Synthesis: Climate Change Impacts from a Cross-Sectoral Perspective: Consequences for Political Response

8

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Abstract

The foregoing Chaps. 4, 5, 6 and 7 have indicated the need for action in response to the pressing issues of land-use change, its linkage to natural hazards, the associated vulnerabilities, and the supply of and demand for water and energy in the Metropolitan Region of Santiago de Chile. It was evidenced that serious problems already exist in this context and will most likely be aggravated under future climate change conditions. Consideration of other driving factors such as demographic, socio-economic and technological change in the assessment of future development paths allows for the assumption that sectoral developments are interlinked, e.g., land-use change and hazard generation or energy and water supplies. This chapter takes a closer look at these interlinkages and discusses them in the light of cross-sectoral policy recommendations.

Keywords

Climate change impacts • Interlinking processes • Cross-sectoral policies

8.1 Climate Change: Why a Cross-Sectoral Perspective Matters

Climate change is a complex phenomenon and the result of numerous interwoven—physical, socio-economic, social and technological—processes (e.g., Smith and Stern 2011), all of which calls for a comprehensive climate change impact assessment analysis. This complexity is particularly evident when it comes to cities, where urbanization, changing land use and soaring greenhouse gas (GHG)

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emissions are in the process of altering the climate (cf. Chap. 1). Consequently, climate change cannot be seen as an isolated process.

Response strategies to the complexity of climate change and its associated impacts necessitate an integrative policy approach. Here the strong sectoral interlinkage, e.g., between water, energy, planning and housing, demands cross-sectoral interaction, not least when adaptation comes to the fore. This means that adequate climate change (adaptation) response must take into account the interaction between policies in different areas and between policies at different levels of decision-making (Adger et al. 2005; Bulkeley 2010; Ohlson et al. 2005; Urwin and Jordan 2008). Interaction should take place horizontally across different policy sectors and vertically across different levels of government (e.g., Corfee-Morlot et al. 2009), rendering it a multi-level governance concern. And it is especially the multi-level complexities of climate change adaptation that make integration challenging (Huntjens et al. 2012; Adger et al. 2005).

Furthermore, climate change-related policy measures should consider synergies with existing measures (e.g., Burton et al. 2002; Corfee-Morlot et al. 2011; Dovers 2009; Smith and Stern 2011), e.g., those emerging from natural resource or water management, disaster risk management, urban planning, sustainable development, or poverty reduction (Füssel 2007). In this context, elements of existing institutional frameworks are often identified as obstacles to climate change response action, e.g., weak and illegitimate governance and institutional structures, lack of coordination between administration levels and rejection of change (cf. Burch 2010; Measham et al. 2011; Sánchez-Rodríguez et al. 2008). In other words climate change response challenges institutional dynamics, since it goes beyond traditional and heterogeneous local administrative structures and capacities to respond (e.g., Huntjens et al. 2012). Changes to institutions and governance will be needed, however, if strategies for adaptation to climate change are to be developed and successfully put into effect.

Calling attention to the results of Chaps. 4, 5, 6 and 7, this chapter points out the interlinkages of several ongoing processes that drive development in the MRS and their capacity for cross-sectoral adaptive policy response action. Section 8.2 synthesizes the different climate change impacts, while Sect. 8.3 discusses the cross-sectoral adaptation measures designed to bridge the sector divide.

8.2 Climate Change Impacts and Their Interlinkages in the MRS

The authors of Chap. 4 have highlighted the close relationship between precipitation and the water supply, on the one hand, and the inflow of surface water from the Andes, on the other. As precipitation occurs for the most part in the winter, inter-annual water supply variations are high and in the summer depend heavily on melt water from glaciers and snowfields. The authors stress that in so-called “dry” years the demand for water already exceeds the supply. Furthermore, water demand in the MRS is characterized by the conflict between various water users. Changes in temperature, precipitation and stream flow predicted for the future will exacerbate current problems, as less water will be available than required. The increase in water demand arising from a growing population and added irrigation can only be compensated in part by new technologies. In other words the water sector is strongly determined by climate conditions

In the energy case, the authors of Chap. 5 have identified a strong interlinkage between ongoing urbanization and the energy sector. Persistent population and GDP growth rates have increased the demand for energy in the MRS. Higher temperatures will lead to a further increase in the demand for electricity to serve air conditioning and refrigeration installations, and a decrease in the consumption of gas and petroleum products used for heating. Although half of the electricity available in the MRS is generated by hydropower (and the other half by thermoelectric power), climate change will affect the energy sector only slightly. In this context, Chile's dependency on fossil fuels and the highly concentrated market (Simon et al. 2012) are expected to cause major problems.

The authors of Chap. 6 have demonstrated the close link between ongoing urbanization patterns, including increased sealed surfaces, and the generation of flood and heat hazards, and their aggravation through climate change. The loss of green areas and agriculturally used land is a conspicuous factor in the reduction of the key cooling and retention functions crucial to flood and heat hazard prevention. The authors of Chap. 7 have shown the increase in exposure of people and housing to both hazards.

As these selected "sectors" indicate, none can be regarded in isolation when it comes to assessing climate change impacts and more particularly to developing climate change response. Water is crucial and therefore inextricably bound up with all other issues. Given the predicted decline in the supply of water due to less annual precipitation and higher temperatures (cf. Chap. 2), water is becoming a scarce commodity, which in turn simultaneously affects both water and energy supplies. Although more green areas are needed to cool the city and serve as retention areas for temporary intensive rainfall, they require additional irrigation most of the time, as the MRS is located in a dry climate with few winter rainfall events. Importantly, ongoing expansion of the urban area has led to a dramatic reduction in green space.

This means that the interwovenness of the processes climate change involves is also an issue for the MRS, while the processes themselves call for cross-sectoral responses, since interventions in one sector can produce positive or negative consequences in others.

8.3 How to Develop Non-Sectoral Adaptation Measures

Designing interventions to combat the cross-sectoral challenges, inherent in climate change, calls for careful consideration of interlinkages. The links between mitigation and adaptation should not be ignored but rather considered simultaneously and as interconnected (cf. Füssel 2007; IPCC 2011; Lowe and Lorenzoni 2007; Tompkins and Adger 2005). Climate change response, notably in cities of the global south, should be closely linked to development strategies (cf. Huq et al. 2006;

Sánchez-Rodríguez et al. 2008). Approaching both issues as interconnected could foster mutually positive effects and increase the potential success of development and climate change policies (OECD 2009; Huq et al. 2006). Furthermore, adaptive response action is tightly linked to disaster risk reduction strategies, since both aim at reducing vulnerability by enhancing the capacity to anticipate, resist and recover from hazards. Wherever possible, therefore, any synergies between them should be exploited (cf. OECD 2009).

Again, the distribution of competences at different levels of decision-making, the connections and interdependencies these levels entail, and the resultant need for coordination call for an integrative approach in the case of cross-sectoral adaptation measures. Participation could foster the inclusion of a wide range of actors from different sectors and administrative levels. In a participatory process, stakeholders must be integrated from the outset of the project to enable cross-sectoral consideration of the interwoven processes and impacts involved. As numerous scholars have stated, scientists, practitioners, decision-makers, policy analysts, local communities, NGOs, private sector representatives, government agencies, and international organizations, among others, need to be involved to guarantee an integrative policy-making process (cf. Füssel 2007; Krellenberg 2012; OECD 2009; Watson 2005). Here, a scientifically organized participatory process has the potential to bring actors and knowledge together in a more 'neutral' environment (Krellenberg 2012; Krellenberg & Barth 2014).

On the other hand, the participatory process does not guarantee per se the effective implementation of cross-sectoral measures. To give a concrete example: the development of climate change response action for the MRS (Chap. 9) led to the 14 context-specific adaptation measures presented in Chaps. 4, 5, 6 and 7. Given the impact interlinkage described in Sect. 8.2 of this chapter, the proposed adaptive response measures are of necessity also interlinked and cross-sectoral. Careful implementation will thus be required to achieve the intended positive effects. Prior to implementation, co-benefits and the potential impact of each measure on other sectors should be assessed in order to arrive at a 'win-win situation' rather than maladaptation.

The example of green space makes the relationship between the water and the energy sector palpable. Developing green areas as a response to increasing heat and flood hazard is of the utmost importance. Given that water is now more scarce in the MRS and irrigation demands are on the increase, this dilemma could be solved in part by reusing grey water. Possible conflicts of interest between green areas and the energy sector could arise against the backdrop of the surface available for solar and wind installations and the attempt to diversify energy sources.

It is important that decision-makers are aware of the interlinkages. Hence these issues are emphasized and discussed in the present example of the Regional Climate Change Adaptation Plan for Santiago de Chile. Criteria and metrics were defined and included in the Plan to facilitate evaluation of the adaptation measures and their success within the given policy environment (cf. Moser 2009). This and other issues are presented and discussed in the next chapter.

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