such as KLIMZUG, contributing to research on a comprehensive strategic agenda – 'Zukunftsstadt' (since 2013).

Lastly, the approach of resilience entered the German research agenda in spatial and urban planning in the second half of the 2000s (Fleischhauer 2008, BMVBS and BBSR 2009).

Guiding Urban Concepts in Relation to Climate Change – Urban Form and Environmental Impacts

Some of the concepts to be presented in the subsequent chapters have had a relevant function for climate mitigation (Ger.: 'Klimaschutz') and adaptation (Ger.: 'Klimaanpassung') planning (Greiving et al. 2011: 45), providing both orientation and prioritisation. The 'Resolution on climate mitigation in the fields of construction, housing and urban development for the 116th conference of ministers of construction, 14th March 2008' aimed at providing guidance for communal urbanism in light of climate change (Greiving et al. 2011: 46), including suggestions for energy policies and environmental frame conditions. It furthermore suggested setting goals for a) impacts from demographic change and related urban restructuring (Ger.: 'Stadtumbau') and further settlement development, infrastructures, and housing; b) raised environmental standards (based on international and national requirements); c) new versions of the energy saving regulation; and d) rising energy costs and liberalisation of the energy market. Besides formulating these goals, the resolution also served as a set of arguments for a constructive discussion among all stakeholders.

Research Projects of Climate Change Research in the Urban Context

An increasing number of research projects links the challenges related to impacts of climate change to the development of rural and urban human settlements. The research projects can be found throughout Germany, guaranteeing to cover a variety of findings related to geographical, topographic settings as well as to sizes and to the rural-urban continuum. These projects include ExWoSt (StadtKlimaExWoSt), KLIMZUG and KARS (Klimaanpassung Region Stuttgart).

ExWoSt (StadtKlimaExWoSt)

The 'Research Programme on Experimental Housing and Urban Development' (2009–2014) includes a research strand on 'Urban Strategies for Adapting to Climate Change' (StadtKlimaExWoSt) (Ger.: 'Urbane Strategien zum Klimawandel'). It looked into lessons learnt in German communities, successfully responding to the impacts of climate change. This included the

analysis of instruments and local actors (BBSR webpage n.d.). Additionally, the EXWOST research project took five guiding concepts in the urban planning field as basis for evaluating their potential adapt to climate change (Spiekermann 1999, Greiving et al. 2011: 47).

KLIMZUG

As part of the federal Government's adaptation strategy, BMBF launched in 2009 the KLIMZUG funding programme (Ger.: 'Klimawandel in Regionen zukunftsfähig gestalten') to conduct research on adaptation strategies in regions. Concretely, the projects of Klimzug Nord aimed at looking into sustainable urban adjustments to climate change in the metropolitan area of Hamburg, including adaptation to river (water) level rise (Klimzug webpage n.d.). A research team of the HafenCity University Hamburg analysed the different 'Leitbilder' and their implementations, published in their 2012 working paper 'Klimawandel und Siedlungsstruktur: Anpassungspotenzial von Leitbildern und Konzepten'.

KARS (Klimaanpassung Region Stuttgart)

BMUB and two municipalities (Ludwigsburg and Esslingen am Neckar) jointly worked on setting up regional cooperation and networks towards climate adaptation. The objective was to embed strategies of responding to the impacts of climate change into municipal and regional planning. One result included the development of a model towards planning based on climate guiding concepts (Ger.: 'Klimaleitplanung'). The research in Ludwigsburg was focused on new developments at the urban fringe dealing with adaptation to heat, whereas in Esslingen, solutions were discussed to facilitate an integrated and comprehensive approach within a compact urban setting, through 'decreasing density'. The KARS project was the first to particularly assess existing guiding concepts on the city scale. Korbel and Kurth (2016) discussed this necessity for the metropolitan region of Stuttgart. The analysis focused on costs, spaces, flexibility, infrastructure and potential for densification.

View on the Media University, Stuttgart

4 Assessment of Selected Guiding Urban Concepts

The following chapter summarises the findings of academic research on guiding urban concepts in the German context.

Assessing Guiding Urban Concepts – Resilience in the Context of Climate Change

The term resilience derives from the Latin word 'resilire' that can be translated as 'leap back' or 'recover from'. The term is synonymous with 'strong' and 'flexible' and is used in both natural and social sciences. Since the 1970s, the term is used in the academic discourse on climate and disasters, in the fields of engineering and ecology (Gaillard 2010: 220).

IPCC's 2014 report defines resilience as "the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation" (Field et al. 2014: 1772). In addition, GIZ refers to resilience based on a definition by the Federal Ministry for Economic Cooperation and Development (BMZ) as "the ability of people and institutions […] to withstand acute shocks or chronic stress caused by fragile situations, crises, violent conflict or extreme natural events, and to adapt and recover quickly without compromising their medium and longer-term prospects" (BMZ 2013). Resilience, firstly helps to deal with the fact that the vulnerability of systems[2] and human communities can never be entirely predicted; and secondly, it helps to develop strategies and concepts that foster better prepared urban and social systems, i.e. mitigation and adaptation, disaster prevention (Godschalk 2003: 138). However, the theoretical concept of resilience of urban communities is "hard to operationalise" (Béné et al. 2012: 45); therefore, it requires identifying practical criteria to ensure and foster urban resilience. Moreover, such criteria help to assess the degree of resilience in existing planning strategies or guiding concepts.

Godschalk's Resilience Criteria

A number of resilience assessments that are applicable to different research sectors were developed during the past decades. In 2003, Godschalk summarised eight assessment criteria of a resilient system to disasters (Godschalk 2003: 139).

2 Godschalk identified four aspects of a resilient system: resilient physical systems, resilient operating systems, resilient social systems, and resilient environmental systems (Godschalk 2003: 139).

Table 2: Resilience Criteria according David Godschalk

	Criterion	Description
1	Redundancy	Securing the entirety of a system through a "number of **functionally similar** components so that the entire system does not fail when one component fails".
2	Diversity	Protecting the entirety of a system through a "number of **functionally different** components in order to protect the system against various threats".
3	Efficiency	Securing a dynamic system through a **balanced ratio** of delivered and self-generated energy.
4	Autonomy	A system that is capable "to **operate independently** of outside control".
5	Strength	A system that has the "power to **resist** attack or other outside force".
6	Interdependency	A system having **interconnected** components that "support each other".
7	Adaptability	A system that has the "**capacity to learn** from experience and the flexibility to change".
8	Collaboration	A system that entails "multiple opportunities and incentives for stakeholder **participation**".

Source: Godschalk 2003: 139

Oberbaum Bridge, Berlin

In order to transfer Godschalk's eight criteria to the spatial and human settlement context, Knieling et al. (2012: 16 f.) formulated five new criteria. Godschalk's criterion of 'Strength' was renamed as 'Robustness'/ 'Consistency' and the criteria 'Exposure' and 'Diversity' were added. Henceforth, a selection of guiding urban concepts served as an assessment basis for three research projects that cross-cut between urban development and climate change impacts in Germany: 'KARS', 'Stadt-KlimaExWoSt', and 'Klimzug Nord'. The following table provides a brief explanation to the five criteria within the urban planning discourse:

Table 3: Assessment Criteria of Guiding Urban Concepts with Regards to Indicators of Resilience

	Criterion	Definition	Analytical indicators for Guiding Urban Concepts
1	Redundancy	• Positive resource turnover to mitigate Co_2 emissions, reduce waste and traffic.	• Route connection • Traffic • Resource efficiency • Cost efficiency
2	Diversity	• Small scale and small spatial mix between infrastructures, buildings, green spaces to ensure a convenient urban microclimate	• Mix of built and un-built spaces • Low density • (High amount of) green spaces
3	Interdependency*/ Redundancy*	• Functionality/capacity of a system • Linked to (functionally similar) supporting systems (in case of failure of one component) • Avoiding mono-functional uses	• Complementary compo-nents • Independence mixed uses
4	Exposure***/****	• Reduce exposure of settlement areas (to ensure robustness) • Avoid construction in vulnerable areas • Preservation of green spaces, fresh air corridors	• Few settlement expansion • Keep clean of vulnerable spaces • Preservation/creation of open spaces
5	Robustness* Consistency**	• Robustness towards extreme weather events, particularly with buildings being located in exposed areas	• Robustness towards extreme weather events • Robust building structure • Flexible building structure

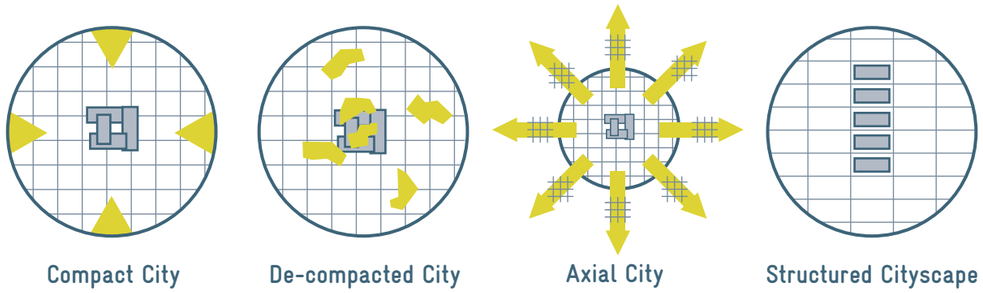
Source: (Sources: *Godschalk 2003: 139, **Korbel and Kurth in KARS 2016: 55, ***Knieling et al. 2012: 16, **** Beatley 2009)

The following chapters refer to the above-mentioned set of criteria, applied to a selection of case studies. However, criteria may vary for each case study.

Selected Types of Guiding Urban Concepts in Germany

Guiding urban concepts used by the above-mentioned research projects included models, such as 'compact city', 'de-compacted city, 'axial city' and 'organised and loosely structured cityscape':

Figure 4: Guiding urban concepts



Source: Kevin Lynch 1961

The following table summarises the selected guiding concepts and their use in the ExWost, KLIMZUG and KARS research projects:

Table 4: Overview of Presented Guiding Urban Concepts

	Guiding Urban Concepts				Assessment - Resilience		
	English term(s)	German term(s)	Since	Example	ExWoSt (Greiving et al. 2011)	KLIMZUG NORD (Knieling et al. 2012, 2014)	KARS (Korbel and Kurth, 2016)
1	Compact city/ European city	'Stadt der kurzen Wege'/'Kompakte Stadt'	1960s onward	Tübingen	✓	✓	✓
2	(Newer) Axial City Concept or Concept of Decentralised Concentration	'Neue Achsenmodelle'/'punktaxiale Stadt'/ 'Dezentrale Konzentration'	1933/ 1990s	Hamburg/ Copenhagen/ Berlin-Brandenburg	✓	✓	✓
3	Deconcentrated/ Perforated Model	'Entdichtete Stadt'/ Perforierte Stadt'	1980s	Halle, Leipzig	✓	✓	
4	Organised and Loosely Structured Cityscape	'Gegliederte und aufgelockerte Stadt'	1950s	Districts in Berlin (Hufeisensiedlung, Siemensstadt), Frankfurt		✓	✓

Guiding Urban Concept 1 – Compact City

The guiding concept 'compact city'[3] is also referred to as 'Short-distance Structure Development' (Ger.: 'Stadt der kurzen Wege'). The origin of this idea comes from the regained appreciation of historic urban patterns and the local identity. The preceding area clearance was replaced with careful building renovation. This concept is also referred to as "European city" (Kiepe 2007: 2) or "contracted city model" (Friesecke n.d.), in opposition to the 'dispersed city'. This guiding concept gained attention in Germany in the 1990s (Spiekermann 1999: 26) and in the European Union it is considered to contribute to achieving the revitalisation of urban centres, while containing urban development, and resource and energy saving (Kaji 2003: 2). The limitations of the concept emerged with some dynamics in different parts of Germany, e.g. shrinking cities in Eastern Germany (Sturm 2007).

Features

Within the trend of turning cities compact, buildings and neighbourhoods are redesigned to human scale (e.g. demolishing large scale infrastructures) (Fürst et al. 1999: 60) and filling empty sites with housing or green spaces.

This concept promotes walking, cycling and a well-connected public transport network (in SURN: 54 Jessen 1998, Bose 1997: 36), as well as functional mixture, with a preference towards internal development, as described by Korbel and Kurth (2016: 54).

Mobility: the compact city guiding concept favours diverse, efficient, mainly de-motorised and affordable mobility. There is a high degree of publicly serviced transport modes. A hierarchy of proximities between destinations (work, leisure and neighbourhood) is part of the concept (see descriptors 8–10 in Table 5).

Open space: adequately distributed open space serves for multifunctional interaction and as a link between various functions. Furthermore, they function as fresh air and ventilation corridors. Ideally, such space should to be kept independent from economic and commercial pressure (Neuman 2005) (see descriptors 11–12, 15 in Table 5).

Life style: part of the concept is also awareness of the population and reflection on their lifestyles, mobility and consumption patterns (see descriptors 15–18 in Table 5). Broad social responsibility needs to be created to implement sustainable and resilient models. Here lies a link to the concept of sustainable urban development and resilience: meaning through adaptive lifestyles and mitigating behaviour and consumption (cf. UN-Habitat 2009: 128).

Adequate density (descriptors 1–7): compactness should not be confused with over-crowdedness. The compact city model promotes an efficient land use and adequate verticalisation in accordance to the human scale. Furthermore, it also refers to an adequate mix and a proximity of functions (see descriptors 1–7 in Table 5).

3 In the context of the US, the concept is called 'transit oriented development' or "neo-traditional towns" (Neuman 2005: 12) which is upheld within the smart growth movement.

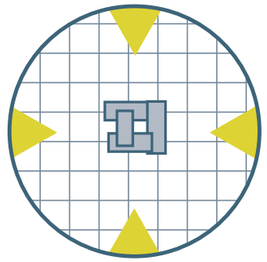
Table 5: Descriptors of the Compact City Guiding Concept

1	–	**(Urban form)** High dense settlements
2	Mixture of land uses	**(Spatial characteristics)** Mixed land use
3	Fine grain of land uses (proximity of varied uses and small relative size of land parcels)	–
4	Increased social and economic interactions	–
5	Contiguous development (some parcels or structures may be vacant or abandoned or surface parking)	–
6	Contained urban development, demarcated by legible limits	**(Urban form)** Clear boundary from surrounding areas
7	Urban infrastructure, especially sewerage and water mains	–
8	Multimodal transportation	**(Urban form)** Less dependence on automobile (← high density)
9	High degrees of accessibility: Local/regional	–
10	High degrees of street connectivity (internal/external), including sidewalks and bicycle lanes	–
11	High degree of impervious surface coverage	–
12	Low open-space ratio	–
13	Unitary control of planning of land development, or closely coordinated control	–
14	Sufficient government fiscal capacity to finance urban facilities and infrastructure	**(Social functions)** Independence of government (← clear boundary)
15	–	**(Spatial characteristics)** Diversity of life (← mixed-land use)
16	–	**(Spatial characteristics)** Clear identity
17	–	**(Social functions)** Social fairness (← high dense settlements)
18	–	**(Social functions)** Self-sufficiency of daily life

Source: (left) According to OECD (2010) and Neuman (2005) based on Burton 2000, Galster et al. 2001, and Song and Knaap 2004
(right) According to Saaty & Dantzig 1974

According to Jan Gehl (2010), building five floors above the ground floor can be considered adequate to keep human interactions possible. Monnet (2015) identified four density types that accumulate to 'human density': physical density, density of urban facilities and urban furniture, vehicular density, and commercial density. Examples of the compact city guiding concept are included in the IBA – International Architecture Exhibition (Ger.: 'Internationale Bauausstellung') in Berlin, Nurnberg and Lübeck (see Fig. 6).

Figure 5: Compact City Guiding Concept



Source: Korbel and Kurth 2016: 55

Figure 6: Example of a Compact City – Lübeck (Germany)

Source: Innomann 2007

Analysis of the Compact City Guiding Urban Concept

The following table summarises the assessment of the compact city guiding concept with regard to its potential to be matching the criteria of a resilient city:

Table 6: Assessment of the 'Compact City' Guiding Concept

	Criterion	Assessment
1	Efficiency	(+) Short distances (+) Low spatial use (+) Efficient infrastructures (+) Low energy consumption
2	Diversity	(+) Mixed urban structures (-) Few un-built areas (-) High density of construction (-) Low central urban green space
3	Interdependency/ Redundancy	(+) Well-connected infrastructure networks (n) Polycentric infrastructures and trading facilities (+) Mixed use
4	Exposure	(+) Low settlement expansion (n) Partial pressure of densification (n) Pressure of re-densification on open spaces
5	Robustness/ Consistency	(n) High sealing of urban surface (n) High amount of shaded areas (+) Robust structures of construction (+) High flexibility of construction (use, density, traffic)

Source: Based on the resilience criteria by Godschalk, ExWoSt, and KARS, prepared by Laue, version March 2017
[Assessment: (-) negative, (+) positive, (n) neutral]

Ecological Aspects

The compact city follows the concept 'resourceful use of central urban space' aiming at responding to future limitation of ecologic resources (Fürst et al. 1999: 61). For instance, filling urban vacant spaces may avoid urban sprawl. Furthermore, new inner city development and brownfield[4] development aim at reducing the sealing of valuable urban surface. This, along with recreational concepts of the surrounding towns and communities fosters the natural recovery of sealed urban soil and opens opportunities for their ecologic rebalancing. High built up density and a mix of uses achieve short-distance structure development: new real estate development in existing neighbourhoods increases the feasibility of alternative transport modes and walkability, in opposition to the concept of a car-friendly city. Hence, reducing noise and air pollution. Tertiary sectorial uses and complementing residential uses ensure mixed use. Computer aided technology can help identifying adequate compactness.

Limitations and Challenges

The application of the compact city guiding concept can be challenging in cities with high urban growth, industrial concentration, planning policies that contribute to sprawl, or reverse residential property taxation. Furthermore, Michael Neuman addresses the paradox that "for a city to be sustainable, functions and population must be concentrated at higher densities", yet to be liveable, these "must be dispersed at lower densities" (Neuman 2005: 16). Even though attributes such as "greenery, sense of safety, good schools and quiet streets" (ibidem) can also be found in sprawling city concepts, the compact city has a more sustainable reputation (Beatley 1995, 384).

However, mixed use could cause challenges. For example, it could lead to the increase of housing prices and over-densification, transit congestion and insecurity. Ecological consequences could be a high demand of energy, contamination, heat island effect and loss of open space (cf. Kunz 2015: 88). Regulations and incentives need to be created to attract an investment in central areas that aims at a sustainable use. In addition, the compact city guiding concept is strongly linked to the Northern American and European city concepts, resulting in a difficult transferability to other contexts. The successful application of this guiding concept is very context-specific and should go beyond the reproduction of (European city) images and generic designs. Lastly, urban growth will remain a challenge to a balanced sustainable and resilient urban development.

Promotion of the Compact City Guiding Concept

The compact city is a central element in discussions of various agencies. For instance, UN-Habitat points out that the compact city model requires "a close link between planners and engineers involved in urban infrastructure" (UN-Habitat 2009: 213). Additionally, it also mentions that it is a central consideration for planning and managing cities in a post-oil era, emphasising on "public transport and pedestrian-based movement" (idem: 5, 70). Furthermore, a 2010 OECD report promotes compact growth to maximise related complementarities, also named as 'Eco-compact city policy' (idem: 22, 106). In addition, the Japanese government developed a policy referring to the compact city guiding concept (idem: 217), aiming at reducing congestions, shifting transport modes, and increasing urban density. However, the OECD raises questions on how to apply the guiding concept in differing contexts (idem: 130).

Role in Urban Sustainability, Resilience and Climate-Proofing

The compact city guiding concept shows a great potential towards a climate-proof city, through a high degree of efficiency due to its compactness (incl. low costs in infrastructure and energy and low land acquisition), and a low grade of exposure, due to a compact urban core (Greiving et al. 2011: 47, KARS 2016: 54).

According to the OECD report, increasing density of residential areas contribute to combatting climate change by facilitating adaptation and mitigation measures regarding land use zoning, retrofitting and building codes, transportation, waste management, etc. (2010: 130). The report acknowledges that informal urban areas show attributes of the compact city guiding concept, such as a mix of uses, car-free areas and a strong sense of community. The 2009 UN-Habitat report discusses the compact city guiding concept as a concept that reduces "excessive use of energy" (2009: 158). Consequently, the concept appears to suit climate-proofing. In addition, it also points out social benefits of the model, such as reduced segregation among social groups (ibidem). However, current tendencies such as "market forces towards sprawl" and decentralisation of work challenge the concept (idem: 159).

4 The term 'brownfield' describes formerly developed (urban) land that is currently unused or underused.

Guiding Urban Concept 2 – Axial City Guiding Concept or Concept of Decentralised Concentration

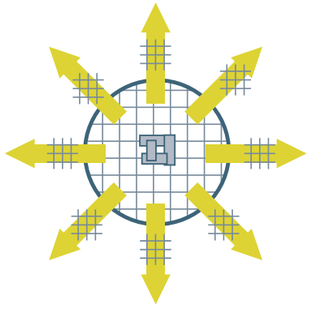
The guiding concept of 'decentralised concentration' is a European concept with dispersed urban functions that are coordinated by public entities in line with private actors and is related to the axial city concept, developed by Fritz Schumacher for Hamburg. With the political transformation at the end of the 1980s in central and Eastern Europe and the German reunification, Western German cities faced an increase in population due to immigration, resulting in urban growth. This challenged the prevailing guiding concept of the 'compact city', which proved to be insufficient for the new scenario. The uncontrolled development of housing projects and commercial estates in the city fringes called for a new guiding concept of 'decentralised concentration'.

Since BMUB included this new guiding concept in the 1992 'Regional Planning Act' and in the 1995 'Action Framework for Spatial Planning Policy' (Fürst et al. 1999: 63), it has become an objective of the German towns and cities agenda. Moreover, planning along this principle is guaranteed in the 'Federal Spatial Planning Act'. In the English-speaking planning discourse, the concept is referred to as 'Corridor Models' or 'Concept of Decentralised Concentration'. Today, academia distinguishes between 'Early Axial Models' and 'Newer Axial Models'.

Features

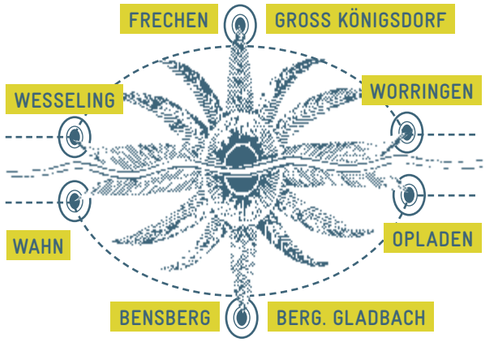
Characteristics of 'decentralised concentration' are fostering a layered system of centres and sub-centres (cf. Knieling et al. 2012: 28), while guaranteeing socially and ecologically adequate urban development, high-density locations and a mix of uses (Fürst et al. 1999: 63). This mix of functions contributes to the relief of larger urban centres. Any green space (buffer zone) between centres and axes provides green infrastructures for urban ecological functions (idem: 57). In the decentralised guiding concept, the urban 'corpus' is determined by compact continuous 'settlement axes' (resembling tentacles) towards the city core, facilitating good accessibility to the city centre by transit lines served mainly by public transport. Examples for newer axial model compositions include Hamburg, Munich (Directed Density), Berlin, Copenhagen ('finger plan') and Stockholm ('pearl chain').

Figure 7: Axial City Guiding Concept and Concept of Decentralised Concentration



Source: Korbel and Kurth 2016: 55

Figure 8: Figure of Hamburg Plan



Source: Fritz Schumacher 1922

Analysis of the Axial City Guiding Concept

The following table summarises the assessment of the axial urban development model with regard to its potential to be matching the criteria of a resilient city:

Table 7: Assessment of the 'Axial City' Guiding Concept

	Criterion	Assessment
1	Efficiency	(+) Efficient traffic system (+) Efficient infrastructure (+) Pooling of infrastructures
2	Diversity	(n) Large spatial diversity (–) Small spatial compactness (+) Green spaces in axial interspace
3	Interdependency/ Redundancy	(–) Orientation along axes and centre (n) Singular autarkic settlements with relevant infrastructure in the centre (+) Mixed use in compacted points
4	Exposure	(–) High sealing of urban surfaces (+) Consistent axial structures (+) Flexibility of construction in the basic pattern inside settlement cores
5	Robustness/ Consistency	(n) Low settlement expansion along axes (n) Partial pressure of densification (+) Clearing of green areas and open spaces between settlement cores

Source: Based on the resilience criteria by Godschalk, ExWoSt, and KARS, prepared by Laue, version March 2017
[Assessment: (-) negative, (+) positive, (n) neutral]

Ecological aspects

The axial city guiding concept guarantees green unbuilt corridors with essential urban ecological functions: fresh air corridors and habitat for flora and fauna. This provision of fresh air inside the usually highly sealed and dense city's core is a relevant ecologic feature supporting climate change adaptation. In addition, the connection of dense axial cores reduces the need for motorised traffic, which plays a crucial role in the mitigation of GHG emissions.

Role in Urban Sustainability, Resilience, Climate-Proofing

This guiding concept has potential towards being adaptive to climate change impacts, especially in terms of relieving heat stress. One disadvantage is that the concept in its strict application would entail limited compactness due to its linear concept. Moreover, this would seal a considerable amount of surfaces, enhancing the urban heat island effect.

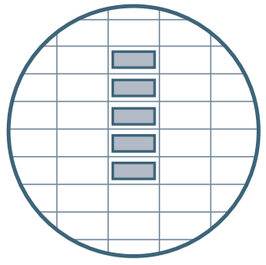
Guiding Urban Concept 3 – Organised and Structured Cityscapes

The guiding concept of the 'Organised and Loosely Structured Cityscape' (Ger.: 'Gegliederte und aufgelockerte Stadt'), also called 'Deconcentrated cityscape through decentralisation' (Salin 1960: 27), was developed in 1944 and republished 1957. This concept was predominant after the Second World War, with around 50% of the urban building stock destroyed in Western Germany (Fürst et al. 1999: 41), and an existing lack of building material and economic hardship due to the reparation payment. Vast areas were subject to rebuilding, however, due to lacking post-war visions, historic guiding concepts and terminologies (from National Socialism) were initially adopted.

Features

The concept connects landscape with built environment, similar to Howard's Garden City. Connections were concentric and axial, dividing the city into cells with the centre being a representative (not geographic) centre. Its hierarchy follows Walter Christaller's "system of central space and places" of the 1930s (Fürst et al. 1999: 42).

Figure 9: The ideal Structured Cityscape Concept



Source: Korbel and Kurth 2016: 55

Figure 10: Example – Hufeisensiedlung in Berlin (Germany)

Source: Berlin Senate n.d.

Analysis of the Organised and Loosely Structured Guiding Concept

Table 8: Assessment of the Organised and Loosely Structured City Guiding Concept

	Criterion	Assessment
1	Efficiency	(–) High traffic (–) High land consumption due to settlement structure (+) High utilisation of infrastructures
2	Diversity	(n) Missing diversity of structures, yet available on large scale (+) Scattered areas with vast green spaces
3	Interdependency/ Redundancy	(–) Mono-structures (–) Concentration of critical infrastructure (–) Missing mix of (urban) use
4	Exposure	(–) High use of spaces (large scale) (+) No pressure of densification (+) Dispersion due to green spaces
5	Robustness/ Consistency	(+) Due to demolition and re-naturalisation, good local microclimate (–) Susceptible open (loose) building structure (n) Low flexibility due to mono-structures, but reserved (open spaces) available (for modification/conversion)

Source: Based on the resilience criteria by Godschalk, KARS, prepared by Laue, version March 2017
[Assessment: (-) negative, (+) positive, (n) neutral]

Ecological aspects

This concept allowed walkability and a reduction in the dependency on cars (Fürst et al. 1999: 43). However, it did not foresee the increasing needs for services and spatial organisation of an urban and prospering society. Hence, car traffic would have been an unavoidable feature. Therefore, the concept contains potential for climate change adaptation, featuring aspects of the compact city, such as walkability, short distances and dispersed green. However, its dispersion represents a weakness, especially in terms of mitigation.

Role in urban sustainability, resilience, climate-proofing

The guiding concept will foster climate-proofing planning efforts in combination with other strategic components and guiding concepts in a contextual manner.

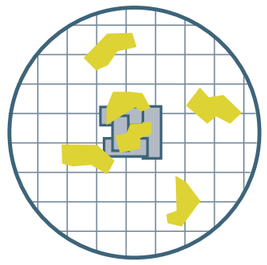
Guiding Urban Concept 4 – Deconcentrated/ Perforated Concept

After Germany's reunification in 1990, Eastern Germany's cities started to 'shrink'[5] due to migration, leaving vast infrastructures and housing unused. The 'Deconcentrated and perforated' city concept (Ger.: 'Entdichtete und Perforierte Stadt') responds to this shrinkage.

Features

The Deconcentrated/Perforated concept aims at a selective decreasing density of cities. Abandoned areas are re-naturalised and transformed into fresh air corridors. The result is a more heterogeneous space and urban functions with new qualities (Korbel and Kurth 2016: 54) for leisure and regional adaptation and lowers the decelerated suburbanisation. However, it enhances social polarisation due to an increased choice of residential locations (Knieling et al. 2012: 28) and urban centres may lose adequate functional density due to a decreasing purchase power (Jessen 2007: 55ff in Knieling et al. 2012: 28). This concept is widely adopted in cities such as Leipzig and Halle.

Figure 11: Ideal Concept of Decentralised Concentration



Source: Korbel and Kurth 2016: 55

Figure 12: Example of Decreasing Density in Shrinking Cities – Halle (Germany)

Source: Rößler 2010: 94

5 The term 'Shrinking cities' described this phenomenon, including decreased fiscal revenues, redundant infrastructures and unused building stock (Fürst et al. 1999: 63).

Analysis of the Deconcentrated City Guiding Concept

The following table summarises the assessment of the concept of decentralised concentration with regard to its potential to be matching the criteria of a resilient city:

Table 9: Assessment of the Decentralised Concentration Guiding Concept

	Criterion	Assessment
1	Efficiency	(-) Reduction of short distances (car dependencies) (-) Inefficient infrastructure (-) Low utilisation of infrastructures
2	Diversity	(n) Large spatial diversity (+) Green spaces in axis interspace
3	Interdependency/ Redundancy	(n) Partially well-connected infrastructure networks (n) Minimum of infrastructure (n) Partial mix of (urban) use
4	Exposure	(+) Low settlement expansion (+) No pressure of densification (+) Population reduction due to partial demolition
5	Robustness/ Consistency	(+) Improved microclimate as per additional (new) open spaces (n) Viable structures thanks to adequate decreasing density (n) Partial demolition of building stock and renaturation of open spaces for future uses

Source: Based on the resilience criteria by Godschalk, KARS, prepared by Laue, version March 2017
[Assessment: (-) negative, (+) positive, (n) neutral]

Ecological Aspects

The concentration of compact urban functions in subcentres avoids uncontrolled urban functions inside the 'buffer zones', supporting the role in climate change adaptation of these. The sub centres can follow the principle of 'Short-distance Structure Development', creating functional functional compactness to avoid sprawl. In addition, public transport is feasible, yet it may partially be dependent on car traffic, due to its decentralised nature making air pollution remain higher than in the compact city.

Conclusion of the Analyses

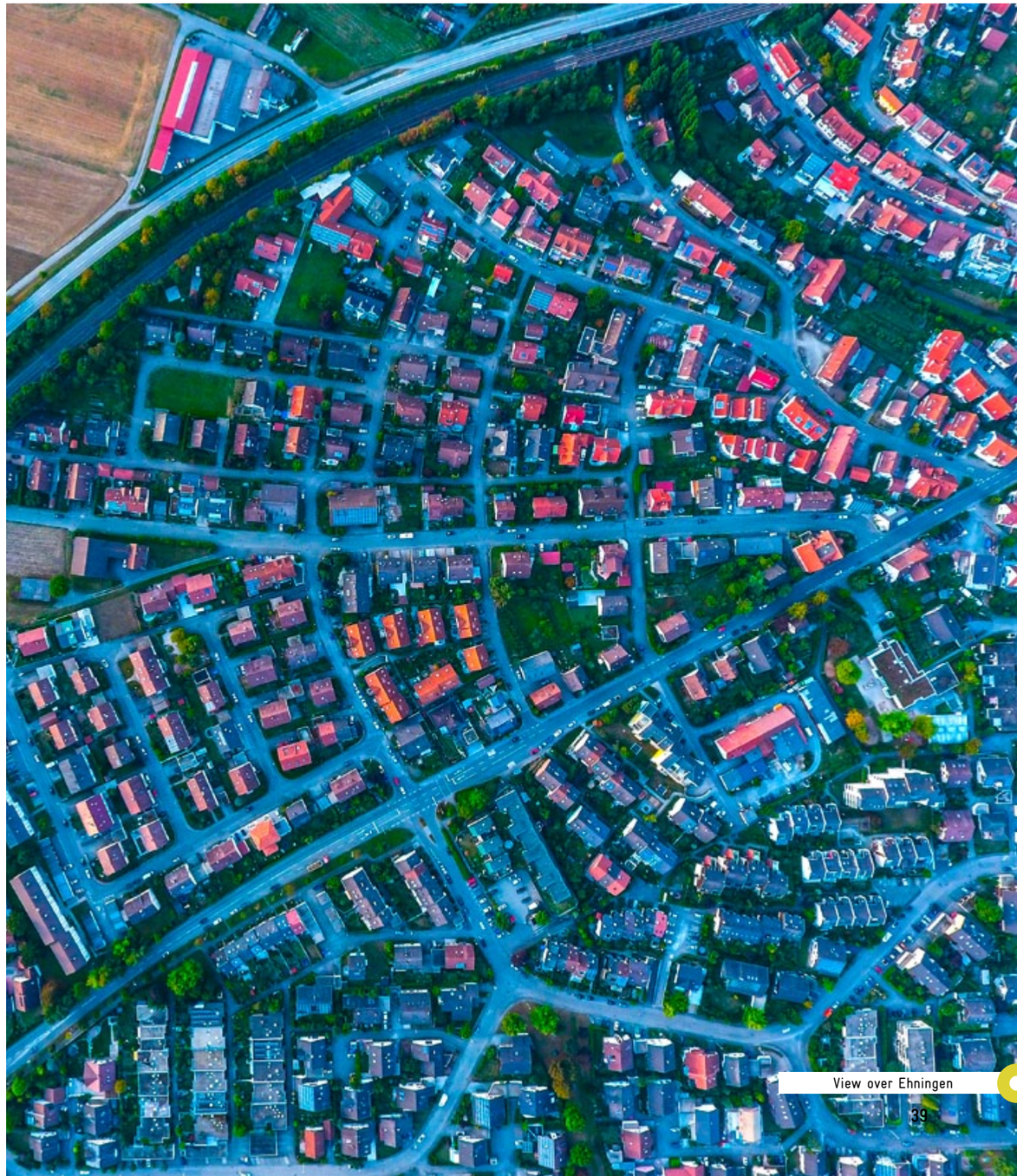
Considering the summarised analyses and the conclusive statements by the academic scholars, all guiding concepts are partially feasible for the climate-proofing of cities. The following table provides an overview of the findings:

Table 10: Assessment of Four Guiding Urban Concepts

	Criterion	Compact City Guiding Concept	Axial City Guiding Concept	Organised and Loosely Structured Cityscape Guiding Concept	Deconcentrated/ Perforated Guiding Concept
1	**Efficiency***	(+) Short distances (+) Low spatial use (+) Efficient infra-structures (+) Low energy consumption	(+) Efficient traffic system (+) Efficient infra-structure (+) Pooling of infra-structures	(-) High traffic (-) High land consumption due to settlement structure (+) High utilisation of infrastructures	(-) High traffic (-) High land con-sumption due to settlement structure (+) High utilisation of infrastructures
2	**Diversity***	(n) Mixed urban structures (-) Few un-built areas (-) High density of construction (-) Low central urban green space	(n) Large spatial diversity (-) Small spatial compactness (+) Green spaces in axis interspace	(n) Missing diversity of structures, yet available on large scale (+) Scattered areas with vast green spaces	(n) Large spatial diversity (+) Green spaces in axis interspace
3	**Inter-dependency**/ Redundancy***	(+) Well-connected infrastructure networks (n) Polycentric infrastructures and trading facilities (+) Mixed use	(-) Orientation along axes and centre (n) Singular autarkic settlements with relevant infrastruc-ture in the centre (+) Mixed use in compact points	(-) Mono-structures (-) Concentration of critical infrastruc-ture (-) Missing mix of (urban) use	(n) Partially well-connected infra-structure networks (n) Minimum of infrastructure (n) Partial mix of (urban) use
4	**Exposure****	(n) High sealing of urban surface (n) High amount of shaded areas (+) Robust structures of construction (+) High flexibility of construction (use, density, traffic)	(n) Low settlement expansion along axes (n) Partial pressure of densification (+) Clearing of green areas and open spaces between settlement cores	(-) High use of spaces (large scale) (+) No pressure of densification (+) Dispersion due to green spaces	(+) Low settlement expansion (+) No pressure of densification (+) Population reduc-tion due to partial demolition
5	**Robustness**/ Consistency****	(+) Low settlement expansion (n) Partial pressure of densification (n) Pressure of re-densification on open spaces	(-) High sealing of urban surfaces (+) Consistent axial structures (+) Flexibility of construction in the basic pattern inside settlement cores	(+) Due to demolition and re-naturalisation, good local microcli-mate (-) Susceptible open (loose) building structure (n) Low flexibility due to mono-struc-tures, but reserved (open spaces) avail-able (for modifica-tion/conversion)	(+) Improved micro-climate as per addi-tional (new) open spaces (n) Viable structures thanks to adequate decreasing density (n) Partial demoli-tion of building stock and renatura-tion of open spaces for future uses

Source: Based on the resilience criteria by Godschalk, KARS, prepared by Laue, version March 2017
[Assessment: (-) negative, (+) positive, (n) neutral]

According to the KARS project, the 'compact city' and 'axial' concepts match with the largest part of the resilience criteria (Korbel and Kurth 2016: 56). Klimzug Nord added the concept of 'Decentralised concentration' among the most suitable (Knieling et al. 2012: 54). All concepts highlight the need for open space and for fresh air corridors, while limiting sprawl. Due to its mono-functional structure, the 'perforated model' is considered less suitable (Korbel and Kurth 2016: 58). As revealed by these analyses, even though all concepts foster resilience, none serves as a one-fits-all recipe to guarantee mitigation, adaptation and resilience in their entirety nor combined.



View over Ehningen

5 New Guiding Urban Concepts Versus Revision of Existing Guiding Concepts

Given that none of the current guiding concepts solves the complexities of urban issues alone, while leading to climate-proofing, the question arises whether a new guiding concept will be needed.

Towards New Guiding Urban Concepts

The German Advisory Council on Global Change (WBGU) calls for adapting the existing guiding concepts and, if necessary, to invent new ones (WBGU 2016: 2). Consequently, efforts to develop new guiding concepts have picked up. Greiving and Fleischhauer suggest formulating guiding concepts that foster 'climate responsibility', 'Resilience towards hazards', and a 'resilient society' (BBSR 2009b: 18). In the mitigation context, new guiding concepts have appeared, such as the 'energy efficient city', the 'CO_2-neutral city', the 'resource efficient city' or the 'energy self-sufficient/independent city' (cf. Korbel and Kurth 2016: 60, BMBF/BBSR 2009: 49). However, new guiding concepts should include, besides spatial implications, social (housing, social infrastructures, combatting social segregation, mobility, urban qualities and social city) as well as environmental aspects (traffic, air and climate, open space and commitment) (Spiekermann 1999: 27).

Towards Adjusting Existing Guiding Urban Concepts

The KARS research group points out that there is no necessity to formulate a new overarching guiding concept for a resilient city. They argue that the existing concepts already include elements of resilience and that creating a new resilience concept would lead to focusing on adaptation and mitigation, leaving out economic and social aspects (Korbel and Kurth 2016: 60), potentially creating competition between a socio-centric and eco-centric urban agenda. Instead, some researchers suggest making use of elements from different guiding concepts or broadening the criteria catalogue of existing guiding concepts (BBSR 2009b: 18, Knieling et al. 2012: 60) by intertwining criteria of resilience and sustainability.

Adding Criteria to Existing Guiding Concepts & Contextual Aspects Matter

Existing guiding concepts have been adjusted in recent years, especially in order to include mitigation efforts into planning. Nevertheless, further steps will be needed to include criteria that ensure sustainability (cf. chapter 5.4). According to the KARS research project, the concept of the 'compact city' (based on the Leipzig charter) can be extended by criteria to ensure robustness and resilience.

As mentioned in chapter 3.2, context plays a significant role for the successful application of guiding concepts. Particularly relevant are acknowledging topographic and geographical situations (e.g. river, valley), as well as re-evaluating the contemporary and previous ecological situation and climate impacts.

Adequate and Integrated Combination of Guiding Urban Concepts

In German cities, the four explained concepts represent the base for developing further guiding urban concepts (cf. Spiekermann 1999: 22). In the KARS project's analysis about Stuttgart, it has become evident that the topographic setting requires the use of specific guiding concepts. As a result, the project suggests a combination of the axial, compact and sustainable city according to the 'Leipzig Charter' (Korbel and Kurth 2016). As mentioned in chapter 3.2, combining concepts is common practice in German cities. As a result, there is a balanced development, which considers prevention of extreme weather events (Korbel and Kurth 2016: 58-59). Hence, for a climate friendly and climate-proof development, a set of suggestions, listed in the following table, have been formulated (cf. KlimaScout 2012):

Table 11: Key Points for Developing a Guiding Urban Concept for Climate Mitigation and Adaptation

Key Points	Elements
Compact city with adequate urban density	• Keep settlements and their elements coherent and adequately compact (according to local situation), • Keep settlements and their elements connected (but avoid sprawl!), • Keep short distances to foster and consolidate adaptive behaviour
Small-scale mixture of uses (housing, working, services, leisure)	• Avoid mono-functional development and inadequately low development
Close infrastructure network to avoid too high concentration of infrastructures	• Allow polycentric structures and development
Reduction of resource throughput (cf. BBSR 2009a)	• Reduce CO2 emissions by reducing waste and traffic • Facilitate a resilient layout, infrastructure (and services) and building stock, fostering low energy consumption, or generating (renewable) and low-emission energy, • Invest in high-standard of construction and their durability
Increase of robustness of newly developed settlement areas	• Identify autarkic structures/elements within the existing and planned system/layout, • Increase the adoption of development axes that allow further compact development, yet flexibility to respond to unforeseen disasters or erratic weather events
Generously landscaped and greened city to create and preserve open spaces	• Increase the adoption of relief corridors and spaces (i.e. ventilation)
Socio-cultural guiding concepts	• Raise and maintain awareness on all actors' levels, turning knowledge and awareness into values • Develop and maintain sustainable lifestyle (Bosse et al. 2011: 6)

Source: KlimaScout 2012, translated by F. Laue 2016

Green rooftop, Frankfurt a.M.

Process of Adjusting and Developing Guiding Urban Concepts

As recommended by 'KlimaScout 2012' and BMVBS/BBSR (2009a: 7), the following steps contribute to developing guiding concepts that foster a local sustainable and adequate climate:

Table 12: Key Elements to Ensure Guiding Urban Concept Development	
Embed any guiding concept discourse in a process.	• Embed the discourse into a targeted implementation of the discourse • Ensure a monitoring process
Ensure participation	• Include all stakeholders of urban (and if needed rural) development in the specific context. • Include local citizens and inhabitants in the development/ revision of guiding concepts.
Legitimise the output/concept	• Legitimise the revision/new formulation of guiding concepts to serve as a foundation for future planning
Holistic nature of the concept	• Make sure to embed the new/revised guiding concept in a comprehensive strategy.

Source: Based on and translated from BMVBS / BBSR 2009a: 7, adjusted by F. Laue 2017

The 'KlimaScout' project's free-access database provides instructions for workshops to develop a guiding concept (Tischer et al. n.d.), which can be either top-down or bottom-up. These are summarised in the following table:

Table 13: Top-down or Bottom-up Elaboration of Guiding Urban Concepts for Sustainable and Resilient Cities			
	Top-Down Elaboration	Bottom-up Elaboration	Combined Elaboration
Features	• Elaboration of guiding concepts (exclusively) by municipal (expert) staff along with mayor or governor	• Direct involvement of (affected and/or concerned) citizens in the process along with public and private and civic sector	• Combination of top-down and bottom-up strategies – Usage of interviews and surveys, focus group discussions, questionnaires, etc. – Public discussions – SWOT analyses – Usage of moderation techniques – Collaboration in targeted (multi-stakeholder) working groups – Random sampling of adjustment suggestions – And moderated short listing of suggestions – Commitment to elements of the guiding concept in daily practice on all tiers
Advantages	• Less need for coordination	• High degree of identification • Eased implementation of selected measures	• Coordination of process (time and milestones) • Transparency in process to all tiers
Challenges	• Expected lower degree of identification with decisions in urban society	• Time consuming • Increased complexity of the process	• Time consuming

Source: KlimaScout 2012, translated by F. Laue 2017

Towards Integrated Guiding Urban Concepts

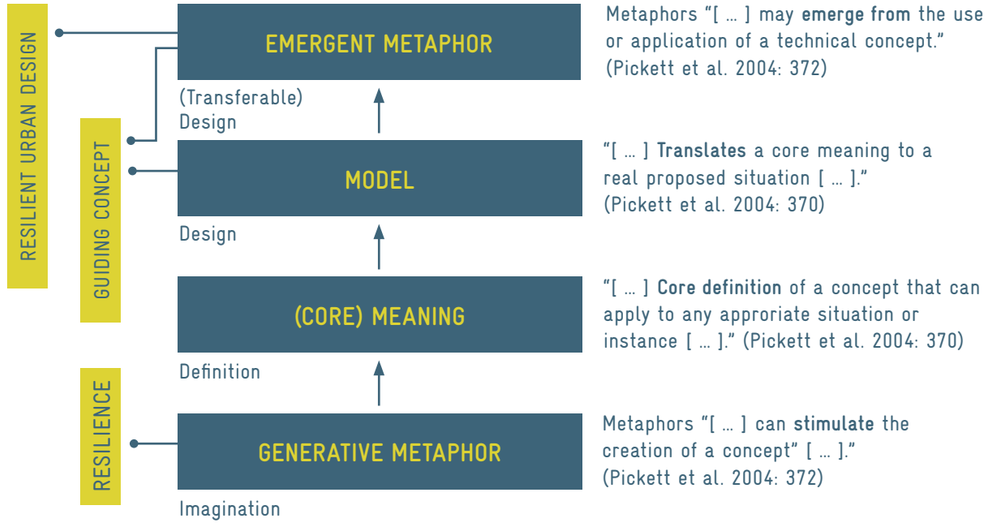
The adjustment or development of guiding concepts needs to be embedded into at least two prevailing paradigms: sustainable urban development and urban resilience (cf. WBGU Summary, 2016: 26). Furthermore, global initiatives, such as the Agenda 2030, the New Urban Agenda or the Paris Agreement, will influence this process.

Towards Integrated Guiding Urban Concepts – Paradigm 2 - The Resilient City

Chapter 4 introduces the criteria to assess the degree of resilience for guiding concepts in urban planning. This sub-chapter will briefly discuss the discourse around the 'resilient city'. In theory, and progressively in practice, cities can be resilient or strive for resilience. However, is there a concept or a 'resilient city' paradigm?

According to the World Bank, "a resilient city can adapt to a variety of changing conditions and withstand shocks while still providing essential services to its residents." Godschalk defines 'resilient city' as "a sustainable network of physical systems[6] and human communities" and suggests that it needs to be tackled in a multi-disciplinary way (2003: 14, 137). However, according to Jabareen, city resilience is particularly hard to grasp as dealing with complex systems[7] (2013: 221). Additionally, ICLEI, which annually hosts a congress on resilient cities, defines 'resilient city' as "prepared to absorb and recover from any shock or stress while maintaining its essential functions, structures, and identity as well as adapting and thriving in the face of continual change. Building resilience requires identifying and assessing hazard risks, reducing vulnerability and exposure, and lastly, increasing resistance, adaptive capacity, and emergency preparedness" (ICLEI 2015). Moreover, Jabareen presents a 'resilient city framework', comprising of four interlinked concepts: vulnerability analysis, uncertainty oriented planning, urban governance and prevention (2013: 227).

Figure 13: Guiding Urban Concepts and Resilient City Metaphor



Source: Adopted from Pickett, Cadenasso and Grove 2004, F. Laue

6 According to Godschalk, "physical systems are the constructed and natural environmental components of a city" (2003: 137). Human communities entail formal and informal ways of social and institutional capacities.

7 As pointed out by Folke et al., complex systems are "characterised by multiple pathways of development, interacting periods of gradual and rapid change, feedbacks and non-linear dynamics, thresholds, tipping points and shifts between pathways, and how such dynamics interact across temporal and spatial scales […]" (2010: 721).

Béné et al. discuss the notion of resilience and its growing influence and acknowledge that "applying a resilience framework helps thinking holistically (i.e. about the 'system')" (2012: 44). However differentiating between good and bad[8] resilience, they caution not taking 'resilience' as the new ruling paradigm imposed by policy makers or donors to support projects (idem: 47). Furthermore, the authors suggest to not "romanticise" the concept of resilience, in order to avoid unquestioned positivism.

Towards Integrated Guiding Urban Concepts – Paradigm 1 - Sustainable Cities and Urban Development

WBGU names five fields for transformation: decarbonisation, energy and mitigation of climate change; mobility and transport; urban form; adaptation to climate change; and poverty reduction and socio-economic disparities (2016: 17). The adjustment or development of guiding concepts needs to be embedded into at least two paradigms: sustainable urban development and urban resilience (see chapter 4). The idea of sustainability entered the discourse of guiding concepts in urban development in the 1990s (WBGU 2016: 65). WBGU suggests creating a guiding concept that offers orientation for cities to transform towards this paradigm (idem: 17).

WBGU lists different guiding concepts that aim at achieving urban sustainability in different ways. Among them, the 'social city', the 'cultural city' (Schmitz, 2001) and the 'liveable city' (Hall and Pfeiffer, 2000) focus primarily on the needs of the urban population; the 'competition-oriented city' (Zehner, 2001) focuses on economy; and the 'inclusive city' and the 'accountable city' focus on political aspects (UN-Habitat, 2002; WBGU 2016: 65). Influential documents in this discourse include the UN's non-binding, voluntarily implemented action plan Agenda 21 for Sustainable Development (1992), promoting the slogan 'think global, act local', and the 'Leipzig Charter' (2007).

As it can be seen by the variety of terms sustainable urban development does not describe a singular set, but a spectrum of dynamic aspects and dimensions, describing a sustainable urban development: economy (work and wealth); society (social coherence and social solidarity); environment (stable ecosystems); shelter (decent affordable housing for all); access to resource-conserving mobility; life (building the 'Liveable City'); and democracy (empowering the citizenry) (Hall and Pfeiffer 2000). Above all, sustainability is a systemic concept, requiring interaction between tiers, levels and sectors (cf. citizen participation and commitment). However, as a sustainable city refers to non-spatial elements (e.g. participation and commitment, mixed mobility modes, greening and sustainable energy), when linking it with existing guiding concepts, the specific context of each city will determine the desired package.

WBGU acknowledges that the Leipzig Charter, is too focused in Europe, lacks the inclusion of informal settlements, and does not provide fast and deep enough responses to the current planetary crises (2016: 38). Hence, WBGU suggests a "social contract for comprehensive renewal of the global settlement system" (idem: 36).

Towards Integrated Guiding Urban Concepts – From Agenda 2030 to the New Urban Agenda

Cities are key locations to address global challenges, including climate change. A number of global initiatives aim at preparing human settlements and cities for future climate challenges: the Agenda 2030 (2015), the Paris Agreement (2015) and the New Urban Agenda (2016).

The Agenda 2030 is articulated through 17 interlinked Sustainable Development Goals[9] (SDGs). SDG 11, with the objective to "make cities and human settlements inclusive, safe, resilient and sustainable" has 10 targets[10]

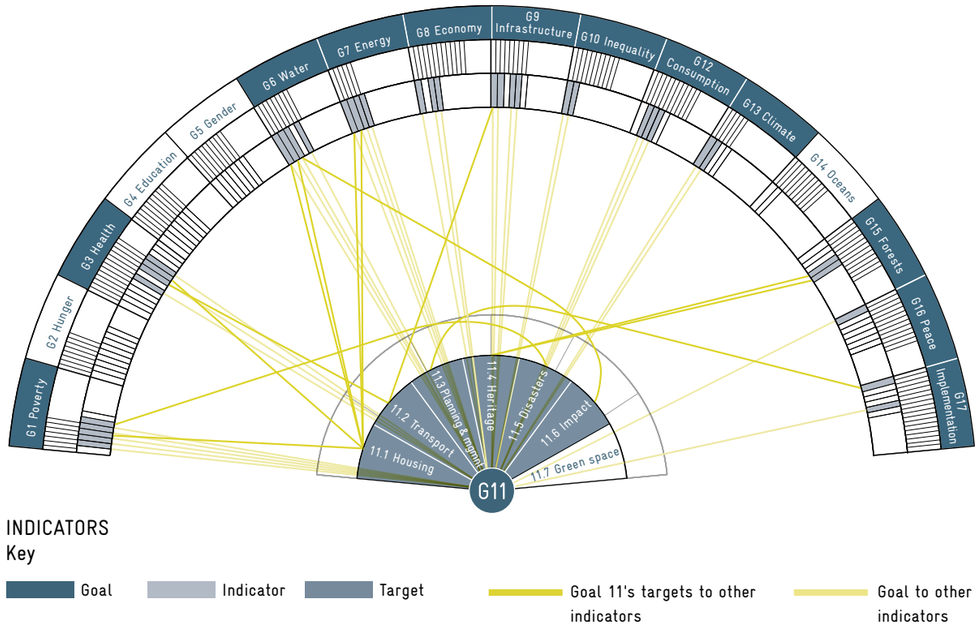
8 According to Béné et al., bad resilience may include political resilience by autocratic or authoritarian regimes (Béné et al. 2012: 47).

9 The SDGs have a total 169 targets and 232 indicators.

10 SDG 11 has seven thematic targets and three cross cutting targets.

and six indicators and crosscuts with a large number of other SDGs whose success will depend on a mutual impact. SDGs 6, 7, 8, 9, 12, 13 (59% of the goals) are linked with cities, as well as 39% of the targets and 39% of the indicators (Misselwitz, Villanueva and Rowell 2015a: 16).

Figure 14: SDG 11 in Relation to the Remaining 16 SDGs



Source: Misselwitz, Villanueva and Rowell, 2015b

With the view to linking the socio-centric with the eco-centric agenda, SDG 11 supports the aims of the SDG 13 (on Climate Action), through its targets 11.B and 11.C. During COP21, the binding Paris Agreement, which addresses climate change mitigation, adaptation, and resilience, was formulated. The Paris Agreement suggests having cities as one of the ('non-Party') stakeholders[11] for mobilised "stronger and more ambitious climate action" (UNFCCC 2015: 2). During COP21, the link between human settlements and climate change was highlighted. As stated by ICLEI's Secretary General, "climate action in and by cities, towns and regions will be instrumental in ensuring that we stay on a 2 degrees Celsius pathway" (UN News Centre 2016: para. 2). A by-product of this process was the reformulation of the voluntary network "Covenant of Mayors for Climate & Energy" in 2015, with the aim to foster "mitigation, adaptation, and secure, sustainable and affordable energy".

The action-oriented New Urban Agenda (NUA), adopted in 2016 as a new political strategy for the coming 20 years (WBGU 2016: 6), based itself on the Paris Agreement, the 'Framework for Disaster Risk Reduction' and SDG 11. The NUA aims at facilitating the delivery of most SDGs in urban areas (UN-Habitat 2016: 1).

11 The Paris Agreement agrees on including non-Party stakeholders such as "[…] civil society, the private sector, financial institutions, cities and other subnational authorities, local communities and indigenous peoples, […]". (UNFCCC 2015: 2)

The NUA explicitly refers to climate change resilience, adaptation, and mitigation. Particularly, urban resilience is understood as a crosscutting concept between urban and climatic challenges (Tollin and Hamhaber 2017: 12). In addition, references to guiding concepts are found implicitly in the NUA. For instance, it refers to "promoting the development of urban spatial frameworks, including […] appropriate compactness and density, polycentrism and mixed uses" (UN-GA 2016: 11).

Further global initiatives on resilience include 'C40 Cities Climate Leadership Group', '100 Resilient Cities' and the 'City Resilience Profiling Programme'. In 2017, the "Global Covenant of Mayors" was launched.

Towards Integrated Guiding Urban Concepts – Further Overarching Concepts: Climate-Proofing for Development and Cities

The expression 'Climate-Proofing' can be translated in German as 'klimawandelgerechte Planung' (KlimaScout 2012, Birkmann and Fleischhauer 2009). GIZ refers to a climate-proof urban development as "city development strategies, urban designs, land use and master plans, and all related investments are resilient and adaptable to the current and future impacts of climate change. Furthermore, corresponding climate protection measures need to be taken, and they must be aimed at decarbonisation" (2017: 3). According to Kabat et al., "climate-proofing should be driven by opportunities for technical, institutional and societal innovations", rather than by fear to the impacts of climate change (2005: 283). For urban planning, climate-proofing is understood by methods, instruments and procedures that secure plans, programmes and strategies to become resilient and adaptive, while giving room for mitigation (Birkmann und Fleischhauer 2009: 118).

Climate-proofing counts with three dimensions. The first is 'process related' planning and decision making to develop resilient spatial structures. The second describes 'subjects' or actors that are affected by climate change to be involved in the process through capacity building and raised awareness. Lastly, the third refers to 'objects' that need to be secured and maintained when adapting to climate change (Birkmann und Fleischhauer in 2009).

So far, municipalities have formulated climate mitigation concepts, in addition to urban development concepts and land use plans (Korbel and Kurth 2016: 118). Particularly, the KARS project aimed at anchoring climate adaptation strategies in urban and regional planning. One output of the KARS research project is the idea that climate adaptation (and consequently, mitigation) projects need to be independent, equally looking into the particularities of climatic and urban aspects (Korbel and Kurth 2016: 126).

Towards Integrated Guiding Urban Concepts – Adjustment of Selected Planning Tools and Concepts

Adjusting Scales, Tools and Measures

As climate change affects areas beyond administrative borders, strategic urban development need to consider new scales (Kiwitt in KARS 2016: 23). According to the KARS project, climate analyses need to differ according to different scales: region – city – quarter (Korbel and Kurth 2016: 126).

The amendment and inclusion into the planning process of the 'Environmental Impact Assessment' tool is suggested by Birkmann/Fleischhauer (2009). In addition, environmental and legally protected goods for the environment, environmental impacts and indicators of climate change need to be considered. This requires scenario planning, exposure and vulnerability assessments and a prediction of adaptability and resiliency (Birkmann in KARS 2016: 17).

Over the past years, efforts were made to translate the discourse into the guiding concept's third level – the level of implementation and concrete measures. For instance, the KARS project adapted the concepts of city images using four categories (Korbel and Kurth 2016: 127) to create the 'colourful city':

- **The blue city (water in the city):** for a liveable microclimate, measures such as fountains, flowing waters, low degree of sealed surfaces, and other soil bioengineering measures are suggested.
- **The green city:** measures such as green spaces and pocket parks, large scale green areas, roof- and facade greening, and plantation of resistant plants are suggested.

Figure 15: The Colourful City

Source: HFT Stuttgart, Josefine Korbel, Detlef Kurth 2016

- **The white city:** light and reflective façade/roof/floor colours and surfaces are recommended to contribute to a raised Albedo effect.
- **The grey city (shadow in the city):** for a liveable microclimate, measures such as shaded, recreational, waiting areas, arcades and pergolas are suggested.

In addition, these measures or categories were developed to serve as illustrative and communicable means to be used in participatory approaches.

Above all, researchers recommend establishing climate analyses and adaptation concepts as a regular control task in planning, decision-making, tendering, etc.

Moreover, it is suggested to introduce new map symbols or keys into development plans to describe measures and emphasise on zoning for adaptive measures within a plan.

Adjusting Planning Frameworks – Integration of Adaptation and Mitigation in Planning – 'Klimaleitplanung' (Climate Planning Guidelines)

Bavaria's Highest State Planning Authority was a pioneer in linking mitigation concepts with urban development planning. As part of the research area "energy efficient cities", the model of 'Klimaleitplanung'[12] was developed.

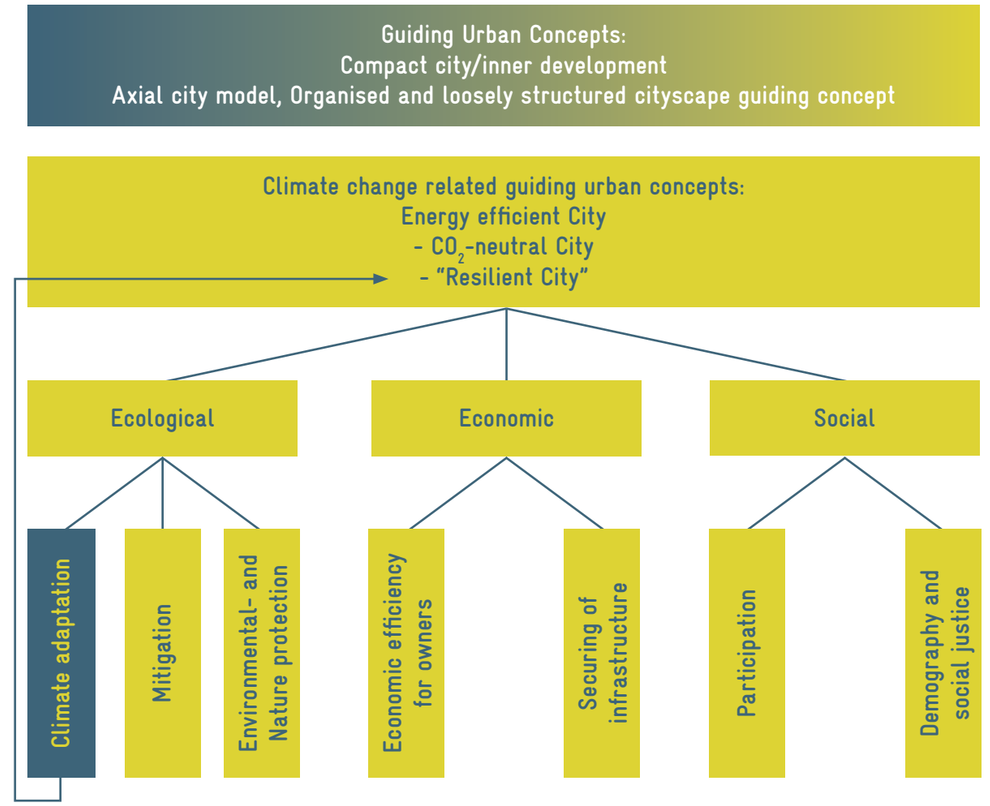
The researchers Korbel and Kurth (2016: 118) developed this concept by including adaptation into the planning process. Additional emphasis is given to the tool of 'Environmental Impact Assessment' (EIA) as an integrated part of a new climate sensitive planning approach. Kurth highlights that not considering climate response concepts adequately by local governments may lead to assessment errors in urban development planning in the middle- and long-term (2012: 25). Mitigation and adaptation need to be considered in a combined manner together with urban planning instruments. The new integration of guiding concepts and the incorporation of climate change responses into them requires adjustments across scales, measures and tools.

Guiding Urban Concepts as Part of Integrated Resilient and Sustainable Urban Development Framework

The 'resilient city' could be seen as one guiding concept among others, hence not as an umbrella term. However, it is an essential concept in combination with existing guiding concepts, paired with a contextualised elaboration of a planning toolbox for climate-proof planning (Fig. 16).

12 The term 'Klimaleitplanung' is an adaptation of the term 'Bauleitplanung'. Klimaleitplanung derives from the concern of climate-sensitive planning into standardized planning processes.

Figure 16: Guiding Urban Concepts for Climate Change as Part of Sustainable Urban Development



Source: HFT Stuttgart, Josefine Korbel, Detlef Kurth 2016: 60; translated by Laue, 2017

Bicyle Street, Munich

6 Conclusion

The presented assessment of the guiding urban concepts reveals that there is no singular solution for the current urban challenges. According to the analyses, none of the guiding concepts exclusively serves as a one-fits-all recipe to guarantee mitigation, adaptation and resilience in their entirety or combined (Greiving and Fleischhauer's 2009: 17, Knieling et al. 2012: 56, Korbel and Kurth 2016:60). Furthermore, challenges remain in terms of development on the spatial levels and in the urban form. Consequently, in the German context, the choice of guiding urban concepts for resilience, mitigation and climate-proofing should vary between cities.

Another conclusion is that there are two ways of dealing with resulting assessments, considering that the guiding concepts do not fulfil the entirety of resilience criteria. One part of the academic community suggests formulating a new guiding concept, while other researchers (KARS, Klimzug) suggest further developing existing concepts or combining them, linked to overarching more systemic paradigms such as the sustainable city and the resilient city.

Similar to the term 'resilience' and 'resilient cities', 'sustainability' underwent a diversification of definitions and applications. With its non-spatial elements, the 'sustainable city' paradigm serves as an overarching frame for guiding concepts to be embedded. Concerning the resilient city, it is recommended that it serves as an overarching paradigm rather than being limited to a guiding concept to planning.

Recent global initiatives tackle both 'resilience' and 'sustainability' aspects. The Paris Agreement and the New Urban Agenda entail the confirmation that contextualised planning and management, as well as reconsideration of existing planning tools can foster climate-friendly and climate-proof urban development. Hence, this brings strategic and financial potential to further develop guiding concepts.

It furthermore requires zooming out of different scales (from macro scale, meso scale and micro scale), and zooming in into more concrete starting points to contribute to the adjustment and application of planning with a view to adjusted and newly developed guiding urban concepts. This supports synergies and fosters climate-proof planning. On the one hand, concepts require conceptual modifications; and on the other hand, tools and measures need adjustment. This also requires adapting scales for guiding concepts across municipal borders. Moreover, smaller and localised, easily communicable images or visions help to develop and communicate guiding concepts across all urban actors. Finally, a local and regional planning and administration framework needs to accommodate adjusted guiding concepts.

Combined concepts should consider the following ideas:

- acknowledge preceding planning models and guiding concepts (how they shape the spatial situation, how administration and services deal with it);
- combine/compose different types of guiding concepts, as each city/settlement might require a unique 'solutions package';
- assess complementary guiding concepts and their compatibility with the given urban or economic structure (e.g. by combining socio-cultural guiding concepts with ecological guiding concepts);
- and lastly embed the guiding concept package into the existing or the newly negotiated paradigms (cf. von Winterfeld et al. 2011, KARS 2016).

Consequently, although guiding urban concepts are only one part of the integrated planning to achieve sustainable urban development, they are an essential part of it.

View on the train station of Frankfurt a.M.

7 Reference List

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