The heat adapted city? A Constellation Analysis of urban governance and planning to tackle heat stress risks in mid-latitude cities

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1. Introduction

Recent social science research points out the gap between an ever increasing number of publications on climate change adaptation, but little implementation of risk reducing measures in practice (e.g. Vink et al. 2013; Wamsler et al. 2013).
There is still not enough known about how planners and policy makers in cities with moderate climate handle the specific adaptation problem of urban heat and prepare the cities for challenges to come.
Therefore our research project tries to find answers to the following questions:

- How are heat risk policies integrated into urban development policies in cities with moderate climate?
- What challenges and constraints do urban planners face in their daily practice to integrate the topic of heat risk and how can they be handled?

2. Analytical perspective

Policy integration is defined as forming relationships between single, potentially complex areas of political problem solving (integrated policy) with comprehensive, more or less coherent policy-arrangements (integrating policy) (Bornemann 2013). By taking the perspective of policy integration the analytical focus lies on the arrangement of policies and their relationship with each other.
Two empirical dimensions are focused studying policy integration: 1. The material manifestations, observations of practices handling the policy problem- respectively its integration or non-integration. 2. The symbolic expressions and normative ideas how to handle the specific policy. (ibid.)
Constraining factors arising from different frames, values and beliefs of actors that are embedded in complex institutional environments are conceptualized as barriers (Biesbroek et al. 2014) to policy integration.
Studying policy integration empirically, the characteristics and interplay of the policy to be integrated, the integrating policy and its respective institutions and actors, the urban institutional setting and contextual factors are examined.

4. Study site

Our case study focuses on Berlin, Germany. Berlin has got a moderate climate with warm summers and cold winters and does not come to mind first when thinking about urban heat risk. Nevertheless, a statistical analysis finds that the urban heat island effect potentially causes 1600 excess deaths in the city per year (Scherer et al. 2013). Moreover, climate change projections show rising temperatures of up to 2.5°C and more extreme weather events by 2050 (Lotze-Campen et al. 2009).
Since the adoption of the climate policy working program in 2008, the city of Berlin is also an active agent with regard to urban climate change policy making. Instruments, that have been developed to promote the adaptation to climate change impacts, shall serve as examples for other German towns (SenStadt 2010).

3. Research approach and method

To analyze the current state of policy integration of heat risks into urban planning problem-centered expert interviews with Berlin administrative officials have been conducted. The interviews have been transcribed and analyzed using the method of content analysis (Mayring 2005). Moreover, grey literature as well as policy and planning documents on climate change adaptation and subjects that are related to urban heat have served as empirical material for the analysis.

For inter- and transdisciplinary research on innovation, sustainability and technology the research approach of constellation analysis has been developed at the TU Berlin (Schön et al. 2007). The approach proved useful to structure the interdisciplinary results gained on policy integration of heat risk into urban governance and planning in Berlin. Identified influences on the studied subject are categorized into four main element groups and their relations to each other. Element groups are

1. social actors (e.g. people, groups, organizations),
2. natural elements (e.g. air, water, landscape etc.)
3. technical elements (e.g. hardware, solar panels objects) as well as
4. signs/symbols (e.g. standards, laws, current political or social concepts) (Ohlhorst and Schön 2015).

Relations are set as simple, targeted, missing, conflicting and resistive. The resulting interplay presents relatively stable bundles. These bundles, the constellations, show the influencing factors on the way a research object is handled.

5. Results

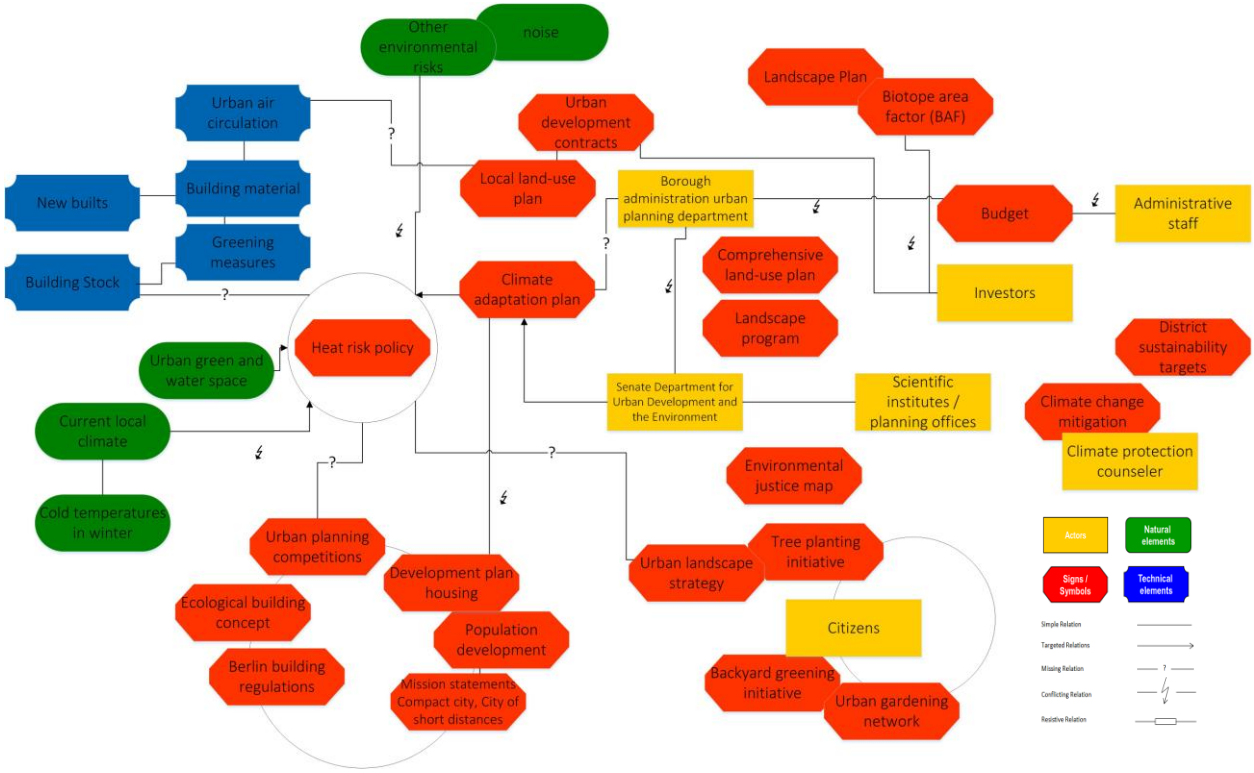

Fig. 1: Constellation of Berlin heat risk policy integration into urban development policy

The constellation displayed here is reduced to the most important characteristics of the integration of heat risk policy into urban development policy. The next paragraphs focus on some of the preliminary results concerning different symbolic and material dimensions of policy integration on a practical planning level in Berlin.

5.1 Contextual factors

We conceptualize contextual factors as topics that dominate the Berlin political discourses and determine the mode of policy integration.
One of the contextual factors affecting heat risk policy integration is the green image of the city. 45% of the surface is covered by green space and water (Dugord et al. 2014). The green image of the city affects how the need for action is perceived.
The city's growing population (Statistical Office Berlin-Brandenburg 2014) is another factor influencing the urban capacity to integrate heat mitigation and adaptation into urban planning and governance practices is. It implies a rising demand for housing space and therefore activates building interests.

Present housing policy relates to rising temperatures due to climate change. It determines land-use for up to 100 years depending on the life span of the buildings with considerable effects on urban heat. Interviewees therefore point out that consequences for urban heat depend on the way the new housing space is dealt with.
The economic situation of Berlin is precarious in relation to other German federal states (Bulkeley et al. 2015). This makes keeping and attracting economic investment the dominant political strategy which competes with heat risk policies. It also entails budgetary restrictions for the urban authority affecting the ability to deal with voluntary municipal task like climate issues.

5.2 Policy to be integrated: 'what and how' of heat risk policy

Heat risk policy's symbolic and material dimensions can only be analyzed in relation to the integrating policy of urban development. We therefore define heat risk policy as the consideration of potential risks for human beings stemming from gradually increasing urban temperatures in the course of planning and governance undertakings. This implies fixing, including and taking measures of greening and air circulation as well as risk reducing building material.
Current heat risk policy integration is determined by the perception that today's heat risks can be of minor concern for the planning agenda, heat is an issue for urban planning focusing on future risks. In the planning weighting process local climate as one environmentally protected good is put in hierarchical order with others. Local climate as a planning issue is perceived as too complex to be able to formulate place-specific, legally incontestable building demands. As periods of heat are perceived as short unlike ongoing noise exposure, noise is given priority of risks to be tackled. Also noise prevention as a planning demand has clear thresholds to be met. There are trade-offs as planning recommendations for building positions for example are different for both risks.
There is a wide range of measures in the planning and political discourse, but the dominant framing in policy documents points out the importance of urban green to tackle heat risks. The communication strategy of Berlin as a green city minimizes the perceived need to currently take preventive action. Yet, the current position of urban green does not necessarily reflect the needs imposed by heat risk (see Stiles et al. 2014). Moreover, urban green is contested by politically backed up building aspirations of private investors.

5.3 Integrating policy: urban development in the city of Berlin

As the integrating policy we examine urban development policy in the city of Berlin. Formal and informal institutions like norms and regulations guiding the actors in their practices are analyzed concerning their capacity to integrate heat risk policy.
Heat as a climate change adaptation issue is mentioned in policy instruments fixing general strategic development aims; among them the urban landscape strategy, planning and building competitions, the ecological building concept, but first and foremost the City Climate Development Plan. The plan, currently the guiding Berlin adaptation action paper, is a scientifically informed, informal planning instrument which needs to be considered in every formal planning process.
Besides the comprehensive land-use plan, the local land-use plan is considered the most important formal planning instrument by the interviewees, especially in terms of fixing measures against urban heat. Urban officials knowing the daily practice of land-use planning point out that there are ways to include heat risk measures into local land use processes. Instruments like urban development contracts or biotope area factors could be added. Yet, in practice this is not often done. There is a strong political preoccupation with attracting investments and catering to investors' needs, integrating proposed heat risk measures is regarded as potentially discouraging investments**.**
Integrating heat risk adaptation calls for a restructuring of norms that are constitutive for urban planning. These norms make planning with dynamic and uncertain conditions seem contradictory. Interviewed urban planners suggest leaving untouchable spaces, but consider this impossible as planning is expected to enable urban development, not restrain it.
Another inherent logic of urban planning is its main occupation with new building sites and development of vacant areas. But heat risk policy demands new protection measures for the urban assets that already exist. Residents need to be protected from impacts of outdoor and indoor heat. The role of public authorities and existing instruments to integrate heat risk adaptation and mitigation of the building stock as well as indoor heat is still very much uncertain. Forms of governance trying to activate private engagement and investment have been developed mainly focusing on greening the city. Among them there are publicly and privately funded tree planting initiatives and backyard greening initiatives and the support of the administration for urban gardening initiatives.

5.4 Responsivity of the institutional setting

Institutional factors are general influences of the urban institutional setting on the coordination of policies. They are not necessarily influencing integration of heat risk policy especially, but would be similar for other policies.
Long term planning practices are difficult to be changed in Berlin due to the logic of the local two tier governance system. The Senate Department for Urban Development and the Environment (SenStadt) is in charge for the urban development policy guidelines for the whole of the city. There are 12 district authorities, each being institutionally set up in a different way performing assigned tasks relatively autonomous but being subject to the Senate Department.
The Senate Department is considered by interviewed officials on that level to be the provider of conceptual frameworks for urban development whereas the districts are seen as the implementation agencies. The interviewed district planners reject responsibility by not having enough endowment, staff, guidelines and budget, to perform this task. Voluntary planning aims are not covered by their regular budget, and staff is not sufficiently trained to apply for funding. Also scientific knowledge on climatic issues is bound to city governance level not adequately including the operational planning level of district planners. Therefore district authorities happen to reject information offered by the Senate Department, like concept plans, strategies and information leaflets. Interviewees point out that these documents provide too much general information that only marginally links up with their daily practice. The information does not fit their needs for detailed risk analysis and politically backed up prioritization of measures.

6. Discussion: Overcoming barriers to policy integration of urban heat risks

Heat as a risk factor for the urban residents, infrastructure and environment is not given political priority in Berlin. A few possibilities to tackle barriers to preventive heat risk governance could be identified.

- Formal policy and planning instruments need a stronger target specificity
- Responsibilities between local tiers of governance need to be fixed
- Competing local policies and political discourses need to be linked in planning practice
- Science and policy need to interface on *all* governance levels
- Sustainable institutional structures, including long term personnel and financing for adaptation issues, need to be built

Berlin's authority has developed certain strategies on a single actor as well as the Berlin administration level that could tackle some of the mentioned barriers: A newly developed environmental justice map shall identify risk areas not based on one environmental risk. It integrates heat risks with other environmental and social risks to avoid the separated analysis of risk factors common in planning processes.
At the moment a new map for urban planners showing the climatic risks at a resolution of 10m² is set up including district planners in the process.
Some districts have introduced sustainability/ climate adaptation targets which shall enhance ownership of the topic.
District officials collect press articles, so when a heat wave occurs they can point out the need to act and get political back-up.
Climate protection coordinators fulfill a strong integrating task among the district administrative sectors. They could also be installed in all districts as integrating figures also between districts and senate departments.

7. Conclusion

The material and symbolic influences on the integration of heat risk policy into urban development policy have been examined using the approach of constellation analysis. The constellation analysis shows the integration of heat risks into urban planning and governance processes is a complex undertaking. Heat risks are on the agenda of urban planning and policy-making- heat policy gets integrated into different policy instruments. Nevertheless, the amount of conflicting and missing relations between elements also shows, that the policy integration remains at a conceptual, but not an operational level. Studying the barriers to heat risk policy integration also enabled us to identify potential strategies to overcome them in Berlin. As heat risks are a phenomenon affecting dense urban environments policy integration can be considered a challenge to come for other cities in moderate climate zones as well. The Berlin example points at general governance and planning

barriers faced within urban planning and governance. It also hints at potential coping strategies tackling those impediments which need further examination.

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