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Urban Governance Toolbox for a Climate-Friendly Smart City

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1 ABSTRACT

While many European cities have integrated climate protection into plans and processes and are aware of the dramatic effects of the climate change for the urban space, the integration of climate adaptation remains limited. However, even if the defined climate goals are reached, cities will have to adapt their structures and processes to deal with increased risks. That is why climate protection must be supplemented by climate adaptation measures in order to preserve attractive, liveable and safe living space.

The paper builds on activities within the project SMARTilience funded by the federal Ministry of Education and Research. The Institute of Human Factors and Technology Management (IAT) of the University of Stuttgart, the HafenCity University Hamburg, Drees&Sommer, the Malik Management GmbH and the German cities Mannheim and Halle (Saale) are developing an integrated, socio-technical control model, the so-called urban governance toolbox, to support decision-makers and other actors in municipalities to promote effective climate action. This toolbox should include smart tools which helps to increase the resilience of a city and integrates climate change and climate adaptation.

This paper discusses the justification of its development, possible content and the concept behind the urban governance toolbox. Furthermore, the paper will present two concrete use cases (Mannheim and Halle) with their urgent pressure to act on climate adaptation and how those two urban laboratories with real experiments will contribute to the development of the toolbox. Furthermore, the paper explains the peer-to-peer learning which is strongly emphasized in the project as one part of the urban toolbox.

Keywords: resilience, climate adaptation, urban governance, peer-to-peer, real laboratories

2 GENERAL PROBLEMS DUE TO CLIMATE CHANGE

2.1 Effects of the climate changed

Increasing extreme weather events such as heavy precipitation or storms endanger lives and public and private assets with considerable potential costs. The following figure shows the potential impacts of climate change on the German gross domestic product:

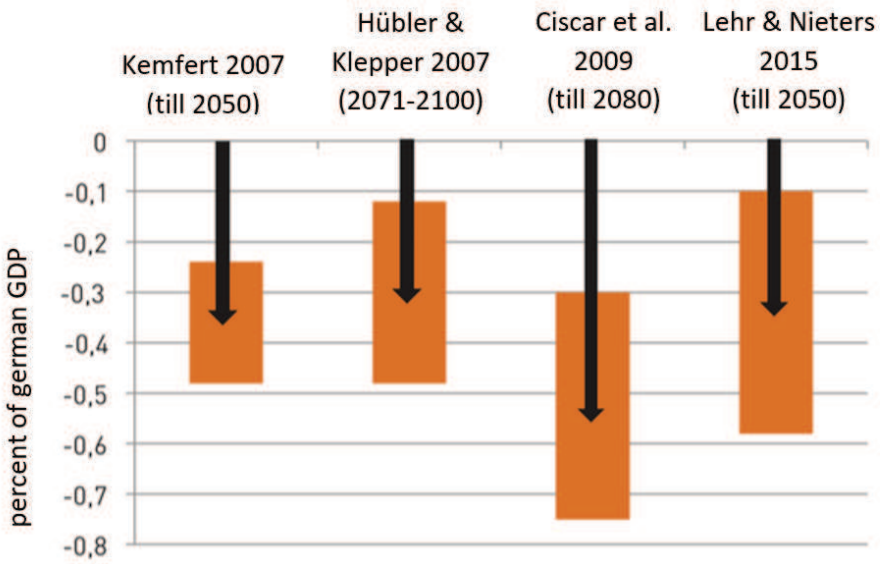

Fig. 1: Overview for estimating the reduction of the German gross domestic product due to the consequences of climate change (source: Hirschfeld/Schulze 2015:8)

Furthermore, heat islands in cities burden the health of their inhabitants and reduce the attractiveness and value of a city. Climate protection and adaptation measures are therefore becoming increasingly important to

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prepare cities for the challenges of tomorrow or today. The measures cover a wide range of topics: from climate-friendly construction and sustainable mobility to urban greening, sustainable agriculture and forestry, nature conservation, biodiversity and renewable energies to health protection, education and public involvement. In order to increase the adaptive capacity of a city and initiate suitable climate protection and adaptation measures, it is necessary to analyse concrete needs and facilitate integrated planning, sustainable financing and adequate implementation at an early stage. However, this poses a significant challenge for many municipalities, due to factors such as the complexity of the political structure of a city (keyword: multilevel governance), the lengthy decision-making and planning processes, the thinking and acting in departmental structures and the problematic financial situation of German municipalities (see Knieling 2016).

2.2 Conditions in cities and urban governance

In recent years, a range of handbooks, guidelines and good practise approaches concerning climate adaptation have emerged, along with increased awareness of the relevance for climate adaptation is seems to be improving in the minds of the civil society, local politicians and local municipalities. In many cases, climate protection monitoring centres have been set up which follow an integrated approach and coordinate and integrate various measures. Two examples are the cities of Mannheim and Halle (Saale). There are numerous synergies between the measures and initiatives of climate protection and climate adaptation such as the use of green infrastructure (keyword: multifunctional green spaces, roof greening). However, the conflicting objectives between climate protection and climate adaptation, which arise, for example, when areas are used for competing measures such as flood protection or the production of renewable energies for electric mobility, have so far received less attention.

Secondly, climate protection and adaptation are subject to a multitude of framework conditions and requirements. In 2013, for example, the European Union adopted the EU Strategy for Adaptation to Climate Change. In addition, national strategies have been developed. For Germany, these included the German Adaptation Strategy to Climate Change of 2008 and the subsequent Action Plan Adaptation of the German Adaptation Strategy to Climate Change of 2011. Furthermore, strategies have been drawn up at state level and local climate protection plans. Consequently, the multitude of recommendations for action and specifications create a complex institutional environment for municipalities to negotiate effective paths toward integrated climate adaptation and protection (vgl. Cormont/Frank 2010: 8ff).

Thirdly, work in municipal administrations is often strongly influenced by thinking in terms of departmental structures (Engels et al 2018: 14 and Schüle 2016: 18). This presents an important barrier for effective integrated planning and implementation of climate protection and adaptation measures. Resilience effects the different departments as city development and urban planning, mobility, green areas, social affairs, disaster management etc and so far there are no established working structures within the administration for such a cross-sectional issue. There is a lack of resources for interdepartmental, project-related cooperation or for established processes within and outside the city administration. Climate change control centres, which have been set up in many places for interdepartmental work on the challenges of climate change, are also reaching their limits and those of the affected departments. The interdepartmental use of collected municipal data is also affected. Particularly in the case of municipal geodata the use for integrated action has significant potential for improvement.

3 URBAN GOVERNANCE TOOLBOX

3.1 Description of the project

The project SMARTilience sets itself the goal of designing a municipal control model for a climate-resilient urban development through an iterative process engaging the two German cities Halle and Mannheim to applicate tools of this model within a living lab. During the definition phase from March 2017 to April 2018, the consortium accomplished important preliminary work and established partnerships between research, industry partners and city partners. This phase also include a review process to identify and analyse existing research results on climate resilience in cities, as well as related management models. Based on the obtained results, we designed the full project, analysing needs, urban challenges and relevant legislation. The research and development phase started in February 2019 and will last until January 2022.

The project is called SMARTilience as smart tools and the resilience of a city are the focuses.

The SMARTilience project aims to design a municipal governance model for climate-resilient urban development and to implement this in the two major German cities of Halle and Mannheim. The governance model should cover all process steps of planning, implementation and evaluation, and support municipal decision-makers and stakeholders in foresighted, efficient climate action. In this process, innovative governance formats for integrated municipal management are to be brought together with concrete fields of action within climate-resilient city (e.g. databased planning procedures, innovative citizen participation formats, investment in ecosystem services and networked technologies, etc.) and tested in the model cities.

We use a “wide” definition of the governance term (see Mayntz 2004; Benz et al 2007 and Zürn 2008) and explain it as Stoy 2015:

"While the concept of control explicitly targets the control actions of political actors, the governance perspective deals with the institutional structure and its effects on the actions of the addresses (Trute et al 2008: 177)" (Stoy 2015: 34).

In addition, political recommendations for action will be developed for the federal government, the states, and the EU with the aim of integrating municipal climate resilience into the existing regulatory framework. In a further step, new financing models are to be identified to ensure adequate participation of the private sector in investments in climate resilience. Therefore there are six work packages shown in the following graph.

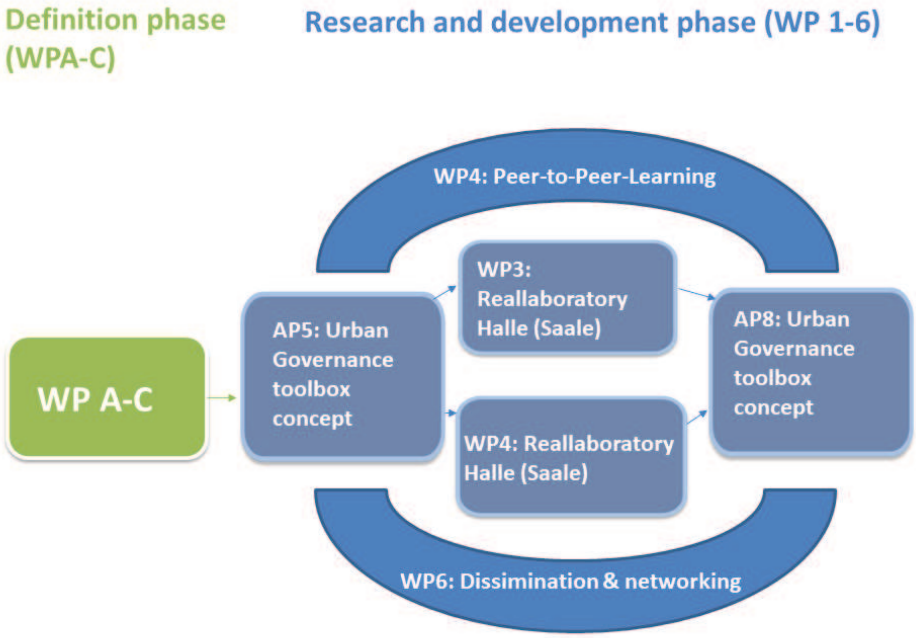

Fig. 2: Work plan for the project SMARTilience

As mentioned, before there are many existing platforms, guidelines and best practises, which should be integrated into our toolbox, as we do not want to reinvent the wheel.

Overall, the project is highly transdisciplinary and application-oriented. Since the systematic exchange of knowledge between the project partners and especially between the real laboratories plays a central role in the project, a separate work package is dedicated to this (Peer-to-Peer-Learning). In this work package the strategy for the integration of the different technical, social and scientific strengths of the partners and their knowledge levels is developed.

3.2 Conception of the toolbox

A first step in the project was the collection and systematisation of the the state of knowledge on management practices and on planning, implementation and assessment instruments for collective climate mitigation and adaptation in cities. Therefore, the IAT and HCU executed a desktop research and several

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surveys. In the research period it became clear that there are already exisiting a lot of toolboxes and guidelines in Germany, but nervertheless there is a lack of an easily operable toolbox for administrative staff members combining the knowledge of climate protection as well as climate adaptation and giving practical insight advices.

The other project partners and external experts also contributed their knowledge to the control model. For example, Drees&Sommer conducted a survey concerning the use of geo data within German cities and introduced different GIS tools in order to visualize the dangers of climate warming.

Another very creative method in order to gain input for the toolbox and as a tool itself was the Syntegration method. From the 16th until 19th of June 2019 over 40 experts from cities, industry and academia met in Mannheim to discuss the opening question: How can we govern integrated climate change mitigation and adaptation in cities?. Supported by the innovative Malik Syntegration® method – a word combination of synergy and integration – integrated actions and policy recommendations have been formulated for 12 central topic areas. The IAT operationalised the Syntegration results and used them as a basis for further research and implementation activities.

Parts of the toolbox will be the method of real laboratory (described in 4.3) and peer-to-peer learning (described in 5). Those two among others will be applied in the model cities of Halle (Saale) and Mannheim, taking into account the specific requirements based on geodata. Based on the resulting practical experience, the governance model will be further developed into a prototype.

4 USE CASES MANNHEIM AND HALLE

In the definition phase the cities Halle (Saale) and Mannheim has been chosen as project partners as they have different climate conditions and political circumstances, but suffer from similar climate effects. Tools of the toolbox should be applicable in different German cities.

4.1 Halle (Saale)

Halle (Saale) is the most populous city in Saxony-Anhalt and is one of the most densely populated areas in Central Germany. Since 2010, Halle has demographically undergone a trend reversal towards a (slightly) growing city. Due to the age structure and the birth rate, however, the positive trend is permanently dependent on a favourable migration balance, while at the same time there is strong competition within the major cities of Central German. The average age of the population is beginning to level off, with the number of younger senior citizens will even decrease, while the sharp increase in the number of the very elderly aged 80 and over represents a major challenge.

In principle, the climate region in which the city of Halle (Saale) is located can adapt to rising air temperatures and a reduction in precipitation frequency, primarily in the summer months. However, since a reduction in precipitation is not expected, an increase in extreme weather events is predicted. The flood event in 2013, among other things, has shown susceptibility or concern. Older thermographic aerial photographs also prove the existence of heat islands in the inner city area.

Since February 2013, the city of Halle (Saale) has had an Integrated Municipal Climate Protection Concept in place and has consistently implemented it in practice. At the same time, the Climate Protection Service Centre was set up as a link and coordinator for this crosscutting municipal task and the Climate Protection Steering Group, which comprises of selected actors from the city administration, was founded (integrating municipal utilities, housing industry, transport companies, real estate, etc.). Since 2014, the German Weather Service has been investigating the urban climate of the Saalestadt in a multi-year measurement programme. In December 2015, the political will was anchored in the energy and climate policy vision of the city of Halle (Saale) by a decision of the city council. The revision of the climate protection concept, which is to be completed in 2018, is currently underway.

The effects of climate change and thus the need for climate adaptation must be prepared and made visible for urban society. From this, in turn, necessary measures must be derived which are incorporated into the integrated concepts (e.g. into the climate protection concept). It is very important to create a link to the existing plans and concepts of the municipality and to harmonise the resulting synergies or conflicts.

4.2 Mannheim

Mannheim is the third largest independent city in the state of Baden-Württemberg. Mannheim has 336,368 inhabitants, 316,265 of whom have their main residence (as at 31.12.2016). The proportion of foreigners in relation to the main residence is approx. 25 %. 43% of the population has a migration background. The population forecast up to 2036 assumes a population increase of 8%.

Mannheim has a very mild climate by Central European standards. When considering areas with a problematic urban climate, the main problem areas of the city of Mannheim are increased temperature, increased air pollutants and a lack of cold air supply. The overheating of inner city areas towards heat islands shows the lack of elementary green spaces. Thermal environmental conditions have deteriorated in recent decades, especially due to increased construction activity. The high traffic intensity within the city is an immense obstacle to a further reduction in CO2 emissions.

In 2009, there was the creation of the climate protection control centre/foundation of the climate protection agency Mannheim. One year later, an urban climate analysis and climate protection concept 2020 was prepared. Furthermore, there is a city communication campaign "MANNHEIM AUF KLIMAKURS" with various preliminary projects (since 2012). Moreover, programmes for energetic renovation of private houses and greening of roofs, facades and unsealing areas are supporting the citizens and there is an evaluation/analysis of 30 properties of the City of Mannheim. Additionally, Mannheim serves as a multiplier in regional, national and international networks.

Climate adaptation measures have so far only been pursued/implemented to a limited extent. Another point is that Mannheim is a growing city and therefore there are strong construction activities. Additionally the integration of various population groups in the creation/implementation of climate protection/adaptation measures (in particular also migrants) is a huge challenge as well as the involvement of young adults, adolescents and children in the creation of concepts/implementation of climate protection and adaptation measures. Thematic focuses in Mannheim, which must be further differentiated within the framework of the real laboratory on the basis of previous work packages of the definition and R&D phases, are: Heat island/heat effect (in particular impact in densely populated inner city districts), heavy rainfall events (e.g. flooding of the sewerage system) and invasive species (fungal attack, impairment of flora/fauna, economic damage due to additional expenditure).

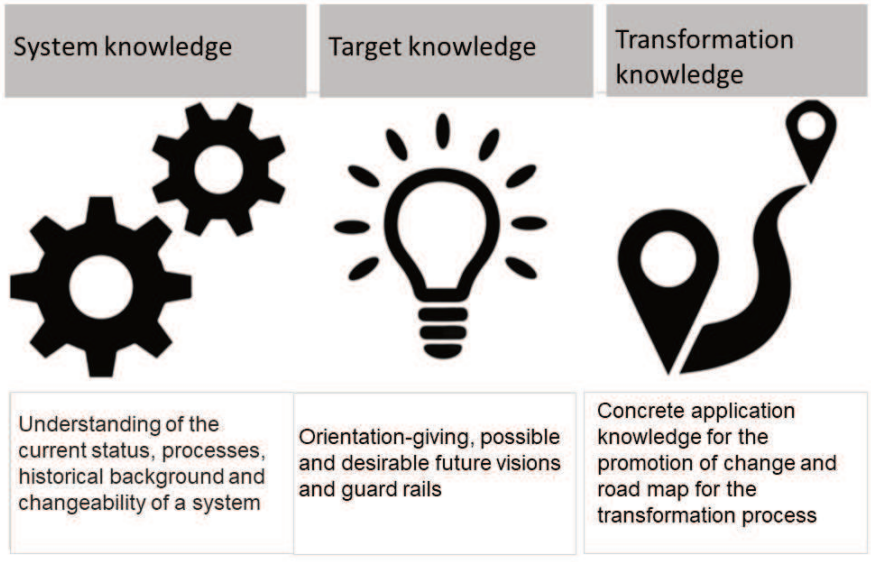

Fig. 3: Different types of knowledge (Source: ProClim 1997) Work plan for the project SMARTilience

4.3 Real laboratories

In order to ensure the practical and application relevance of the integrated control model, it is developed and tested in these real laboratories along the specific needs of two sample municipalities - the real laboratories in Halle (Saale) and Mannheim. The sample municipalities are already introducing ongoing pilot projects in the field of climate-resilient urban and infrastructure development, and supplementing them in control, planning and implementation, as well as evaluation, with innovative measures and practices from the

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building block of the control model in order to measurably contribute to improving the climate resilience of their city. The selection of specific measures and practices takes place according to need and according to the respective level of development of climate resilience on site. Legal framework conditions and regional strategies are taken into account. The laboratories Halle and Mannheim will start in January 2020 and lasts about 18 months.

We follow this definition of a real laboratory:

„A real laboratory is a social context in which researchers carry out interventions in the sense of real experiments‘ in order to learn about social dynamics and processes. The idea of the real laboratory transfers the scientific concept of the laboratory into the analysis of social and political processes. It ties in with the experimental turn in the social and economic sciences. There are close links to concepts of field and action research.“ (Schneidewind 2014)

Therefore, in the two laboratories there are three objectives: a) test of parts of the developed urban governance toolbox, b) development of a laboratory conception with the local administration and civil society and c) concrete measures e.g. geodata strategy development or heat plan.

These ideas are planned for the laboratory in Halle:

- Consolidation and optimization of existing data in the partner consortium and model cities (studies, projects, geodata, ...)
- Update and implementation of the integrated climate protection concept and interlinking with existing plans in the city
- Communicating and addressing the need for adaptation to climate change for urban society
- Testing transferability to other municipalities / learning from each other (peer-to-peer)
- Interdisciplinary exchange and networking activities
- These measures are planned in Mannheim:
- Analysis of the available (geo-) data and development of a strategy for the use of data for climate protection and adaption
- Consideration of climate protection and climate change adaption in current projects of urban development or planning and approval procedures as well as cross departmental work
- Implementation of the “Urban Governance Toolbox” to analyse the concrete need for action and to select suitable planning and implementation measures taking into consideration the specific problem in Mannheim
- Increased communication and citizen participation in climate change mitigation and adaption to show specific needs, identify consternation and profit from available synergies
- Action plan 2030 for climate protection and climate change adaption to support integrated sustainable urban development
- Peer-to-Peer: systematic promotion of exchange and learning between project partners (mentoring, studying, shadowing).

The conception of the transformation arena as well as the concrete agenda (see DeFila et al 2019) shall remain flexible and open for new ideas during the process of the real laboratory. The first ideas consist of one to three real experiments and different participation methods with the civil society. One fix point is that in March 2020 there will be a co-creative workshop in each of the cities where those ideas will be discussed in more detail in order to fix a concrete roadmap for both laboratories. The IAT will evaluate together with the HCU the laboratories parallel.

5 PEER-TO-PEER-LEARNING

In order to systematically promote the exchange of sample municipalities with each other and between the participating science and practice partners, to recognize and analyze common challenges, to identify best practices and working solutions and to learn from each other, SMARTilience follows the approach of peer-to-peer learning. The development status of the respective projects in the real laboratories, challenges and

risks are assessed in three cycles using an adequate survey tool. The status reports form the basis for the targeted exchange and co-creation of solutions in three peer-to-peer workshops. The first peer-to-peer workshop took place in November of 2019. All workshops are directed towards the needs of the urban actors respectively the urban project partners Mannheim and Halle. Through a qualitative query of the requirements, the first contents and the rough conception of the process could be determined. The results showed that cities have different needs in the context of climate protection and climate change adaptation. Among other things, marketing campaigns, technical aspects (for example sensors) and data management were important to the cities. In addition, the aim is to find out how participation is also used internally in public administrations to support rethinking and acceptance in the context of the climate. Only the project consortium took part in the first workshop. Every city has the opportunity to integrate itself into the peer-to-peer process and thus learn more about other topics and cities. As other workshops and conference calls will take place with other cities on additional topics. Furthermore, the process of peer-to-peer learning is presented transparently and can be used by other cities via the toolbox from SMARTilience.

In addition, minor challenges in everyday project work at the real laboratories are discussed in regular learning sessions by telephone with the project partners in order to jointly identify possible solutions. It is envisaged that each project partner will experience the project reality in the real laboratories through participatory observation according to the principle of shadowing

6 CONCLUSION

Since SMARTilience is an ongoing project there will be more results and discussion points which shall be presented at a later point. The real laboratory will be flexibly executed and an adaptation of the planned activities is possible at any time of the 18-month long process within the cities. Therefore, a reflection workshop in December 2020 is planned as each partner should learn and contribute with their own perspective during the real laboratories.

After the laboratories, the collected experiences will enter in the redevelopment of the urban governance toolbox. As an example the tested governance practises, such as the real laboratory approach will be adapted and uploaded in the toolbox. The evaluation of the real laboratories and the learning process will be a great challenge for the consortia. As well as, the dissemination of the results and the toolbox.

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