Climate and Development

ISSN: 1756-5529 (Print) 1756-5537 (Online) Journal homepage: https://www.tandfonline.com/loi/tcld20

Collaborative governance and the challenges of participatory climate change adaptation planning in Santiago de Chile

Jonathan Richard Barton, Kerstin Krellenberg & Jordan Michael Harris

To cite this article: Jonathan Richard Barton, Kerstin Krellenberg & Jordan Michael Harris (2015) Collaborative governance and the challenges of participatory climate change adaptation planning in Santiago de Chile, Climate and Development, 7:2, 175-184, DOI: 10.1080/17565529.2014.934773

To link to this article: https://doi.org/10.1080/17565529.2014.934773

Published online: 18 Jul 2014.

Submit your article to this journal

Article views: 805

View related articles

View Crossmark data

Citing articles: 9 View citing articles

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=tcld20

Climate and Development, 2015
Vol. 7, No. 2, 175–184, http://dx.doi.org/10.1080/17565529.2014.934773

climate and development

CASE STUDY

Collaborative governance and the challenges of participatory climate change adaptation planning in Santiago de Chile

Jonathan Richard Barton[a], Kerstin Krellenberg[b] and Jordan Michael Harris[a,c,d]*

[a]*Pontificia Universidad Católica de Chile, Centro de Desarrollo Urbano Sustentable, Providencia, Chile;* [b]*Department of Urban and Environmental Sociology, Helmholtz Centre for Environmental Research, Leipzig, Germany;* [c]*Instituto de Estudios Urbanos y Territoriales, Pontificia Universidad Católica de Chile, El Comendador 1916, Providencia, Chile;* [d]*Escuela de Sociología, Universidad Diego Portales, Santiago, Chile*

(*Received 6 August 2013; final version received 10 March 2014*)

This article focuses on collaborative governance and the challenge of participatory processes in order to form integrated adaptation responses to climate change. The case of Santiago de Chile, where the creation of a Regional Climate Change Adaptation Plan for the Metropolitan Region was undertaken in collaboration with the Regional Government and the Regional Ministerial Secretariat of the Environment, provides the experience of such a participatory process being part of a larger inter- and transdisciplinary project. The article highlights the complexities involved in this process and knowledge transfer in the context of collaborative governance. The principal challenges identified are: to 'make the case' with respect to climate change adaptation planning; to be able to communicate scientific data effectively and to be clear about methodologies and uncertainties; and to ensure an integrated, coordinated response rather than sectoral fragmentation. The paper concludes that despite the complexities involved, participatory planning processes are preferable for urban climate change adaptation, as such processes are more legitimate and generate the social capacity building and inter-sectoral cooperation needed in the context of the current governance models in large Latin American cities, as exemplified by the case of Santiago.

Keywords: climate change adaptation; collaborative governance; participatory process; Santiago de Chile

1. Urban climate change adaptation as a collaborative, participatory process

To include multiple actors from different sectors and administrative levels into climate change adaptation has been increasingly at the fore of contemporary discussions (Adger, Arnell, & Tompkins, 2005; Birkmann, Garschagen, Kraas, & Quang, 2010; Bulkeley, 2010; Corfee-Morlot, Cochran, Hallegatte, & Teasdale, 2011; Füssel, 2007; Tompkins & Adger, 2005), owing to an increasing consensus that political action needs to be undertaken in order to translate sound climate science into policy and specific measures, to finance these appropriately (Stern, 2006). According to Emerson, Nabatchi, and Balogh (2011, p. 3), collaborative governance 'captures a fuller range of emergent forms of cross-boundary governance, extending beyond the conventional focus on the public manager or the formal public sector' and includes public–private and private–social partnerships and co-management regimes. Thereby, collaborative governance can be time-consuming but, on the other hand, can benefit saving considerable time and energy in downstream implementation if collaboration effectively works (Ansell & Gash, 2007). Collaborative governance refers to 'a two-way communication and influence between agencies and stakeholders and also opportunities for stakeholders to talk with each other' (Ansell & Gash, 2007, p. 546).

Cities in general consist of densely populated areas that concentrate a significant portion of critical infrastructure and often represent the most important poles of economic growth for their respective countries. Climate change represents an additional stress factor, putting continued economic stability and the maintenance of critical infrastructure, such as transportation, health and sanitation services, upon which urban populations depend for their livelihoods, at risk (United Nations Human Settlements Programme [UN-HABITAT], 2011). In the case of developing countries, urban areas are also home to large populations residing in risk-prone areas, often with precarious housing conditions that may even lack adequate basic services and infrastructure. In this way, climate change is likely to have disproportionate impacts on those populations that are least able to prepare for and respond to

*Corresponding author. Email: jordan.harris28@gmail.com

© 2014 Taylor & Francis

climate-related challenges and disasters (Satterthwaite, Huq, Pelling, Reid, & Romero Lankao, 2007), although all socio-economic strata might be equally effected but showing different capacities and means to cope with the impacts (Krellenberg, Müller, Schwarz, Höfer, & Welz, 2013). In any case, integrating climate change considerations into urban planning becomes imperative in order to minimize possible future costs associated with climate change impacts and provide improved protective measures for vulnerable populations and critical infrastructure.

Adaptation, therefore, must become a critical element of urban planning and development processes, going beyond simple disaster relief programmes and reactive funding mechanisms, typically characteristic of city-region coping strategies.

Furthermore, the issue of how to plan for adaptation to climate change has become increasingly crucial. As climate change adaptation can be considered a cross-boundary issue, as defined by Ansell and Gash (2007), in calling for collaborative governance, new decision-making processes are needed that differ from traditional approaches. Therefore, collaborative governance is increasingly considered to be essential in climate change adaptation in order to bring public, private, civil society and academic/scientific stakeholders together. Thereby, collaborative governance moves beyond merely public sector government decision-making and prioritization, with a view to opening up debate on public issues, increasing participation and enhancing legitimacy for consensus-driven outcomes, and should be contrasted with forms of governance that are merely consultative, participatory governing processes (Ansell & Gash, 2007). It is the multiplicity of actors that represents the main merit regarding the decision-making processes, as this allows for inter-sectoral coordination regarding the generation of effective adaptation measures. It involves an awareness of the complex ways in which existing sectoral and spatial urban planning instruments have been designed and implemented, consideration of the limitations and opportunities for incorporating climate change dimensions, and the politics of the process itself.

A collaborative governance framework has the potential to contribute to more robust strategies over multiple governance levels and sectors, as such strategies take a variety of interests and needs into account, while still operating within the corresponding technical and financial limitations (Jones, Jones, Walker, & Walsh, 2009; Shaw, Colley, & Connell, 2007; Vogel, Moser, Kasperson, & Dabelko, 2007). Despite the desirable results of collaborative governance processes, reaching consensus among divergent actors and interests is not always a simple or straightforward task. The involvement of a wide range of stakeholders can lead to conflictive situations where different perspectives across sectors and levels enter into competition. In this way, participatory decision-making is not often the most efficient, timely or simplest way to enact management policies, despite the fact that it has been trumpeted as fundamental and necessary for issues of environmental management (Moser, 2009; Reed, 2008). However, it is clear that it is paramount when dealing with the effects of climate change, which cross traditional, sectoral lines and have an impact on almost every aspect of urban development and its management (Barton, 2009; Roux, Rogers, Biggs, Ashton, & Sergeant, 2006; Sanchez-Rodriguez, 2009).

It is the complexity of this space – of collaborative governance – that is explored in this case study article by reviewing the participatory process (2010–2012) as one methodological aspect of a greater inter- and transdisciplinary project (Krellenberg, 2012, Krellenberg & Hansjürgens, 2014) for generating a Regional Climate Change Adaptation Plan for the Metropolitan Region of Santiago de Chile (MRS) (Krellenberg, Heinrichs, & Barton, 2010). This process involved the participation of key public institutions, the private sector civil society and academia, and it demonstrates the complexity and effectiveness of a collaborative, participatory planning process, including a science–policy interface.

The basic premise of the article is to provide further evidence from a specific case study in Santiago de Chile, showing that a participatory, collaborative governance process is an effective form of generating a coordinated response to climate change. Collaborative governance in the way of multi-stakeholder involvement is particularly important in order to formulate an integrated response, as climate change is an extraordinarily complex phenomenon with wide-ranging and simultaneous impacts on various scales and multiple sectors of urban governance. Furthermore, as in Chile planning and governance schemes are typically sectoral and non-participatory, the experience in Santiago demonstrates that collaborative governance can lead to a heightened adaptive capacity regarding the formation of adaptation measures in response to the main expected impacts of climate change.

2. Santiago de Chile: challenges and constraints for urban climate change adaptation planning

It is only during the last five years that detailed information has emerged on the potential impacts of climate change for the MRS (Barton, 2009; CONAMA, 2006; Cortés et al., 2012; Garreaud, 2011; Romero, Salgado, & Smith, 2010). For this reason it is not surprising that the adaptation debate is a relatively recent one in the Chilean context. Both the availability of valid scientific data and the existence of a public debate on the issue of adaptation have been a sine qua non for being able to start and establish a participatory process for climate change adaptation at the regional (metropolitan) level.

In 2005, the National Environment Commission (CONAMA) contracted the Geophysics department of the

University of Chile to establish expected climate change impacts in Chile during the twenty-first century, based on meta-analysis of global modelling data (CONAMA, 2006). This study was performed on a national scale, using international climate meta-analysis tools in order to characterize expected climate patterns throughout the country. It was not until 2010 that more detail was added to the regional dimension regarding climate change by downscaling the available information from global models to determine the expected impacts of climate change on a smaller scale (in this case the Metrpolitan Region of Santiago) in the context of the Climate Adaptation Santiago (CAS) project (Cortés et al., 2012, McPhee et al., 2014). Although there is a range of uncertainty in these results, which is usual for long-term, multivariate analyses due to downscaling and data gaps, it is clear that there are climate change-related impacts that will alter historical trends in the MRS. According to the results of the study carried out by Cortés et al. (2012), the MRS will be subjected to annual temperature rises of between 2 and 4°C. Extreme heat events in the summer months are also expected. At the same time, reduced average precipitation rates and increased melting during winter will lead to lower flow rates through the region's Maipo catchment system. Water availability and its cost is a variable that links both temperature and precipitation. Rising temperatures will induce increased water demand for cooling and irrigation (of agricultural land, public and private spaces, e.g. gardens and swimming pools), which implies that conflicts over water supply between different sectors (e.g. agriculture, mining and residential) as well as within sectors, are most likely to increase (Heinrichs & Barton, 2011). Precipitation, while tending towards a general decline in yearly averages, will come in the form of more intense events rather than the usual light rain events (Cortés et al. 2012), indicating continuing flood hazards. Mapping these hazards and the exposure of people and homes, and ensuring that planning instruments take these into consideration, will be increasingly relevant in order to ensure a reduced risk over the longer term (Ebert, Welz, Heinrichs, Krellenberg, & Hansjürgens, 2010; Krellenberg et al., 2013; Müller & Reinstorf, 2011). These impacts will have to be considered in planning the future of the MRS.

3. Participatory adaptation planning in Santiago de Chile

3.1. *Objectives and main focus of the participatory process*

Due to the need for implementing collaborative governance in decision-making and planning processes for climate change adaptation, a robust participatory process was designed in order to bring actors representing a variety of sectors together. The participatory process, initiated in 2010, included close collaboration between climate and social scientists in order to prepare detailed but comprehensible accounts of estimated climate change impacts on the MRS to a wide-ranging group of actors and decision-makers from regional government, national ministries, civil society, the private sector and multi-lateral institutions. The participatory process was organized in the form of a series of 10 Round Table meetings with representatives of these organizations. Within this process, existing measures in the MRS relating to climate change were evaluated and prioritized according to their relevance to adaptation, and a set of climate change adaptation measures were developed and determined in a collaborative manner. Furthermore, the implementation of the measures in terms of the legal, normative, planning and financial requirements, as well as the various institutional responsibilities for each measure on a regional scale, was also discussed and systematized into a complementary Implementation Manual for authorities.

In this way, the participatory process itself can be characterized as a form of anticipatory, public and planned adaptation, as defined by the Inter-Governmental Panel on Climate Change (IPCC) (Adger et al., 2007), in that the adaptation process occurs before observable climate change impacts, involving a response from the public sector regarding a concern for collective welfare, and in the context of a deliberate adaptation policy planning process. The general participatory planning process is presented in Figure 1. For Santiago, this approach represents an innovative and far-reaching policy process within the existing planning and governance scheme, as Chile in general and Santiago in particular are typically characterized by non-inclusive, sectoral and piecemeal governance schemes (Barton, 2009). The participatory planning process allowed for the scientific results regarding expected climate change impacts in the MRS to be brought to a common level of understanding between various local and regional stakeholders. As a result of the interaction between the scientific experts and the participating stakeholders, it was possible to determine what such effects would imply for the social, political, economic and environmental systems represented by the various stakeholder groups.

The overall goal was to generate a collaboratively developed Regional Climate Change Adaptation Plan for the MRS by the end of 2012, so that it could be incorporated into the budgets of those institutions responsible for the development of a regional climate change strategy: the Regional Government (Gobierno Regional – GORE) and the Regional Ministerial Secretariat of the Environment (SEREMI MA). The first goal was successfully accomplished, as the final product of the Round Table process in the form of a Regional Climate Change Adaptation Plan was formally presented to the GORE and SEREMI

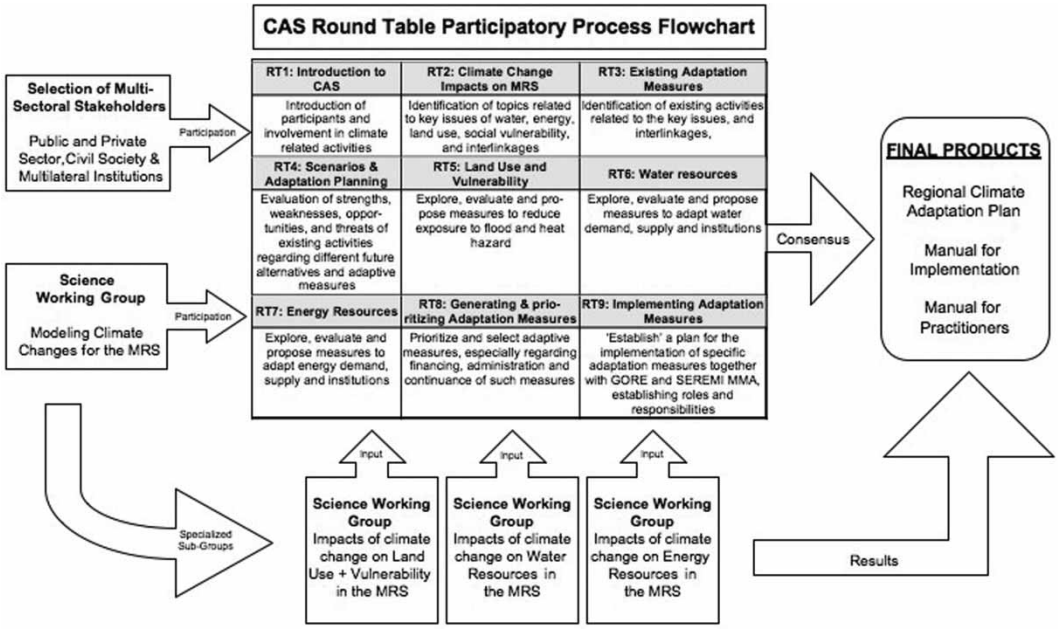

Figure 1. Participatory planning process flow chart.
Source: Authors.

MA in November 2012. This plan is to be subjected to review by all of the regional, sectoral authorities (SEREMI's) and a public consultation process during 2013. Following the modifications that result from this reviewing process, the plan is to be included as an official annex to the Chilean National Climate Change Action Plan in 2014.

3.2. *The organization of the participatory process*

The first step in initiating this collaborative adaptation planning process was to identify key stakeholders. Links were established with two key institutional partners based in the MRS (GORE and SEREMI MA), which are essential to a process for the development of a Regional Climate Change Adaptation Plan. The Regional Government of the MRS is the primary institution for policy formation on a regional scale, and the Ministry of the Environment (MMA), which was formally established in 2010, and its regional branch authority (SEREMI MA), is the Ministry that is responsible for climate change policy.

Apart from the key institutional partners, about 20 representatives from other regional public authorities, the private sector, civil society and multilateral institutions were invited to participate in the process. These participants were chosen by the project coordination team responsible for organizing the roundtables in collaboration with the core regional partners (GORE and SEREMI MA) and included those public and private organizations that have sectoral or spatial influence (e.g. in water management and land-use planning), as well as civil society organizations involved in issues related to participatory governance, sustainable development and climate change.

It was considered important to include a wide range of actors so that a variety of interests would be represented in the formation of the adaptation plan and for potential conflicts between different sectors to be resolved through the participatory process. This differs greatly from the normal procedure for policy formation in Chile, in which typically only public sector authorities and some particular special interests are involved in policy-formation processes, often producing social conflict when such prefabricated policies are presented to the public during open audiences at the end of the process. In addition, including a range of representatives from different social sectors meant that actors were able to share relevant information and experiences, which proved quite valuable when forming the technical details and evaluating the feasibility of the adaptation measures.

Each Round Table meeting included a number of participants who attended regularly, in addition to new participants who were invited in the context of specific issues to be discussed or who were suggested by Round Table participants as relevant actors during the process. This allowed the coordination team to maintain the continuity of the process through a core group of stakeholders, while simultaneously providing enough flexibility to allow for the participation of actors with specialized knowledge and expertise when necessary and for new relevant stakeholders to join the process along the way. Figure 2 displays the various stakeholders involved in the process.

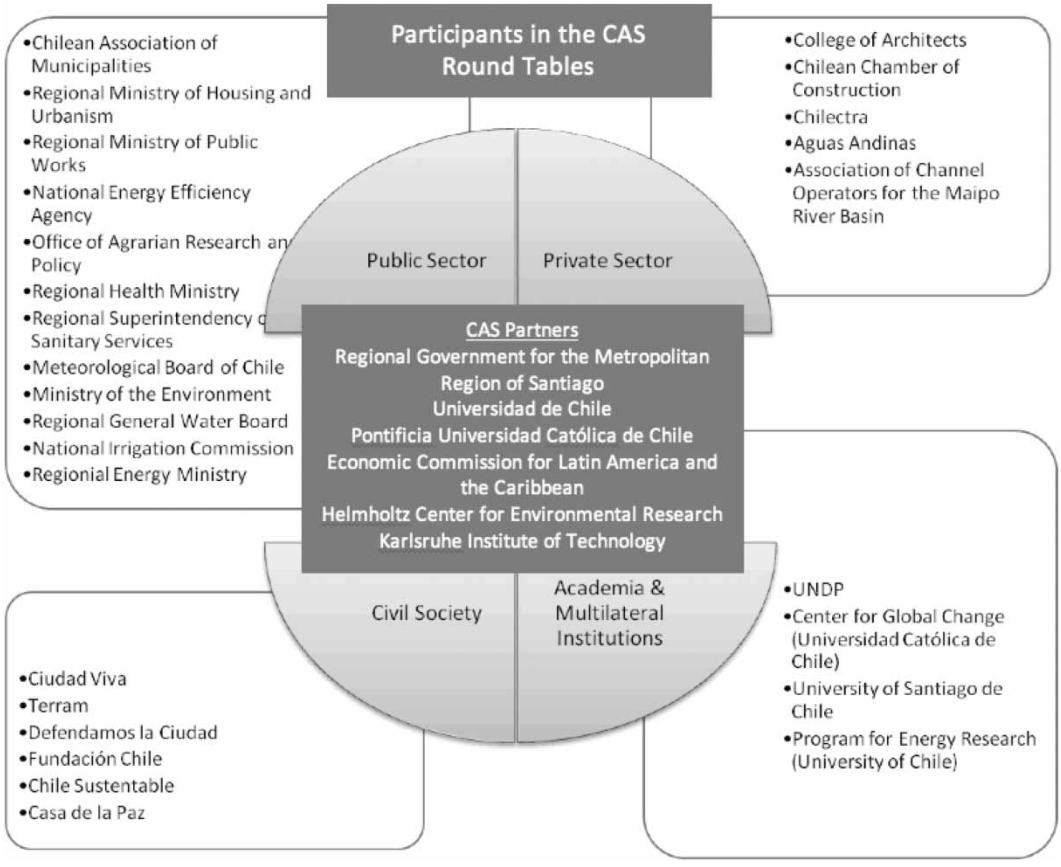

Figure 2. Participants in the roundtable process.
Source: Authors.

The participation of GORE and SEREMI MA as key partners in the project assured a strong institutional backing and a high level of legitimacy as a collaborative governance process. As a result, the Round Table meetings enjoyed high levels of participation. There was general awareness among the stakeholders that the final objective, of achieving a viable Regional Climate Change Adaptation Plan, could be achieved through their direct participation. This is quite different from other processes whereby scientific reports are generated and presented to policy-makers for implementation, with little or no follow-up, as if both elements – science and policy – were neutral and self-contained (Barton & Kopfmüller, 2012). In this way, the collaborative governance process reveals the need, *ex ante*, to create a space for an exchange of scientific findings, political demands and instrumental options, in order to provide for an effective science–policy interface and to legitimate policy decisions through the participation of various stakeholders in the policy-formation process.

All meetings consisted of one or more thematic scientific presentations, followed by a participatory activity involving an activity in which stakeholders reflected on their knowledge and experiences and discussed particular aspects of adaptation. This included priority action areas, obstacles, barriers and challenges, possible adaptation measures, feasibility and issues related to policy implementation and monitoring. The process was designed in this way in order to strike a balance between socializing scientific results and engendering reflections on the practical implications of these results and possible adaptive responses.

In the months between the Round Table meetings, the participating stakeholders were provided with thematic briefing papers relating to the issues and concepts involved in the Round Table process, in order to establish a common framework of understanding. Less frequent working papers provide more substantial scientific inputs. In this way, participants were involved in a continuous learning process and had the opportunity to review and reflect upon relevant information during the periods between Round Table meetings. Table 1 summarizes the Round Table process and additional papers.

3.3. *Challenges of the participatory adaptation planning process*

As with any participatory process, and especially one dealing with an area as complex and dynamic as climate change adaptation, certain obstacles and challenges were

Table 1. Series of Round Table meetings (with scientific input) and additional material.

Roundtables (RT) – scientific input	Briefing papers (BP) & working papers (WP)
RT1 • Introduction to the project • Adaptation and urban regional planning	
RT2 • Preliminary results on expected effects of CC on the MRS • General overview of expected impacts of CC on the MRS	BP1 • Urban adaptation to CC: issues & impacts
RT3 • Final results on expected effects of CC in the MRS	BP2 • Urban climate change adaptation planning
RT4 • Adaptation planning (cases worldwide) and the use of scenarios	BP3 • Scenarios and adaptation planning BP4 • City adaptation plans: cases and experiences WP1 • Executive summary of expected CC for the MRS BP5 • Adaptation planning instruments
RT5 • Flood and heat hazard and exposure in the MRS – possible adaptation measures	BP6 • Risk and vulnerability issues in adaptation planning WP2 • Synthesis report on main findings regarding land use and vulnerability in the MRS
RT6 • Water supply and demand in the MRS – possible adaptation measures	BP7 • Sectoral measures for adaptation and synergies WP3 • Synthesis report on main findings of the Water sector in the MRS
RT7 • Energy supply and demand in the MRS – possible adaptation measures	BP8 • Building adaptation into spatial planning instruments WP4 • Synthesis report on main findings of the energy sector in the MRS
RT8 • Generating adaptation measures: issues and process	BP9 • Financing adaptation
RT9 • Implementing adaptation measures: governance and accountability	BP10 • Governance for adaptation planning
RT10 • Regional climate adaptation plan for the MRS	

Source: Authors.

apparent from the beginning. The first challenge that emerged was how to capture and maintain the interest and commitment of the stakeholders invited to participate in the process, over an extended period of time (over two years). Moreover, the process took place in the context of a situation in which little was known about climate change adaptation, as this issue at the time was restricted mainly to academic circles in Chile, and mitigation dominated the overall climate change debate in the public sector (Barton, 2009, 2013). This aspect is considered fundamental, as a collaborative governance process is dependent on a stable group of stakeholders that attend the meetings regularly, in order to achieve a legitimated, cohesive and inter-sectoral set of measures. Various authors have noted the complexity of stakeholder involvement and the legitimacy of decision-making processes in relation to climate change adaptation (Almansi & Hardoy, 2013; Anguelovsky & Carmin, 2011; Aylett, 2010; Bulkeley & Betsill, 2003; Dryzek, 2001; Few, Brown, & Tompkins, 2007).

One of the primary techniques utilized is referred to as 'making the case' (United Nations Development Programme [UNDP], 2010). This step involves convincing the participants of the urgency, validity and finality of the process, as well as the importance of their support within this process (as representatives of diverse organizations). Infusing the process with a sense of urgency and importance was combined with the empowerment of the stakeholders, achieved by reiterating the fact that their input would have direct bearing on the final product and outcome of the Plan. This proved to be an effective mechanism for maintaining the interest of a core group of

participants, demonstrated by the continuity of their participation throughout the two-year roundtable process.

The second challenge involved the way in which scientific findings were presented to stakeholders. This implied adapting the knowledge and science for dialogue and consensus building among a diverse group of stakeholders, most of who are not familiar with climate change science. For this reason, it was important for the scientists involved to develop a common understanding, allowing for a bridge between scientific data that determined climate change impacts and how this information could be transformed into policy (Krellenberg & Barth, in press). Furthermore, the long-term time horizon and scientific uncertainties involved are among those aspects that must be carefully transferred to stakeholders, in order to foster an understanding of why immediate attention and policy formation is needed, despite the often short-term policy cycles of cities and regional planning instruments (Toth & Hizsnyik, 2008). The long-term time horizon was specifically addressed by focusing on an exploratory scenarios approach that is applied for predicting future climate change impacts and to develop adaptive measures (Berkhout, Hertin, & Jordan, 2002; CRIF, 2010; Kopfmüller, 2014; Melone et al., 2004; Tol, 1998; Turnpenny, Haxeltine, & O'Riordan, 2005). The advantage of this kind of scenario approach is that the connections between climate change impacts are linked to other common data trends, such as GDP, population dynamics, income, economic structure, household dynamics and other factors relevant for the city-region.

The third important challenge was to avoid sectoral fragmentation during the planning process. Through the Round Table meetings and the associated briefing papers, it was continuously pressed upon stakeholders that the complex and dynamic phenomenon of climate change is inter-sectoral by nature and requires integrated, short and long-term responses. In this way, synergies and relations between different climate change impacts were identified by exploring how each organization could be affected, in order to increase the recognition of overlaps. This helped to augment inter-sectoral thinking by stakeholders, and allowed them to discover the necessity of inter-organizational cooperation and coordination. It is precisely this notion of collective action and social capital building that is the basis for a participatory planning approach (Adger, 2003) to Regional Climate Change Adaptation Plan formulation.

Finally, it is worth noting that the entire process took place in the context of a project that enjoyed international funding from the German Ministry of Environment. Maintaining a process that involves funding the work of several international research teams and constant coordination over a three-year period (including time for both scientific research and the entire Round Table process) comes at considerable expense, which in this case was largely externalized. Local public institutions made considerable in-kind contributions through the participation of professionals throughout the process and the use of public facilities for various Round Table meetings and other events. However, it is important to understand that financing a similar process would be a significant challenge in the absence of external funding.

4. Lessons learned from the collaborative governance approach in Santiago de Chile

The principal expectation for the Round Table participatory process was to achieve a robust and varied approach to climate change adaptation policy for the MRS, incorporating the experiences and concerns of diverse group of local actors. The typical governance regime in Chile is characterized by very low levels of public participation, highly sectoral planning mechanisms, and scarce interaction between the public, private, civil society and academic spheres (Barton, 2009). Given the complex and dynamic nature of climate change impacts, it was considered necessary to undertake a collaborative governance approach in order to generate a series of cross-sectoral adaptation measures by reaching a consensus among different actors and sectors that included a variety of perspectives, which were based on sound scientific inputs. In addition, it was observed that participatory process inherent in such an approach was capable of producing a significant degree of political and social legitimacy, making the political approval of a Regional Climate Change Adaptation Plan feasible.

During the Round Table meeting process, stakeholders were encouraged to actively participate by providing input and feedback for developing jointly feasible and adequate adaptation measures. Through various activities, participants utilized the knowledge they had gained regarding climate change impacts, adaptation planning and scenarios in order to determine the strengths, weaknesses, opportunities and threats associated with their current work. The Round Table process was a means of building social capital among the stakeholders, as they become increasingly knowledgeable of climate science, adaptation measures and methodologies, and analysed their own organizational responsibilities and activities in the context of climate change.

By undertaking a variety of participatory activities in which stakeholders from different sectors and management areas are constantly interacting with each other, the experience in Santiago has shown that sufficient rapport can be developed to facilitate decision-making and consensus building for the final collaborative selection of adaptation measures. Consequently, as a result of this process the final Regional Climate Change Adaptation Plan enjoyed a high degree of legitimacy among pertinent actors in the public sector. This legitimacy was demonstrated by the

general approval by the Council of Regional Authorities, who have reviewed the Plan and provided technical observations that need to be integrated before it can be subjected to a public consultation process. As many public authorities had already been involved in the roundtable process, no substantial modifications are needed. In addition, the MMA has committed resources to undertake the public consultation process, and due to the participation of civil society, private sector and academic stakeholders in the process, it is expected that the Plan will be well accepted by the general public.

To summarize, the lessons learned may be of considerable use to other actors involved in similar exercises in diverse urban and regional settings. Bringing different sectors and levels of administration and society together in a collaborative governance approach is an important step for moving beyond sectoral approaches to problem solving. The selection of appropriate participants in such a process is both difficult and vital for consensus building. It is important to have key partner organizations on-board from the outset in order to assure other participants that the probability of the final Regional Climate Change Adaptation Plan being implemented is high.

The methodology used for a collaborative governance process with regards to climate change adaptation has to be clear and methodical. Adequate time must be given to generating background information on potential climate change impacts, to explaining complexity and uncertainty, and to understanding the interests, strengths and weaknesses of different participating actors. Adapting science to aid decision-makers in assessing relevance, importance and costs is a sine qua non of climate change adaptation planning. This involves generating sound science and communicating it in effective ways in order to plan responses.

With a wide range of organizations participating in the Round Tables process in Santiago de Chile, there was a need to convey the importance of collaborative responses to the challenges of climate change and to discuss ways in which different organizations can coordinate their responses most effectively.

5. Conclusions: the importance of dialogue and social capital-building in adaptation planning

As with other key political issues, the connections between different actors and sectors and local actions are not automatic or linear. There is a chasm that is a socio-political space within which multiple actors engage to promote certain actions, block others and prioritize according to interests and pressures. Delving into this socio-political space openly and recognizing its importance for converting concerns into actions are essential parts of the process of climate change adaptation planning.

In the case of Santiago de Chile, this was managed explicitly and systematically in order to generate a Regional Climate Change Adaptation Plan for the MRS. However, the process was fraught with problems that had to be engaged with along the way. This involved 'opening up' organizations, scientists and policy-planning approaches in order to establish a dialogue regarding the most effective ways of moving forward in order to reduce the impacts of climate change on the urban region over the coming century (Krellenberg et al., 2010). In this way, the collaborative approach was very helpful for raising awareness regarding the issue of climate change adaptation among a variety of sectors and administrative levels. The organization of a series of ten Round Table meetings during a period of 2.5 years opened up the possibility for a continuous and horizontally oriented dialogue between the different actors. This dialogue, despite its time-consuming nature, was essential for initiating action against climate change impacts in the context of entrenched sectoral planning. At the same time, it became clear that there is no dialogue without a flow of relevant information and specific activities that facilitate meaningful interactions and social capital building, thus making the communication of scientific information a crucial issue of the overall process. The idea that effectively managing a participatory process is one of the most challenging aspects of collaborative governance was underpinned by the case of Santiago. The efforts that were made in order to better understand the ways a participatory process translates its deliberations into policy and plans, allowed for the development of the Regional Climate Change Adaptation Plan, which will hopefully both increase resilience and enhance response capacities.

Hence, collaborative governance for climate change adaptation is a social learning process that can be furthered by overcoming the gap between the limitations of science (long-term projections) against short-term political objectives and sectoral perspectives. Stakeholder involvement can further the potential of effective and long-lasting implementation, and more proactive rather than reactive responses to specific events (Amundsen, Berglund, & Westskog, 2010). In this sense, responses to climate change impacts need to be carefully initiated. It calls for a balance between stakeholders that are among the impacted sectors and those entities responsible for the final implementation. Climate action plans, climate adaptation strategies and other such instruments have the potential to join sectors and levels of decision-making within an integrated planning approach, heavily oriented towards communication and collaborative deliberation (Healey, 1992).

In this regard, the collaborative governance approach for developing the Regional Climate Change Adaptation Plan of Santiago de Chile was successful. As the emergence of several new projects regarding climate change on different levels in Chile reveal, the dialogue on these issues is coming more and more into the focus. As the collaborative

governance approach presented in this case study was the first of its kind regarding climate change in Chile, it can be assumed that it had a significant influence on social-capital building.

Acknowledgements

The process is part of an international project (ClimateAdaptation-Santiago – CAS), coordinated at the Helmholtz Centre for Environmental Research, funded by the German Federal Environment Ministry and involving four research institutions (two in Germany, two in Chile), the Economic Commission for Latin America and the Caribbean (ECLAC), the Regional Government of the Metropolitan Region of Santiago de Chile, the Chilean Environment Ministry and a range of other governmental and non-governmental institutions.

The authors acknowledge the research support from the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMU), in the context of the ClimateAdaptationSantiago (CAS) project, as well as the Centro de Desarrollo Urbano Sustentable (CEDEUS-Conicyt/Fondap/15110020).

References

Adger, N. (2003). Social capital, collective action and adaptation to climate change. *Economic Geography*, *79*, 387–404s.

Adger, W.N., Agrawala, S., Mirza, M.M.Q., Conde, C., O'Brien, K., Pulhin, J., Pulwarty, R., Smit, B., & Takahashi, K. (2007). Assessment of adaptation practices, options, constraints and capacity. In M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, & C.E. Hanson (Eds.), *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the fourth assessment report of the intergovernmental panel on climate change* (pp. 717–743). Cambridge: Cambridge University Press.

Adger, W.N., Arnell, N.W., & Tompkins, E.L. (2005). Successful adaptation to climate change across scales. *Global Environmental Change*, *15*, 77–86.

Almansi, H., & Hardoy, J. (2013, May 31–June 2). *Advancing on local urban climate change agendas through multi – stakeholder collaboration*. Paper presented at 4th Global Forum on Urban Resilience and Adaptation. Session D3: Planning for resilient cities in Latin America and Asia. Bonn, Germany.

Amundsen, H., Berglund, F., & Westskog, H. (2010). Overcoming barriers to climate change adaptation – a question of multilevel governance? *Environment and Planning C: Government and Policy*, *28*(2), 276–289.

Anguelovsky, I., & Carmin, J. (2011). Something borrowed, everything new: Innovation and institutionalization in urban climate governance. *Current Opinion in Environmental Sustainability*, *3*, 169–175.

Ansell, C., & Gash, A. (2007). Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory*, *18*(4), 543–571.

Aylett, A. (2010). Conflict, collaboration and climate change: Participatory democracy and urban environmental struggles in Durban, South Africa. *International Journal of Urban and Regional Research*, *34*, 478–495.

Barton, J.R. (2009). Adaptación al cambio climático en la planificación de ciudades-regiones. *Revista de Geografía Norte Grande*, *43*, 5–30.

Barton, J.R. (2013). Climate change adaptive capacity in Santiago de Chile: Creating a governance regime for sustainability planning. *International Journal of Urban and Regional Research*, *37*(6), 1916–1933.

Barton, J.R., & Kopfmüller, J. (2012). Lecciones de una investigación integrativa sobre sustentabilidad urbana: el proyecto "Risk Habitat Megacity" en Santiago de Chile, 2006–2010. *EURE*, *38*, 147–155.

Berkhout, F., Hertin, J., & Jordan, A. (2002). "Socio-economic futures in climate change impact assessment: Using scenarios as 'learning machines'." *Global Environmental Change*, *12* (2), 83–95.

Birkmann, J., Garschagen, M., Kraas, F., & Quang, N. (2010). Adaptive urban governance: new challenges for the second generation of urban adaptation strategies to climate change. *Sustainability Science*, *5*(2), 185–206.

Bulkeley, H. (2010). Climate policy and governance: an editorial essay. *Wiley Interdisciplinary Reviews: Climate Change*, *1*, 311–313.

Bulkeley, H., & Betsill, M. (2003). *Cities and climate change: Urban sustainability and global environmental governance*. New York: Routledge.

Centre for Research in Futures and Innovation (CRIF). (2010). *Scenario Workshop Guide*. Univeristy of Glamorgan: IMCORE, 28pp.

CONAMA. (2006, December). Estudio de la Variabilidad Climática en Chile para el siglo XXI. Study performed by the Departamento de Geofísica, Facultad de Ciencias Físicas y Matemáticas. Universidad de Chile, Santiago.

Corfee-Morlot, J., Cochran, I., Hallegatte, S., & Teasdale, P.-J. (2011). Multilevel risk governance and urban adaptation policy. *Climatic Change*, *104*, 169–197.

Cortés, G., Schaller, S., Rojas, M., Garcia, L., Descalzi, A., Vargas, L., & McPhee, J. (2012). *Assessment of the current climate and expected climate changes in the Metropolitan Region of Santiago de Chile*. Leipzig: UFZ-Discussion Paper.

Dryzek, J. (2001). Legitimacy and economy in deliberative democracy. *Political Theory*, *29*(5), 651–669.

Ebert, A., Welz, J., Heinrichs, D., Krellenberg, K., & Hansjürgens, B. (2010). Socio-environmental change and flood risks: The case of Santiago de Chile. *Erdkunde*, *64*(4), 303–313.

Emerson, K., Nabatchi, T., & Balogh, S. (2011). An integrative framework for collaborative governance. *JPART*, *22*, 1–29.

Few, R., Brown, K., & Tompkins, E. L. (2007). Public participation and climate change adaptation: Avoiding the illusion of inclusion. *Climate Policy*, *7*, 46–59.

Füssel, H.-M. (2007). Adaptation planning for climate change: Concepts, assessment approaches, and key lessons. *Sustainability Science*, *2*, 265–275.

Garreaud, R. D. (2011). Cambio Climático: Bases Físicas e Impactos en Chile. *Revista Tierra Adentro – INIA*, *93*, 13–19.

Healey, P. (1992). Planning through debate: The communicative turn in planning theory. *The Town Planning Review*, *63*(2), 143–162.

Heinrichs, D., & Barton, J. R. (2011). Box 5.3. Santiago de Chile: Adaptation, water management, and the challenges for spatial planning. In C. Rosenzweig, W.D. Solecki, & S.A. Hammer (Eds.), *Climate change and cities: First assessment report on the urban climate change research network* (pp. 123–124). Cambridge: Cambridge University Press.

Jones, H., Jones, N., Walker, D., & Walsh, C. (2009). *Strengthening science – policy dialogue in developing countries: A priority for climate change adaptation*. London: Overseas Development Institute.

Kopfmüller, J. (2014). Scenarios for future developments. In K. Krellenberg & B. Hansjürgens (Eds.), *Climate adaptation Santiago* (pp. 43–56). Heidelberg: Springer.

Krellenberg, K. (2012). A science-policy approach towards local adaptation planning: The case of Santiago de Chile. In K. Otto-Zimmermann (Ed.), Resilient cities 2 – Cities and Adaptation to Climate Change – Proceedings of the Global Forum 2011 (pp. 233–240). London: Springer.

Krellenberg, K., & Barth, K. (in press). Inter- and transdisciplinary research for planning climate change adaptation responses – the example of Santiago de Chile. *Interdisciplinary Science Review, Special issue: Transdisciplinary Environmental Science in Problem-oriented Strategic Research Programs*, *39*(4).

Krellenberg, K., & Hansjürgens, B. (2014). Introduction: Challenges for urban climate change adaptation. In K. Krellenberg & B. Hansjürgens (Eds.), *Climate adaptation Santiago* (pp. 3–15). Heidelberg: Springer.

Krellenberg, K., Heinrichs, D., & Barton, J.R. (2010). Climate change and adaptation strategies in Latin American city regions: The case of Santiago de Chile. In M. Fragkias & C. Griffith (Eds.), *Integrative perspectives on urbanization and climate change* (pp. 4–7). UGEC Viewpoints 3.

Krellenberg, K., Müller, A., Schwarz, A., Höfer, R., & Welz, J. (2013). Flood and heat hazards in the Metropolitan Region of Santiago de Chile and the socio-economics of exposure. *Applied Geography*, *38*, 86–95.

McPhee, J., Vargas, L., Rojas, M., Cortés, G., García, L., & Descalzi, A. (2014). Downscaling of climate changes: what effects can be expected?. In K. Krellenberg & B. Hansjürgens (Eds.), *Climate adaptation Santiago* (pp. 19–41). Heidelberg: Springer.

Melone, E. L., Smith, J.B., Brenkert, A.L., Hurd, B., Moss, R.H., Bouille, D. (2004). *Developing socio-economic scenarios for use in vulnerability and adaptation assessments*. New York: UNDP. 48pp.

Moser, S. (2009). Making a difference on the ground: the challenge of demonstrating the effectiveness of decision support. *Climatic Change*, *95*, 11–21.

Müller, A., & Reinstorf, F. (2011). Exploration of land-use scenarios for flood hazard modeling – the case of Santiago de Chile. *Hydrological Earth Systems Science Discussions*, *8*, 3993–4024.

Reed, M. (2008). Stakeholder participation for environmental management. *Biological Conservation*, *141*(10), 2417–2431.

Romero, H., Salgado, M., & Smith, P. (2010). Cambios climáticos y climas urbanos: Relaciones entre zonas termales y condiciones socioeconómicas de la población de Santiago de Chile. *Revista INVI*, *70*(25), 151–179.

Roux, D., Rogers, K., Biggs, H., Ashton, P., & Sergeant, A. (2006). Bridging the science-management divide: Moving from unidirectional knowledge transfer to knowledge interface and sharing. *Ecology and Society*, *11*(1), Art. no. 4.

Sanchez-Rodriguez, R. (2009). Learning to adapt to climate change in urban areas. A review of recent contributions. *Current Opinion in Environmental Sustainability*, *1*, 201–206.

Satterthwaite, D., Huq, S., Pelling, M., Reid, H., & Romero Lankao, P. (2007). *Adapting to climate change in urban areas. The possibilities and constraints in low- and middle-income nations*. Working paper produced by the Human Settlements Group and the Climate Change Group at the International Institute for Environment and Development (IIED). Retrieved from http://www.iied.org/HS/topics/accc.html

Shaw, R., Colley, M., & Connell, R. (2007). *Climate change adaptation by design: A guide for sustainable communities*. London: TCPA.

Stern, N. (2006). *The economics of climate change: The stern review*. Cambridge: Cambridge University Press.

Tol, R.S.J. (1998). Socio-economic scenarios. In J.F. Feenstra, I. Burton, J.B. Smith, & R.S.J. Tol (Eds.), *Handbook on methods for climate change impact assessment and adaptation strategies* (pp. 37–55). Amsterdam: Vrije Universiteit Amsterdam.

Tompkins, E., & Adger, N. (2005). Defining response capacity to enhance climate change policy. *Environmental Science and Policy*, *8*(6), 562–571.

Toth, F.L., & Hizsnyik, E. (2008). Managing the inconceivable: participatory assessments of impacts and responses to extreme climate change. *Climate Change*, *91*, 81–101.

Turnpenny, J., Haxeltine, A., & O'Riordan, T. (2005). *Developing regional and local scenarios for climate change mitigation and adaptation: Part 2: Scenario creation*. London: Tyndall Centre Working Paper 67.

United Nations Development Programme. (2010). *A Toolkit for Designing Climate Change Adaptation Initiatives*. New York: UNDP.

United Nations Human Settlements Programme. (2011). *Global report on human settlements 2011: Cities and climate change*. London: Earthscan.

Vogel, C., Moser, S.C., Kasperson, R.E., & Dabelko, G. (2007). Linking vulnerability, adaptation, and resilience science to practice: pathways, players, and partnerships. *Global Environmental Change*, *17*, 349–364.