

CLIMATE CHANGE IMPACTS ON GERMAN CITIES AND ACTIONS FOR PRESERVING QUALITY OF LIFE

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Also German cities –as many other cities worldwide- will be affected by impacts of climate change. Starting from the German Adaptation Strategy to climate change, the paper presents a short literature review on impacts of climate change and on fields of action for German municipalities and urban planners to adapt to it.

The literature review shows that main negative impacts of climate change in Germany are due to rising temperatures and cities will also need to cope with altered precipitation regimes. But also positive impacts such as reduced heating costs are reported.

Additionally, the paper highlights a second phenomenon, which also causes specific demands for urban planners regarding human health and quality of life in German cities: demographic change. Altering demographic patterns within the society will lead to altered demands for healthy living conditions.

Moreover, findings from the literature show that specific groups of the society – such as the elderly – are especially vulnerable towards impacts of climate change. A concrete sensitivity towards overheating or bad air is reported.

Both phenomena may simultaneously impact on German urban structures and will demand closer attention now and in the future. Consequently, specific fields of action to adapt to climate change will be presented highlighting their possible contribution sustaining quality of life in cities.

Key words: climate change adaptation, Germany, cities, demographic change, quality of life.

INTRODUCTION

Two contemporary phenomena are appearing on the agenda of urban planners and demand adaptation measures for sustainable settlement structures in Germany: climate change and demographic change. The impacts of climate change are diverse and planners' demands for adaptation are highly complex. Research has been conducted for Asian megacities (e.g. Worldbank, 2010). But also Europe is facing climate-related impacts (e.g. EEA, 2012) and needs to adapt its settlement structures. Though, specific impacts and demands for adaptation may differ. In using Germany as an example, a literature review will highlight possible impacts due to climate change. But it also shows that planners can refer to a large field of actions to adapt German cities to these impacts.

Additionally, a second phenomenon poses additional pressure on urban planners in

Germany: demographic change. Recent findings of the Federal Statistical Office (2011a) show the following effects until 2030: decreasing overall population by around 5 Million, 17% less children and youths and 33% more inhabitants of and over 65 years.

Both phenomena – altered climate conditions in cities and altered demographic structures – might simultaneously impact on German urban structures. For instance, approximated aggravations of the urban heat island effect (a.o. Endlicher and Kress, 2008) may put additional pressure on an increasing but also most vulnerable group of the society: the elderly (e.g. UBA, 2005).

The second part of the paper picks up this issue. It briefly focuses on human health and quality of life in cities as future fields where urban planners need to become active in adapting to impacts of climate change in cities.

DEMANDS FOR URBAN PLANNERS DUE TO CLIMATE CHANGE

Climate change demands more and more complex actions of urban planners in Germany. The German Adaptation Strategy for Climate change (German Federal Government, 2008:10f.) reports rising temperatures of 0,5-1,5°C (2021-2050) and of 1,5-3,5°C (2071-2100) depending on the projection model for Germany. Additionally, decreasing precipitation (appr. 40%) in the summer and increasing precipitation (appr. 0-40%) in the winter are to be expected.

Consequently, Becker *et al.* (2008) argue, that these modifications of climatic conditions significantly impact on humans, the economy and ecosystems. But still, they can be both

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negative and positive (see Table 1, see also BMVBS/ BBR, 2008: 16ff.).

Cities worldwide need special attention when it comes to impacts of climate change. For instance, in its report "Climate Risks and Adaptation in Asian Coastal Megacities" the Worldbank (World Bank, 2010) explicitly focuses on impacts exclusive to Asian megacities. Releasing the report "Urban adaptation to climate change in Europe" also the European Environmental Agency (EEA, 2012) draws special attention on this topic for European cities.

In a German context, for instance Endlicher and Kress (2008) demand to fundamentally overwork known concepts of urban planning. Beside named global impacts of climate change (see Table 1), especially German cities will face an intensification of the urban heat island effect and negative impacts for human well-being (a.o. BMVBS, 2011; Dosch *et al.* 2008; Endlicher and Kress 2008). Ongoing urban sprawl, soil sealing and densification of the urban structure can accelerate these problems (BMVBS, 2011).

According to the BMVBS (2011: 16f.) 13 out of 16 Federal States in Germany have submitted or are elaborating studies on the effects of climate change. Local climatic and topographic specifications such as coast protection in the northern Federal States or alpine potential risks in Bavaria need to be addressed.

Consequently, individual concepts of adaptation are needed. Moreover, major expected consequences of climate change such as i) water management, ii) forestry, iii) agriculture, and iv) health (also German Federal Government, 2008) are the center of attention. A previous study of the Federal Environment Agency (UBA, 2005) also mentions the upper Rhine Valley as a region with specific thermal conditions. But it also highlights "congested urban areas, especially in climatically unfavourable locations (closed valleys) [which] are particularly hit by the direct impacts of climate change" (UBA, 2005: 124).

FIELDS OF ACTION FOR ADAPTATION

Undoubtedly, urban planners have numerous possibilities to adapt to impacts of climate change (see also a.o. Sinz, 2007). As presented in the introductory part, the paper will shortly address selected fields of it. And it will put a focus on two specific aspects: quality of life and public health in cities.

We have learnt that the urban heat island effect might also increase in German cities. And this

Table 1. Negative and positive effects due to climate change

| Negative effects (Becker <i>et al.</i> , 2008: 343) | Positive effects (Becker <i>et al.</i> , 2008: 343) |
|---|--|
| Higher maximum temperatures lead to a higher mortality for the elderly | Reduced heating costs |
| Yields can be negatively affected by droughts and heat waves | Tourism areas may benefit from longer sunny periods |
| Extreme precipitation events results in more erosion and a higher risk of material damage and insurance costs | |
| Higher costs for air conditioning | |
| Higher costs for water provision | |

Table 2. Fields of action for planners and possibilities for improved urban QoL (selection acc. to BMVBS, 2011: 20ff.)

| Fields of action | Potentials for an improved QoL as tasks of the public sector (acc. to BMVBS, 2011: 20ff.) |
|-----------------------|---|
| Human health | <ul style="list-style-type: none"> • Keeping free of ventilation zones to diminish overheating of highly densified areas of the city • Enhancement of green and blue structures within cities to enhance down cooling (see also Endlicher and Kress, 2008) • Due to demographic change and an ageing society increasing demands on the public health sector |
| Water household | <ul style="list-style-type: none"> • Flood adaptive construction of new public buildings and inspection of existing public buildings • Adaptive planting of public green spaces due to drier summers • Enhancement of water retention potentials: roof greening, de-paving to enhance decentralized seeping measures and quality of open spaces • Sense of security |
| Traffic | <ul style="list-style-type: none"> • Enhancement of compact urban structures • Promotion of public transport |
| Open and green spaces | <ul style="list-style-type: none"> • Limit greenfield development • Enhancement of degree of urban green to enable cooling effects • Implement ventilation corridors • Implement ecological network structures |
| Air hygiene | <ul style="list-style-type: none"> • Protection of ventilation corridors to guarantee fresh air within the city • Protection and creation of fresh air production areas |

causes additional heat stress for residents. Careful attention by planners is demanded (Endlicher and Kress, 2008). Additionally to that, German cities will need to deal with ozone stress and bad air (BMVBS, 2011; UBA, 2005). "Particularly at night a cooling-down is lacking, which would be important for periodic recovery" (UBA, 2005: 126).

These impacts endanger residents' health. And they limit residents' quality of life in cities. Moreover, threats such as bad air or overheating are especially dangerous for vulnerable groups such as the elderly (e.g. UBA, 2008). Due to demographic change, their proportion of the society will increase (Federal Statistical Office, 2011). Consequently,

planners will have to deal with their specific demands for healthy living conditions.

Urban quality of life

Urban quality of life (QoL) comprises factors such as employment opportunities, living costs, air pollution, public transport, urban green spaces, security, health services and many more (BMVBS 2011: 19 according to European Commission (EC), 2007; Costanza *et al.*, 2007; Santos and Martins, 2007). Consequently, it is a complex task to preserve it in times of altered climatic and demographic conditions in cities. In so doing, the BMVBS (2011) has formulated ten fields of actions for cities to adapt to the impacts of climate

change. They directly or indirectly influence residents' QoL in cities. Regarding the overall focus of the paper, the following selection (Table 2) highlights the most direct links between fields of actions to adapt to climate change and preservation of QoL.

Human health: direct and indirect impacts of climate change

According to UBA (2005: 129) "Germany is especially vulnerable to the impact of climate change on health, because of the continuous enlargement of the most susceptible demographic group, the elderly". The heat wave in summer 2003 and many international studies clearly "show that mortality increases significantly on days with strong or extreme heat stress" (UBA, 2005: 125).

Beside those direct impacts, the UBA (2005: 125 following McMichael *et al.*, 1997) also highlights an "indirect impact of climate change. This includes the distribution of allergens in the air, degradation of the quality and quantity of water and food, as well as the degradation of ecosystems, which humans need for their recreation."

According to the German Federal Government (2008:49) a further densification of built structures needs to be critically discussed regarding human health issues. Again, an intensification of the urban heat island effect especially during the summer season is expected. And a stronger pressure on human health could be the consequence.

CONCLUSION

The paper gave a short literature overview on impacts of climate change in German cities. We have learnt that especially thermal effects such as the aggravation of the urban heat island effect will significantly diminish residents, QoL. Moreover, Germany faces significant changes in the society due to demographic change. An ageing society puts the elderly as the largest but also most vulnerable group into the center of attention. Issue of human health and well-being may gain importance in urban planning. The paper advocates for focused research on the links of demographic and bioclimatic issues when restructuring urban concepts in supporting sustainable urban development.

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