



The Düxer Stadtoase in Cologne as part of the RWL iResilience.
Foto: Laura Brings.

Real-World Laboratories as Intermediary Platforms?!

A Comparative Case Study Within the Field of Adaptation to Climate Change

Laura Brings

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Abstract

In the field of adaptation to climate change, transdisciplinary and transformative approaches, and real-world laboratories (RWLs) as part of them, found wide acknowledgement. While working on specific topics within a set real-world frame, they involve various actors. In this sense, fostering cooperation of these actors and developing new forms of governance is often stated as one of the main aims. Nevertheless, the actual contribution of RWLs to this is not evaluated widely yet. This article presents a part of the key findings generated in a master thesis, setting a focus on RWLs as potential intermediary platforms for future urban development. Through their flexible and open structure, the analysed RWLs generated multiple changes in governance and social structures. They further showed potential for fostering cooperation between involved actors by offering them a platform to communicate, change roles and by that generate understanding for each other and the topic.

Laura Brings, studied Geography and holds a master in Transforming City Regions. She is a researcher at the Chair of Planning Theory and Urban Development at RWTH Aachen University. She is focusing on effects of real-world laboratories and networking of actors in cooperation with Utopiastadt gGmbH.

Real-world laboratories in the field of adaptation to climate change

Within the last years, more and more real-world laboratories (RWLs) are established in Germany within the field of climate change mitigation and adaptation (for example BMBF 2015: Innovationsplattform Zukunftsstadt). Especially adaptation to climate change is widely seen as a complex task, which poses great challenges for administrations regarding its implementation. These challenges reach from financial and temporal limitations over insecurities about future developments of climate. Moreover, difficulties arise within administrations and research in communicating needs for action and creating acceptance and understanding for measures among actors and especially citizens (Walk 2013: 22; Weyrich 2016: 51). Specifically, the last points are stressed by many research projects, which are aimed to be addressed within the setting of RWLs. In this sense, a focus in RWLs is often set on the participation of multiple actors – and here especially administrations, research and citizens – to foster future joint work (BMBF 2015: Innovationsplattform Zukunftsstadt).

RWLs are often described to enable exchange and provide a safe learning environment, in which roles can be changed and understanding for each other and the topic generated (Schäpke et al. 2017: 14; Kaiser et al. 2020: 16). In this sense, they are even seen as intermediary platforms, which enable communication and the joint work of various actors on a given problem through providing a neutral communication setting and a wide scope (Räuchle 2021: 296).

Research has only recently begun to evaluate the actual impact of RWLs (Bergmann et al. 2021: 560; Lux et al. 2019: 184; Singer-Brodowski et al. 2018: 26).

Therefore, a master thesis written by the author was developed to generate insights on the contribution of RWLs on citizens' adaptation to climate change. Three RWLs with a focus on heat adaptation were evaluated on their inputs, outputs and outcomes. In this regard, also limits and benefits for citizens, urban planning and transformative research were analysed. This article presents a part of the key findings by answering the question, whether and how RWLs can function as intermediary platforms for exchange and thereby enable joint work on the complex task of adaptation to climate change.

Intermediary platforms in this article are defined on the basis of process intermediaries by Kivimaa et al. (2019: 1071): "Process intermediaries have facilitating and supporting functions in projects and processes contributing to transitions. They are usually established or employed to facilitate the realization of specific projects within a niche or in broader transition processes (such as arenas for networking or information exchange) [...] Their key role, thus, revolves around developing connections between different groups of actors as supposedly neutral actors and advancing day-to-day activities or information exchange to benefit transitions".

After giving a short introduction into the topic of adaptation to climate change and the format of RWLs, the methodology and results are presented. The results are then discussed based on the questions, if RWLs can be seen as a chance 1) for citizens to get involved into processes for adaptation to climate change, 2) for socially robust research through wide participation and 3) for a joint future urban development.

Climate change adaptation as a complex task

The effects of climate change are increasingly detectable in Germany. Heat and droughts as well as heavy rainfall, flooding and storms led to more public awareness about climate change. As the effects range from health risks and deaths to damages in infrastructure and crop failures, they are of wide concern. For German cities, a rising heat stress poses the most significant threat. National data shows, that the summers of 2003, 2018 and 2019 were the warmest years since the beginning of weather measuring (UBA 2019: 7f). Specifically, densely built environments and cities show higher heat stress for citizens due to the urban heat island effect, higher CO₂ and particulate matter concentrations (UBA 2019: 152). In summer, this can lead to health risks caused by high temperatures during the day and less cooling during the night. In summer 2003 about 7500 more people died than expected without heat waves, which was also detectable during following years. Nevertheless, the effects of these changes are not only noticeable in health sectors, but in multiple sectors, such as agriculture and infrastructure (UBA 2019: 32f). Therefore, adaptation to climate change is a complex task, which, on the one hand, requires transdisciplinary work across many sectors and, on the other hand, involves various actors from different scales (Knierim et al. 2013: 10f).

Although a wide cooperation of actors within the field of climate adaptation is necessary, this poses great challenges for local administrations.

The greatest barriers for cities to accomplish climate change adaptation, according to Weyrich (2016: 51), are missing financial and personnel resources and capacities, as well as governance and institutional constraints and a lack of awareness and communication among actors. This lack of awareness and communication is especially seen as a challenge for participation of citizens. Here, the missing understanding of citizens about their own role in adaptation projects and the possible impact they can have is seen as a barrier in realising adaptation to heat in cities (Baasch et al. 2013: 71f). Many citizens, as for example pointed out by Born (2011: 82ff) see the task of adaptation to climate change rather at the governmental side, while the will to change the own behaviour and an understanding about the own consternation is mostly not accomplished within projects. Additionally, knowledge about possible own action is mostly not given. Walk (2013: 23) stresses that citizens can only become so called carriers of the process if a high motivation and a great interest in the topic is given. She further points out a need for researchers to widen the approaches to participation in a way, that it raises awareness within the political system and the administrations for existing structures in decision-making processes and the wishes of each involved actor.

In this sense, the question of the contribution of RWLs to those detected challenges is a crucial one. Especially the question of RWLs as intermediary platforms which foster exchange and understanding among actors and for the topic is of great importance for future development of adaptation in cities.

Real-world laboratories as cooperation platforms

As the topic of adaptation to climate change is complex and requires direct action, RWLs are recently used in many research projects (Borner and Kraft 2018: 6). Through testing measures in a local, real-world context and the participation of many actors, transferable measures, awareness for the topic and social learning are aimed to be fostered (Kaiser et al. 2020: 16). RWLs are stated as spaces for new forms of knowledge production, which includes co-design and co-production of knowledge. This, according to Schöpke et al. (2017: 14), offers possibilities of mutual learning as well as an activation, empowerment and integration of multiple actors. Through this, the complexity of sustainability problems, such as climate adaptation, is approached and the need for change aimed to be understood by non-experts. New forms of governance and knowledge production can be enabled, which is highly important when dealing with insecurities and uncertainty – as in the field of climate adaptation.

Although a lot of research has been conducted within this field in the last years, some questions remain open. First of all, it is not clear, which outputs and impacts they actually achieve. A systematic evaluation of the outputs and impacts, as well as the processes and a comparative case study is lacking (Welsch 2021: 9; Lüderitz et al. 2017: 63). In the broader context of transdisciplinary research (TDR), studies are conducted about methods and processes and the influence of research settings, yet “insights on whether working with new formats, such as RWLs, lead to faster or even better effects than ‘conventional’ TDR are lacking” (Bergmann et al. 2021: 560). Here, especially long-term societal changes are stated as difficult to evaluate as a time delay for impacts to occur must be considered. As RWLs themselves are mostly carried out in a comparably short amount of time (3-5 years), the focus of the evaluation is mostly set on direct outputs and the possible uptakes of the results (Bergmann et al. 2021: 561; Lux et al. 2019: 184). Linking research to societal changes also poses great challenges in communication and time delays within the processes were detected. Time restrictions, therefore, are stated as one of the biggest obstacles for systematic evaluation and pledges for longer funding frames are getting louder (Gerhard and Marquardt 2017: 108; Bergmann et al. 2021: 561). Furthermore, the results themselves pose challenges, as the formerly explained time lag of impacts lowers the ability to relate the impacts to a specific research project (Lux et al. 2019: 184; Lüderitz et al. 2017: 62).

In this sense, RWLs are in need of further research regarding their achievements and effects. This article therefore aims to contribute to the current discourse by providing insights into the societal and governance outputs and outcomes RWLs can achieve in their function as intermediary platforms.

A comparative case study on inputs, outputs and outcomes

Within the master thesis, three RWLs were analysed regarding their inputs, outputs and outcomes (Figure 1). Inputs included the research approach and project-initiated activities. Outputs were defined as direct products and results, while outcomes meant the direct effects and short-term results. Impacts were not evaluated as the analysed cases were not finished yet and impact measurement often requires time delay as elaborated before. The focus was set on heat as the most significant climate change signal.

This article focusses on the detected societal and governance changes as well as on the outcomes regarding the question on whether and how RWLs can function as intermediary platforms for exchange from the perspective of citizens, urban development and transformative research.

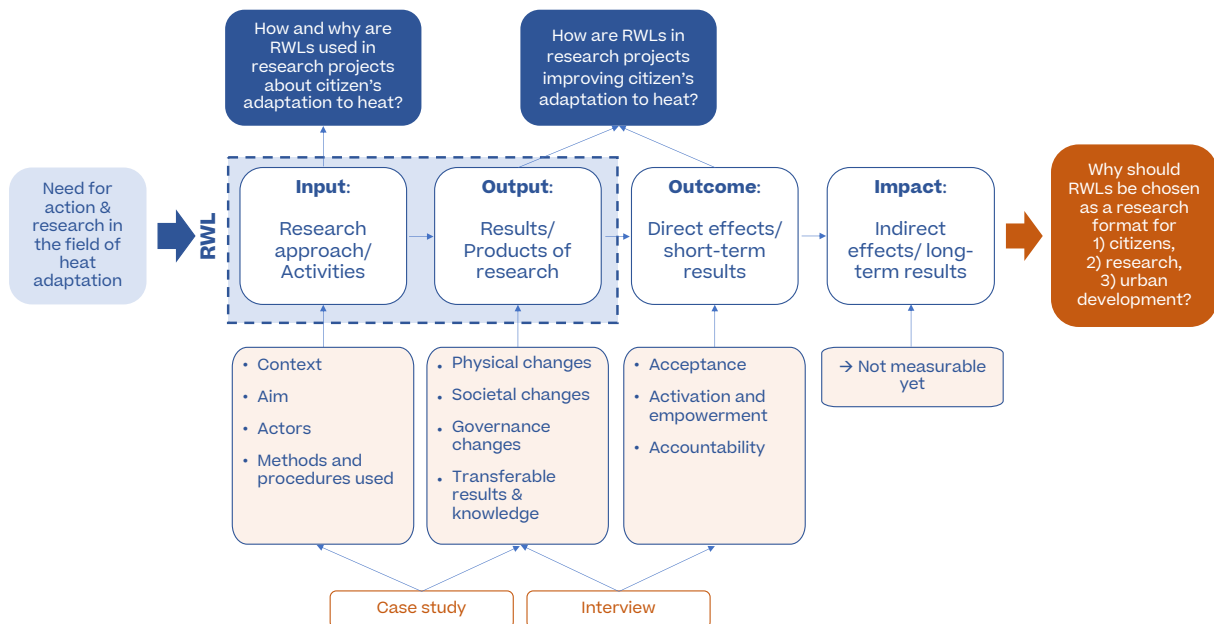


Figure 1: Research approach used in the master thesis.
Source: Author, based on a model by Augenstein et al. 2016.

Within the overall procedure of the master thesis, a literature review was conducted as a first step to access the topic of heat adaptation and RWLs. Further research was then conducted on existing analysis and evaluation schemes to develop a suitable analysis scheme for the work. In a next step three cases were analysed with the scheme and compared to each other. The analysis was first conducted by reviewing project websites and publications and then further completed through interviews with project partners from research and practice (further described as experts).

Three real-world laboratories in the field of adaptation to heat

The projects to be analysed were selected according to three indicators:

- real-world-laboratories as research format,
- heat in cities as focal topic in climate change adaptation and
- participation of citizens as major aim.

To set an equal base of funding and have the same (funding) understanding of RWLs throughout all projects, research projects were selected within the frame of the *BMBF Leitinitiative Zukunftsstadt* (BMBF 2015). The projects selected were *GoingVis*, *HeatResilient-City* and *iResilience*. They each took place in two different locations and had a duration of around two to three years (Table 1). Setting a focus on interventions in mostly urban settings, they all aimed to add up to the existing and future local development and planning processes.

The project *GoingVis* focuses on fostering resilience to the impacts of climate change in small towns. In a co-creative process with the local population, adaptation measures are developed in two locations: the town Boizenburg/Elbe and other small towns in the region Elbe/Elster (GoingVis 2021).

The project *HeatResilientCity* aims to implement “innovative, socially just and user accepted adaptation measures to reduce the summer heat load of people in buildings and open spaces” (Ortlepp and Golz 2018: 1). In two example neighbourhoods (Dresden Gorbitz and Erfurt Oststadt), RWLs take place to develop and implement adaptation measures in a transdisciplinary process (Ortlepp and Golz 2018: 1).

Within the project *iResilience*, multiple stakeholders work jointly on the development of processes and measures to tackle the effects of climate change. In three neighbourhoods in Cologne (Deutz) and Dortmund (Nordstadt and Jungferntal), RWLs are implemented to generate and test measures and technical innovations and to jointly develop roadmaps for resilient neighbourhoods (iResilience 2021: 1).

Project Name	Focal Topic	Location	Duration
GoingVis	Heat	Boitzenburg, Elbe-Elster-Region	09/2019-09/2021
HeatResilientCity	Heat	Erfurt Dresden	10/2017-01/2021
iResilience	Heat Urban Green Heavy rainfall	Köln, Dortmund	11/2018-11/2021

Table 1: Overview of the analysed projects. Source: Author.

Insights into the cases

Within the field of adaptation to climate change, the joint work of actors is necessary in order to respond to (local) risks and needs (Knierim et al. 2013: 10f). This is approached within the format of RWLs, as elaborated before, but evaluation of the processes is widely lacking. In literature, intermediary actors have been defined as key catalysts for fostering changes towards sustainability and facilitating exchange processes between actors (Kivimaa et al. 2019: 1062). Therefore, the question on whether and how RWLs can function as intermediary platforms for exchange and thereby foster cooperation between actors in the field of adaptation to climate change is a crucial one. According to Kivimaa et al. (2019: 1071), process intermediaries develop connections between actors as supposedly neutral platforms. In this regard, the following chapter presents the involved actors as well as changes in governance and societal structures. Additionally, insights into the stated outcomes are given.

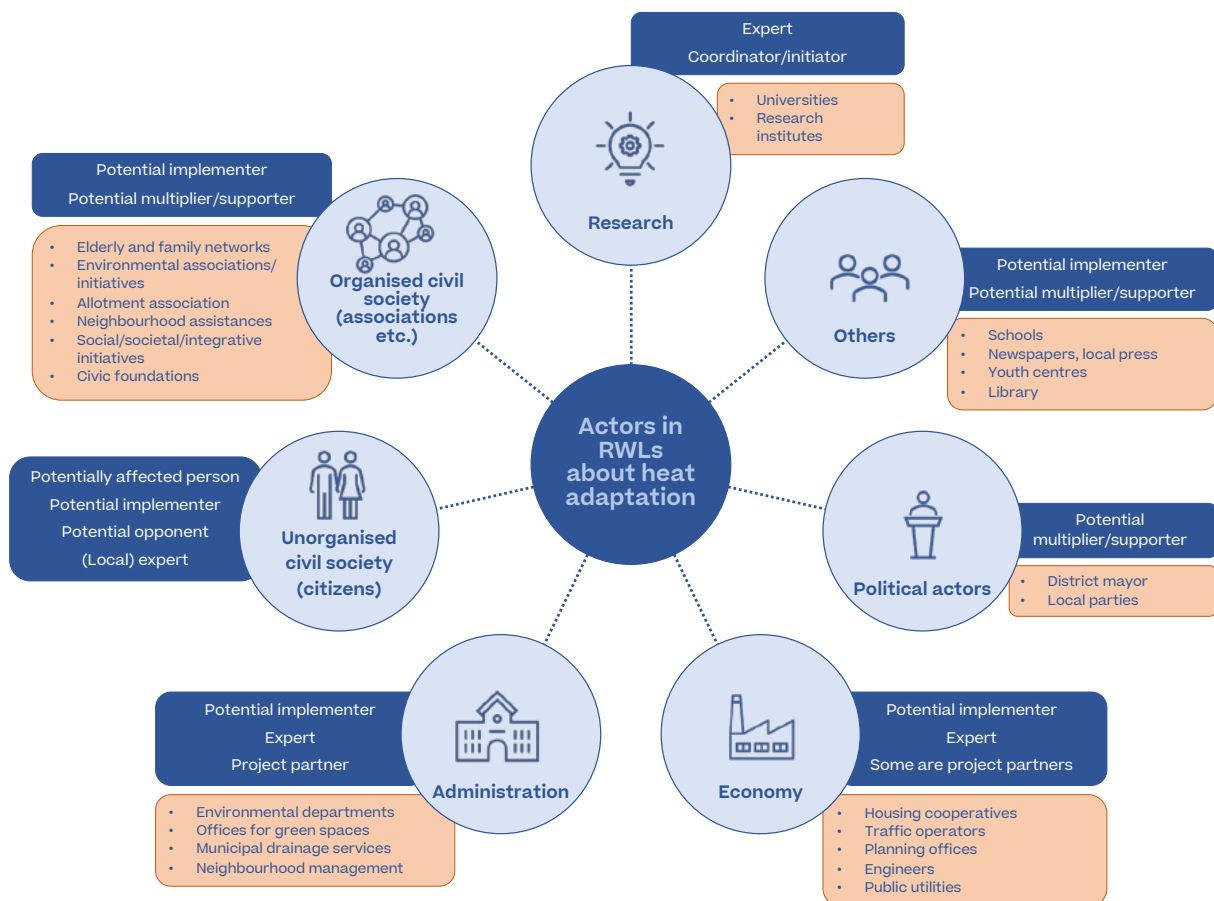


Figure 2: Actors involved in the three projects. Source: Author.

The evaluated projects show a great variety of *involved actors*, reaching from local administrations and researchers to the local civil society and economy (Figure 2). The roles varied from potential implementer, supporter and opponent to coordinator and expert and partly changed throughout the process. This, according to the interviewed experts, fostered understanding for each other and generated insights into the contribution the

particular actors can offer. In this sense, a main characteristic of RWLs often mentioned by the experts was the openness of the format as an opportunity to involve as many participants as possible throughout the whole process. Thereby, not only a great range of actors was able to participate but also additional required actors were involved throughout the process.

To give an example: When organising tree plantings in Erfurt in the project *HeatResilient-City*, many additional actors needed to be involved throughout the process. This, in the end, resulted in a tree planting concept, as well as in new minimum standards for the cooperation of actors in comparative future processes (Figure 3). In this sense, also the possibility to test different participation methods within RWLs, such as walks, future vision workshops or joint planting actions, helped to reach multiple actors and especially many citizens. On the other hand, the openness towards new actors and the possibility to change roles was described as a challenging task for the initiating persons needing a lot of explanatory work.

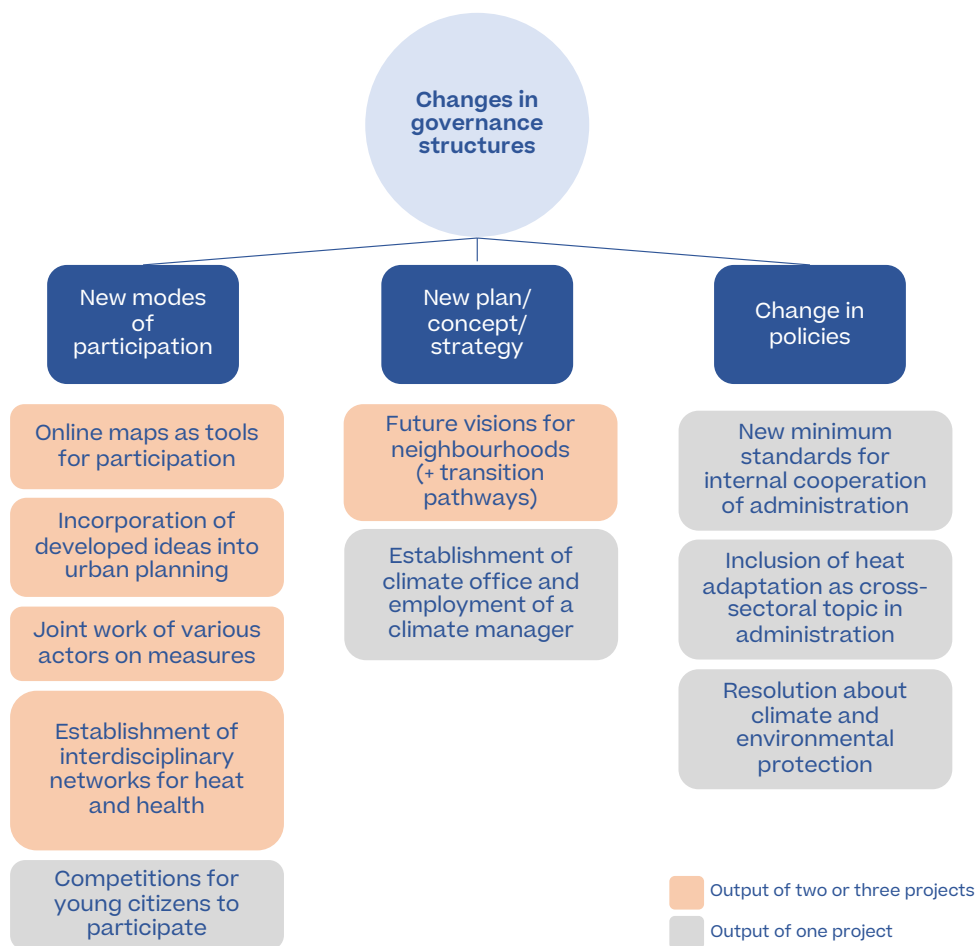


Figure 3: Changes in governance structures achieved within the projects.
 Source: Author.

Regarding *governance changes*, the analysed RWLs helped to strengthen existing local participation structures and form new ones. All analysed projects showed a rise in participation of citizens in measures and processes initiated beforehand by the administration, for

example in form of a rise in tree and irrigation partnerships. Opposite, the incorporation of citizen’s ideas, needs and wishes into local climate adaptation and mitigation concepts and urban planning strategies was achieved. Additionally, new paths for participation and forms of governance were developed and tested (Figure 3). Here, especially the creation of online maps as participation tools can be mentioned, which helped administrations to identify needs for action and gave citizens a communication platform for own ideas. All projects implemented own strategies, reaching from the establishment of a climate office and a climate manager to the inclusion of heat adaptation as a cross-sectoral topic in the local administration. Future visions and transition pathways were developed in all projects aiming to provide further ideas for future projects. RWLs were described by the experts as protected spaces to test and develop new forms of cooperation and governance, which are then partly implemented as long-term structures in the cities.

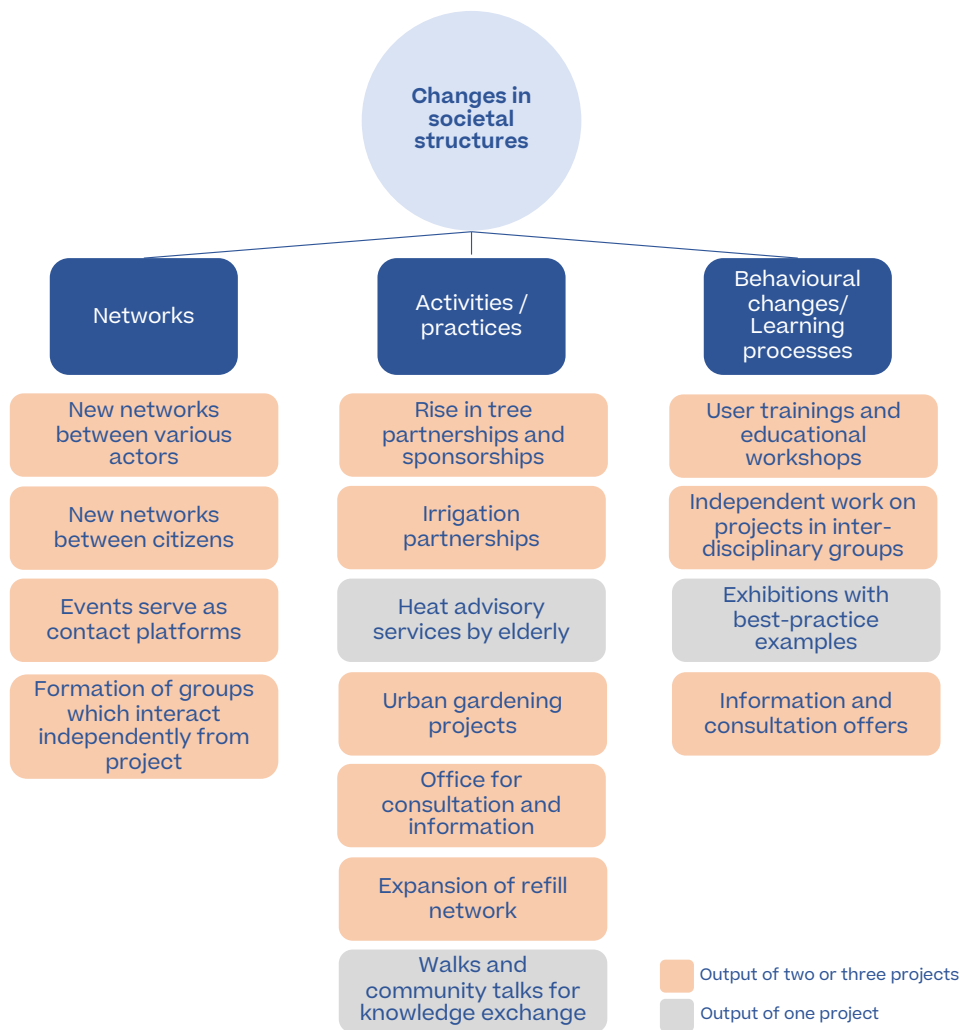


Figure 4: Changes in societal structures achieved within the projects. Source: Author.

In addition to the changes in governance structures, *societal changes* were detectable in all projects. New networks arose and the cooperation of various actors when developing measures was stated to be achieved. Networks developed between citizens as well as between citizens and the administration. In the project *iResilience* this was realised in form

of a heat advisory service by an elderly network in cooperation with the project team. Additionally, cooperation between sectors of the administration was strengthened, for example in the project *HeatResilientCity* in form of a cross-sectoral heat and health network. According to the experts, especially the different formats and methods used within the RWLs helped to create space for exchange (Figure 4). As another example, a competition for students organised within the project *GoingVis* can be mentioned here. It gave students the chance to present own ideas and work jointly with experts from research, the administration and further citizens. This, in the end, resulted in a concept for greening bus stops, which is now organised and expanded throughout the city. Here, also the identification of citizens with self-initiated and developed measures was stated to be of great importance for the further participation in climate adaptation. According to the experts this creates a responsibility, which is important for long-term maintenance of measures.

The formation of groups, which can interact independently from the projects, was another important aspect stated to be crucial when aiming for long-term transformations. This was achieved by the mentioned creation of new networks and added up with informal and formal commitments. Nevertheless, an ongoing sensibilisation, information and activation of actors was stated to be necessary, which poses a challenge for RWLs to achieve during the end of the projects. Tools used for this within the projects were newsletters, posters and flyer, information and consultation events and offices, the establishment of advisory services and city walks. Besides this, personal provision was intended to be improved through various formats reaching from user trainings to the publication of exhibitions, posters and flyers. Within the projects, the activation and empowerment of citizens was stated to be achieved by offering information and communicating skills, fostering knowledge exchange and cooperation between citizens and other actors.

In this sense, the setting of RWLs was described by the experts to be a safe and supportive learning space, in which concrete measures were developed and discussed jointly.

The experts stated to have achieved a wider understanding for this complex topic among the involved actors and by this generated acceptance for measures. This can be seen for example in the will of involved actors to implement further measures throughout the process. Additionally, surveys conducted by the projects suggest a rise in acceptance and understanding. Here, especially trust to the project team was described to be of great importance. This needs special attention during the preparation of the RWL and during the first year. Talks with the involved citizens according to the experts revealed, that the projects or even only individual persons were seen as helpful partners in the development of positive changes and in the demonstration of possibilities and pathways for measures.

A format to get citizens involved in adaptation to climate change

The analysis shows, that RWLs can be described as intermediary platforms fostering more connection between all involved actors and creating acceptance and understanding for the topic of adaptation to climate change. In this sense, they can be seen as a chance for citizens to get involved in the work on adaptation to climate change.

The work revealed that RWLs, on the one hand, can be seen as learning environments for citizens in which information is exchanged. These information are practical and social skills but also theoretical and scientific knowledge. Accordingly, Beecroft et al. (2018: 82f) describe RWLs as settings for individual and societal learning. Here, especially the orientation on the own living environment was stated to generate awareness and makes the complex topic of adaptation to climate change easier to understand. The implementation of tangible measures further generates acceptance for the projects and the topic. The interviewed experts stated to have achieved a wider understanding among citizens for the topic of adaptation to climate change. Thereby also an activation to implement measures for personal provision and in public space was generated. This was also observed by Grothmann (2022: 32), who generated evidence on a rise in motivation and knowledge for the implementation of resilience measures through participation of citizens in RWLs. Additionally, the format of RWLs was described by the experts as a safe and supportive learning environment, which offers space for direct exchange. This strengthens the findings by Kaiser et al. (2020: 16) who write about RWLs as spaces for fostering social learning and raising awareness.

On the other hand, the analysis showed that RWLs can function as a communication platform in which cooperation with other involved actors is enabled. The developed networks and cooperation agreements indicate a high potential of RWLs for fostering the joint work of actors within the field of climate adaptation. This is confirmed by Grothmann (2022: 32), who detected a rise in cooperation between citizens and administrations. Additionally, the analysed RWLs in this work were considered to be of higher acceptance compared to processes initiated by the administration. Particularly project members were described as intermediary actors who support ideas, generate change and thereby foster more participation and the will to cooperate. In this regard, Grothmann (2022: 32) states, that the achieved participation in his analysed projects made participants understand, that climate resilience is a task for society as a whole. Hence, the formerly mentioned missing understanding of citizens about their own role and the possible impact they can have (Baasch et al. 2013: 71f) can be addressed within RWLs. This can also be related to the mentioned possibility of changing roles, which fostered understanding for other actors and their impact.

According to Walk (2013: 23), citizens can only become so called carriers of the process if a high motivation and a great interest in the topic is given. This can be confirmed for the analysed projects. The formation of networks and groups which interact independently from the projects further suggests a high motivation for implementing measures and wide understanding for the topic. Hence, RWLs contribute to the involvement of citizens in the field of adaptation to climate change.

However, various difficulties regarding the format and the complexity of the topic hinder cooperation. Within the analysed projects, insecurities about the change of roles were mentioned as a challenging communication task. Here, the development of training formats for project leaders was stressed as one future task for research. Additionally, the insecure future of measures due to time and financial limitations stand against the aim of long-term transformations (Gerhard and Marquardt 2017: 108; Bergmann et al. 2021: 561). This was stated to need great communication efforts towards citizens by the interviewed experts. They further mentioned that another major limit from the perspective of citizens are the time-consuming resources citizens need to invest within the analysed projects. This effort does not guarantee success and the expectations can also not always be met due to ethical as well as financial limitations. Additionally, citizens are asked to not only follow the own specific interest but to find joint answers to the given problem. This poses great communication efforts for project leaders. Here, Engels and Rogge (2018: 30) found out that “[...] participants perceive their pioneering role rather as a burden that comes with expectations of (regional) value creation”. In this sense, RWLs can also be seen as challenging participation formats for citizens.

Socially robust research through wide participation in real-world laboratories

The analysis showed that RWLs can contribute to more socially robust research by acting as an intermediary platform in which exchange of knowledge and cooperation is fostered. Through the involvement of various actors throughout the process and in multiple formats, exchange is enabled and many scientific results generated.

Scientific results in the analysed projects reached from scientific papers and presentations to reviewed and partly transferable concepts. As a specific benefit of RWLs, the model-like character and the visualisation of concrete measures were mentioned, which improve the resonance on proposed solutions. Additionally, the orientation on a specific context and the implementation of real-world measures was stated to be of great importance. According to Borner and Kraft (2018: 10) or Beecroft et al. (2018: 79), RWLs make the generation of more robust knowledge possible through the inclusion and distribution of system knowledge (about the current situation of a system), target knowledge (about desired futures) and transformational knowledge (about concrete measures to achieve targets). In contrast to non-transdisciplinary processes, RWLs produce results which have a societal legitimation and acceptance generated through the integration of various perspectives in participatory process and the testing of measures by the users (Borner and Kraft 2018: 4).

Through the cooperation of researchers with other actors in various formats, direct access to (local) knowledge and exchange with partners from practice was achieved within the analysed projects. The reachability of other actors was mentioned to be simplified by interacting with civil society and partners from practice directly in real-world experiments. Here, the implementation of visible measures generated the widest feedback, understanding and acceptance. Through the cooperation and the change of roles, new perspectives were stated to be gained.

Nagy et al. (2020: 1) describe RWLs as formats for learning about new perspectives on the faced problem and getting to know different interests and needs of societal actors.

The collaborative generation of different forms of knowledge can also be challenging for researchers. The open format of RWLs allows for participation of actors throughout the whole process, which poses threats for group cohesion and therefore needs strong recognition by the project team (Engels and Rogge 2018: 29). The experts stated to have needed a high amount of time for explanatory work regarding the format and roles. Additionally, the new roles researchers can take in, pose new tasks, for which researchers need to develop new competencies (Borner and Kraft 2018: 4). They can be addressed by the implementation of new qualification possibilities, learning structures and new procedures within the scientific system as well as with a wide reflection of the own role (Beecroft et al. 2018: 80; Borner and Kraft 2018: 10). In this sense, also the mentioned short duration of the projects needs further recognition and rethinking. This is also strengthened by Parodi et al. (2018: 58), who state: "RWLs need more time" based on their comparative study of three RWLs. Especially in transformative research formats, which aim for long term transformations, the short duration is seen as a limitation.

Joint urban development towards climate-proof cities

The analysis highlights, that RWLs can function as intermediary platforms for exchange and thereby contribute to a joint future urban development in the field of adaptation to climate change. As described prior, socially robust measures are developed within RWLs, which pose further benefits for future urban development projects.

In the analysed RWLs concrete measures were developed and implemented. They were tested on feasibility, while their acceptance within civil society and effects were analysed. Additionally, the produced future visions and transition pathways offer further guidance for the local administrations. The joint development of the measures, platforms and tools by multiple actors were described to foster great acceptance and thereby possibly reduce barriers for future implementations. Nagy et al. (2020: 3) accordingly state that measures developed jointly in practice are accepted widely and implemented and distributed more easily. Especially participatory events within RWLs help addressing the complexities of the faced issues and therefore are valuable for future urban development, in the sense that they create acceptance and give administrations insights into potential obstacles (Engels and Rogge 2018: 30). This was confirmed by the experts, which stated to have generated a wider understanding among actors and by this achieved higher acceptance for measures. Grothmann (2022: 32) found out that RWLs can even promote the topic of resilience to climate change as a task for society as a whole. However, this needs further research in the long run regarding the durability of acceptance, understanding and activation.

Additionally, through working of specific problems in RWLs, the collaboration between rather separated sectors and disciplines within administrations can be enabled and new

modes of participation and collaboration discovered. As described formerly, this for example led to cooperation standards within the administration. This is confirmed by the findings of Engels and Rogge (2018: 29), which state that through the inclusion of various and heterogeneous actors from many sectors and with different backgrounds, RWLs can foster social learning and thereby enable cooperation. This implies learning processes between research and practice and the development of new competencies and networks (Nagy et al. 2020: 3).

Especially the task of climate change adaptation and mitigation needs the cooperation of different sectors and disciplines, in this sense RWLs can be seen as intermediary platforms, which support the development of joint strategies in administrations.

Challenges remain regarding the development after the RWL ended and the stabilisation of measures developed in the RWL. Here, the open, flexible and innovative structure of RWLs stands against the stable structures of administrations (Beecroft et al. 2018: 92).

Real-world laboratories as intermediary platforms to enable adaptation to climate change

This work showed, that RWLs can be seen as intermediary platforms for exchange to enable adaptation to climate change in cities. Following the definition by Kivimaa et al. (2019: 1071), process intermediaries facilitate and support projects and processes and aim for transition processes. They are stated to advance activities and information exchange, which then benefits the transitions aimed for. This can be confirmed for the analysed RWLs, as physical changes, as well as societal and governance changes were initiated and developed throughout the process. These changes all thrive towards a transition of the chosen settings to adaptation to climate change. Information exchange was enabled and a greater understanding of the complex topic of adaptation to climate change achieved among the involved actors. Kivimaa et al. (2019: 1071) further state, that process intermediaries play a major role in facilitating connections between actors, as the intermediaries themselves are seen as neutral actors. This can be confirmed for RWLs as the analysed cases showed a rise in cooperation between actors and within actor groups. The project teams in the analysed cases were seen as neutral and supporting agents, which strengthened cooperation and helped to develop ideas jointly. They further enabled new forms of governance and strengthened participation in existing participation formats.

The real-world setting of RWLs apart from regular participation standards gave involved actors the chance to change roles, generate understanding for each other and fostered cooperation and acceptance.

This work showed that RWLs can give citizens the chance to get in touch with the complex topic and strengthens their ability to participate in processes through working in a local context and at eye-level with other actors. RWLs further give transformative researchers the chance to get in direct contact with other actors and by this make their research more socially robust. For urban development, RWLs pose great opportunities for the development of future visions and transition pathways. They further can give insights into possible implementation barriers and offers planners a chance to communicate necessities for change, which is especially important in the complex field of adaptation to climate change.

However, the durability of the generated structures within the analysed RWLs can be questioned and the incorporation of measures created in the flexible format of RWLs into the more stable structures in administrations is still seen as a challenge. Moreover, a long-term evaluation of the analysed cases would be necessary to confirm the short-term outputs and effects.

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