

## Approaches of Flexible Spatial Planning to Sustainable Cities

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### 1 ABSTRACT

This paper is a literature review of approaches of flexibility in spatial planning. It is about key elements which provide a flexible spatial planning to sustainable cities.

Spatial planning plays a decisive role in the implementation of sustainable adaptation measures and in ensuring the climate stability of spatial developments. Because urban structures have an impact on energy consumption and pollution, depending on how a building, park or square is designed.

In order to explore this issue, the paper first underscore the current environmental challenges and combines them with current challenges in spatial planning to point out the need of flexible spatial planning; second, explains why flexibility is necessary and which advantages it brings for sustainable city planning; third gives an overview of existing approaches in the literature. Next it provides the key flexibility elements analyzed from literature review. In conclusion the paper presents eight key elements which provides flexibility in spatial planning: Planning rules and norms, Programs and Concepts, Organization, Experiments, Control and Limits, Utilization structures, Spatial Planner and Time.

Keywords: space, cities, sustainability, spatial planning, flexibility

### 2 CURRENT ENVIRONMENTAL CHALLENGES AND THE IMPACT OF CITIES

Different strategies and concepts develop in countries and regions to set targets to sustainable city planning and designing to meet environmental targets and social needs. Because we do not know exactly what constitutes the environmental challenges and its consequences, it is stressed, that opportunities should be explored which are flexible and adaptive (van Buuren et al. 2013).

The term flexibility in spatial planning is not uniform defined yet. Cattlin (2017) points out that there is a definitional problem of flexibility: "if we lack of a common idea of what flexibility consists of, or who or what can be flexible, or over what kind of timescales we mean spaces to be flexible, we are talking about different things." (Cattlin 2017, p.1). In literature terms like adaptable, flexible, adjustable, agile, customizable or adapt-flexible are used. For this reason, it is necessary to find out whether the terms are used simultaneously or whether they are different terms with different meanings. Perhaps it is not even necessary to define flexibility uniformly. Because this may contradict the term flexibility per se. However, it makes sense not to talk past each other when it comes to the approach. For this reason, it is assumed that flexibility in spatial planning is "a change in the system and making the possibility of obtaining new conditions, needs, and frameworks" (Ardeshiri et al. 2016, p.83-84). If the definition is transferred to urban development, flexibility for spatial planning must achieve the following: spatial structures must be able to adapt to changing circumstances, new uses and also social requirements. Thus, in a next step, flexibility can also be integrated in the planning of cities.

Figure 1 shows the main current challenges in urban development to sustainability: resource scarcity, environmental pollution, urbanization, sealing and soil compaction. Cities are responsible for 2/3 of the world's emissions, thereby they account for only three percent of the surface area. But there is a rethinking in society, they are calling for sustainable solutions and products that adapt to viable (King and Trübstein 2019). Social and political pressure bring about change: it is about more sustainable solutions that influence spatial planning and are influenced the other way round by it. These include, for example, electrification in the transport sector, sector coupling, the generation of sustainable energy, emission-free mobility, green areas and, last but not least, the structures of the built city.

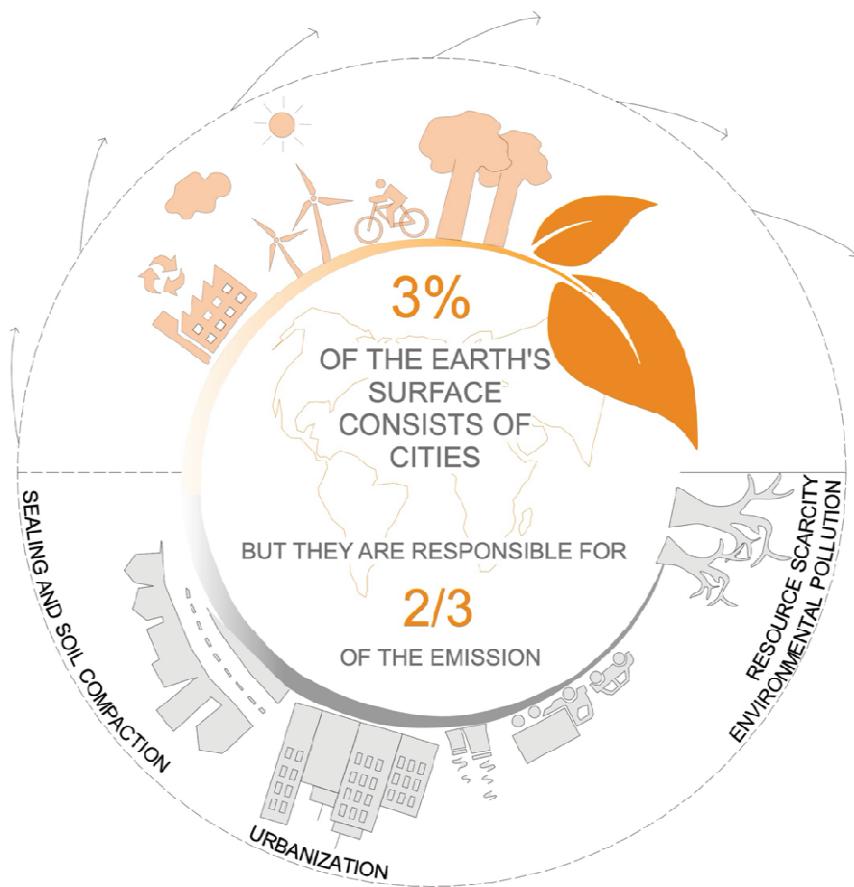


Figure 1 Indicators of climate change and urban development: rethinking in politics and society (own figure according to Stratmann 2019, p.1)

The United Nation recognised the link and interaction between sustainability and cities and therefore developed goals and targets to promote the sustainable development of cities. According to the Sustainable Development Goals (SDGs) one promote Sustainable Cities and Communities (Nr. 11). One of the indicators to achieve this target is the ratio of land consumption rate to population growth rate (United Nations 2020). The goals are not only quantifiable but also qualifiable, because sustainability challenges are different everywhere. It has not only to depend on geographical conditions, but also on social and economic conditions.

### 3 METHODICAL PROCEDURE AND OBJECTIVES

The aim is to filter out and summarize the key elements for flexibility in spatial planning from literature. In this way a common understanding of the planning approach of flexibility can be created and this can also be understood as a planning tool for the future of sustainable cities.

Designing cities with uncertainty and with gaps of knowledge means to develop innovative approaches (Zandvoort et al. 2019). The current challenges can be met by flexible approaches in spatial planning, as “the use of flexibility in designing projects is becoming increasingly common” (Geltner and Neufville 2012). As well van Buuren et al. (2013) called for an adaptive approach where flexibility is central. Based on these facts, it is necessary to take a closer look at the existing approaches to flexible spatial planning and to compile the most important principles to set an understanding.

New solutions must be found to meet the growing pressure for more sustainable cities. Due to the high decisive influence of spatial planning, the approaches already found in the literature are analysed and linked more closely. In the following, the research design is posed and the methodological approach of the work is explained. As a process-based dynamic planning tool, flexibility creates an adaptable planning basis.

In order to achieve this goal, it is necessary in the first step to understand why the approach requires closer examination. The already presented problem shows that due to the increasing pressure for sustainability in order to survive climate crises etc. and to offer society an adequate living space in cities, new approaches to spatial planning are taken.

Figure 2 schematically shows the procedure of literature research and analysis. First of all, an overview of existing approaches to flexibility in spatial city planning has been provided. To select significant flexibility approaches a national (germany) and international literature review was taken. Next followed by a brief analysis of key elements involved in each approach. After filter out the key elements a connection between the elements and sustainable spatial planning is created. At the end the impacts on sustainable city planning and the inferences are presented.

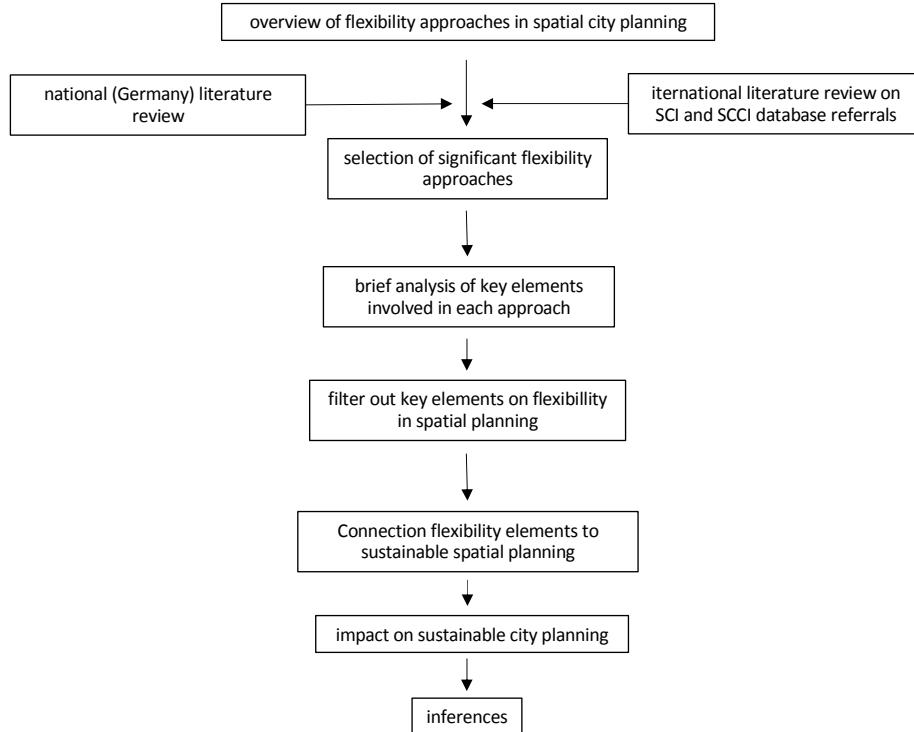


Figure 2 Methodological flow chart

The outline of the paper is: First the paper establishes a connection between current challenges in climate and environmental challenges and current urban development problems. This leads to the conclusion why the approach of flexibility can make a positive contribution to reducing the negative consequences of these challenges. Second, an overview on the methodical procedure on the literature review is given. Next the necessity and advantages of the approaches of flexibility are explained. Various approaches of flexibility are taken up simultaneously. Next the paper provides the key flexibility elements analyzed from literature review. In conclusion the paper presents the key elements which provides flexibility in spatial planning

#### 4 WHY DEALING WITH FLEXIBILITY IN SPATIAL PLANNING?

Summarizing it is seen that flexibility in spatial planning is justified in order to meet sustainable goals in city planning. There are a lot of different arguments promoting the idea of flexibility. Besides social and economic reasons, the ecological benefits play an important role. Next the advantages and also critical points are given.

Flexible spatial planning brings diverse chances to urbanism (Costa et al. 2014). Cozzolino summarize arguments of different authors (Alfasi; Buitelaar; Cozzolino; Moroni; Rauws) towards the essential role of flexibility in the city: “if we recognize the essential role of spontaneity and flexibility in the city functioning (i.e., its creative role for innovation, the importance of localized knowledge, the need for perpetual adjustment and improvements of the build environment, and on) we cannot regulate the city in order to obtain or preserve the specific and predetermined social-spatial configurations as we would or desire” (Cozzolino 2018, p. 16). More flexibility mitigate adverse effects of uncertainty (Zandvoort et al. 2019) and shortcomings of planning (Carr and Dionisio 2017). Because we do not know the future, agile approaches, like flexibility, fits into that we do not know the final result (Aurigi 2016). This brings design for unsheduled uses (Carr and Dionisio 2017). Moreover, it is possible that flexibility reduce resistance against further uses we do not know yet (Carr and Dionisio 2017). Because “adaptive landscape designs are important for hedging

against the negative consequences of long-term commitments" (Zandvoort et al. 2019, p. 21). As well, flexibility supports short-term measures, while keeping options open on the long-term (Zandvoort et al. 2019).

Flexibility offers great opportunities to reduce resource consumption. Because multi usage is possible, less space is needed. Thus, the resource soil can be used sparingly (Geltner and Neufville 2012; Stiftung et al. 2003). For this reason "flexible [...] land use represents efficient land use. This also serves to ensure the conservation of resources and sustainability in urban development" (Stratmann 2019, p. 69). Flexibility can reduce natural and unnatural damages (Ardeshiri et al. 2016), e.g. in times of climate change, when it is necessary to design more adaptable and flexible (BBSR 2016). In times of unforeseeable natural events, areas can be used both as public space for societies and as space for e.g. flooding events. By reusing space and materials a much smaller carbon footprint is given (Godwin 2018). One of the most commonly used definitions which links flexibility with climate change points out: "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their diem, which moderates harm or exploits beneficial opportunities" (IPCC 2007, p.7). Flexible public space contributes to ecological sustainable cities, because it is adaptable for different uses, users and in different times and it consumes less ground, because usage can happen in parallel and/or side by side and offers hybrid space organizations (Stratmann 2019).

Likewise, flexibility offers great opportunities in social aspects. Flexibility provides potentials to society and achieves requirements and goals of people's needs (Ardeshiri et al. 2016). As also mentioned by Ardeshiri et al. "in effect, it should be stressed that flexibility searches for selection arrays against needs" (2016). In view of the ever more rapidly changing demand needs, flexible spatial planning can be combined with faster implementation (King and Trübstein 2019). To put it briefly: flexibility is demand-oriented.

On the one hand there are a lot of reasons to design flexible in spatial planning. But on the other hand there are a few arguments which call the approach into question. Carr and Dionisio explain "that flexible spaces may provoke a greater level of NIMBYism (Not In My Backyard) than conventional land uses" (2017, p. 76). As well there is a risk of inferior re-use and less security of planning (Stiftung et al. 2003; Gifford 1994).

## 5 KEY ELEMENTS OF FLEXIBILITY IN SPATIAL PLANNING

In summary there are some repeated elements in literature which welcome flexibility in spatial planning. For this reason it is assumed that there is a consensus on these elements in literature. Therefore it can be assumed that flexibility depends mainly on the eight elements identified. The identified key elements are: Planning rules and norms, Programs and Concepts, Organization, Experiments, Control and Limits, Utilization structures, Spatial Planner and Time.

To find out key elements in flexibility approaches, an analyse was taken. A total of 16 approaches to the issue have been examined more closely. The approaches have been filtered through national (Germany) and international literature research and do not necessarily explicitly include the approach of flexibility but implicitly. Nevertheless, there are already approaches in the literature that have specifically addressed the issue of flexibility. This spectrum of authors and also the way the term is dealt with highlight the key elements of flexibility through its diversity and at the same time uniformity. The analysis has been carried out qualitatively and is not regarded as conclusive. In the end, once the recurring elements have been included, it is possible to determine on a quantitative level which elements have been mentioned particularly frequently. From this it is concluded that the frequently mentioned elements are central elements of flexibility in spatial planning. Below the key elements are listed and described in their impacts to flexibility in spatial planning.

Planning rules and norms: Rules ensure that flexibility is reduced quickly and easily and thus takes away the possibility of adapting. For this reason, it is necessary to make the way rules and norms are written and deployed flexible. Rules must be established that allow flexibility in spatial planning. This includes not only the flexibility of the standards among themselves, but also the context of the content. There should be flexibility in the rules of use in spatial planning. Conversely, the space itself should also be able to provide differences in rules. Without enough space for flexibility in planning rules, there is no flexibility in spatial planning. Any regulation should be minimal, for maximum flexibility. (Aliyha and Aulia 2019; Carr and Dionisio 2017; Cozzolino 2018; King and Trübstein 2019; Rauws 2015; Van Buuren et al. 2013)

**Programs and Concepts:** Traditional urban development plans and concepts have been drawn up without flexibility and are completed in their spatial and functional system. But flexible concepts have to be established which convey the concept and the handling of adaptability and flexibility in spatial planning. The concepts must be flexible so that the plans and measures developed and implemented on them become flexible. Flexibility must be conceptually anchored in order to be applicable. Flexible concepts can help planners to design the future. The aim is to create long-term plans and concepts that can be flexible adapted in short-term. (BMBVBS 2013; Cozzolino 2018; Fainstein et al. 2018; Lotto and Di Morelli Popolo 2015; Rauws 2015; Reicher 2014; Zandvoort 2019; Zikovic et al. 2014)

**Organization:** The management, institutional context and the planning process itselfs, has to become flexible, summerized to the term organization. To get flexibility in spatial planning, flexibility has to be managed. There has to be a manager, who is responsible for flexibility. The involvement of institutions play a role to establish flexibility in spatial planning. For more flexibility in spatial planning, the institutional design must become more flexible. Institutions must not be rigid, but do welcome flexible participation. If the planning processes do welcome and change to flexibility. (Aurigi 2016; Friedman 1997; Van Buuren et al. 2013)

**Experiments:** Flexibility can provide spaces that are suitable for experiments and pilot projects. This creates new opportunities and possibilities in urban planning: new solutions can be found through flexible space, which are effective and valuable. There are spaces for new ideas and solutions that can be try out without having to commit to them. Therefore, flexibility is also experimental, apart from the fact that the approach is innovative and experimental in itself. Therefore, flexibility in spatial planning brings spaces for unpredictable, improvised and ephemeral uses. (Carr and Dionisio 2017; Hetzberger 2014; Lewis and Schwindeller 2014; Van Buuren et al. 2013)

**Control and Limits:** Flexibility is strongly influenced in spatial planning by control and limits. On the one hand, it can be said that the more the city is controlled and planned from above, the less flexibility. On the other hand, it can be said that a lack of control and limits can have a negative influence on flexibility. Therefore the degree of control and limits plays a decisive role in the flexibility of spatial planning. (Cozzolino 2018; Friedman 1997; Lotto and Di Morelli Popolo 2015; Zikovic et al. 2014)

**Utilization structures:** The current utilization structures are called into question by flexibility. Flexible space and utilization structures must be created multifunctional, but do not claim to be fitted to all uses. The build environment and inventory must be flexible, offering space for other uses and users. Structural elements must be flexible and the utilization structure must be flexible for unscheduled uses. (BMVBS 2013; Carr and Dionisio 2017; Hetzberger 2014; King and Trübstein 2019; Lotto and Di Morelli Popolo 2015 )

**Spatial Planner:** If planners do not fulfil the task of flexible planning, there can not be flexibility in spatial planning. Planners must be more sensitive to needs in order to be able to react more flexible to changes. The way planners understand their task influences flexibility. Relevant suggestions from society should also be sought for this. A flexible space makes it unnecessary for planners to intervene at a later stage. (Carr and Dionisio 2017; Cozzolino 2018; Fainstein et al. 2018; Friedman 1997; Lotto and Di Morelli Popolo 2015; Rauws 2015; Zandvoort 2019 )

**Time:** The time frame of flexibility plays a crucial role, because flexibility creates the possibility to adapt to the physical and social world over time. Because there is always uncertainty about future uses and the requirements change over time. It is therefore important to draw up plans and concepts that are designed for the long term, but can always act in the short term. Changes have to be accepted in different time periods, only then flexibility can succeed. Sufficient space must be left for the time factor, because planning processes can often only be regulated over time. (Cozzolino 2018; Fainstein et al. 2018; Hetzberger 2014; Lewis and Schwindeller 2014; Lotto and Di Morelli Popolo 2015; Rauws 2015; Reicher 2014; Zandvoort 2019)

The combined eight key elements influence the flexibility of spatial planning to varying degrees. The degree of flexibility in spatial planning depends on how many elements are used and the value of these elements accoring to the conditions and case study. How to measure and determine the degree of flexibility on a qualitative and/or quantitative level and whether this is even necessary to achieve the goal of a sustainable city has not yet been considered.

## 6 CONCLUSION: FLEXIBILITY TO SUSTAINABLE CITIES

As outline before, the spatial planning approach of flexibility influence the possibility to achieve sustainable cities. Flexibility is called a designing tool to reach sustainable spatial planning. The approach of flexibility is to see as a process which influence spatial planning as much as spatial planning influence flexibility. In conclusion in literature there are different terms of flexibility but in case they usually mean the same circumstance and there are many overlapping requirements and elements for flexible planning in the analysed approaches.

By analysing the key elements of flexibility it is possible to create a common understanding of flexibility in spatial planning. Without the knowledge of the approach of flexibility and its elements it is not possible to establish the approach and create an international understanding. The eight elements illustrate the complexity of the influence of spatial planning on the flexibility of a city. Not only the built, the physical structures (such as the elements Urbanization structures), but also the temporal course, element time, the organization and last but not least one of the strongest elements: the social influence of Spatial Planner. Looking at the elements, it is obvious that they need and influence each other in order to create the goal of flexible and thus sustainable cities. Without the Spatial Planner no new planning rules and norms can be established. Without concepts and plans, Spatial Planner cannot be guided by them. Without the organization, the approach cannot be executed. Without the temporal consideration, no experiments can be conducted, which in turn require control and limits. These relationships can be elaborated further and it becomes very clear that the elements are closely related and interrelated. All together, as well as each one individually, contributes to the planning and design of a sustainable city.

The field of flexibility is large and certainly includes more than the eight elements presented in this paper. Furthermore, it is debatable whether these elements are representative, how far their influence is. Therefore, a closer (also spatial) investigation is needed in further steps.

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