1. Introduction: distributional effects of climate change – social and economic implications

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Climate change has global impacts relative to both its causes and its effects. These impacts, however, are not distributed evenly but can create dissimilar effects across different latitudes, altitudes and even groups of people, within the same location. For example, some parts of the globe may be impacted by a large number of hurricanes, while others suffer from frequent episodes of drought. Other parts may be more prone to vector disease due to temperature rise or to land loss from sea level rise. Simultaneously, different groups of people may be affected, to differing degrees, because the distribution of these effects combine with yet another important distinction – the coping capacity of different countries, and of the individuals within those countries. Access to information is a key issue in preventing, and adapting to, current and expected impacts from climate change. There is wide variation in the real availability of such information to different groups. Other key issues concern the ways in which stakeholders act on that information.

Climate change tends to increase the frequency and the intensity of weather-related natural disasters. Depending on the location of populated areas, this puts many people at risk with respect to access to water, coastal flooding, disease and hunger. This can leave them with a more degraded environment. Economic, social and environmental impacts, in turn, further increase vulnerability to natural disasters and tend to set back development, destroy livelihoods (especially of the poor), and increase disparity both nationally and worldwide. Acknowledging and understanding these differences can lead to better adaptation processes for all.

In this book we address the many aspects of the distributional issues resulting from climate change from a wide range of perspectives. In general, we discuss some issues at the international level, making reference to worldwide differences at a country level. We also explore the different vulnerabilities that exist among countries and, finally, some at the country level. This enables us better to capture the nature of the distributional
impacts of climate change by tackling the precise differential vulnerability of people and places. People are affected differently by many factors: their income level, the age and gender structure of their population, access to information and environmental assets, and social and human capital. They also respond differently in the ways that they mitigate the effect of climate change and adapt to it because of their economic capacity, institutional development and strength of social cohesion.

This book is divided into two parts. Part I sets the stage by focusing on the relationship between climate change and natural disasters and by broadly exploring the economic and social impacts they cause. Following this Introduction, in Chapter 2 Elizabeth Malone and Antoinette Brenkert describe a vulnerability–resilience indicator model that uses 18 proxy indicators, grouped into eight elements, to assess on a quantitative basis the comparative potential vulnerability and resilience of countries to climate change. The model integrates socio-economic and environmental information such as land use, crop production, water availability, per capita gross domestic product (GDP), inequality and health status. Comparative results for 160 countries are presented and analyzed.

In Chapter 3, María Ibarrarán and Matthias Ruth make the connection between climate change and macroeconomic performance. Their assessment is based on information from climate impact assessments and data from natural disasters. The latter are pertinent to the extent that climate change will increase the severity and frequency of severe weather events, putting more people at risk by influencing access to water, coastal flooding, disease and hunger, and leaving them with a more degraded environment. This in turn leads to increased vulnerability. The study by Ibarrarán and Ruth points at the different vulnerabilities to natural disasters that exist in developed and developing countries. Even within countries, impacts vary significantly across population and economic sectors. When losses from natural disasters are large, their cumulative effects can have notable macroeconomic impacts which feed back to, and further pronounce, existing income inequalities. Impacts tend to be most pronounced for women, the very young, the elderly, and ethnic or racial minorities.

Part II of this book discusses particular impacts of climate change, focusing on their differential effects on specific populations and ecosystems. For example, in Chapter 4 Laurence Kalkstein, Christina Koppe, Simone Orlandini, Scott Sheridan and Karen Smoyer-Tomic explore the discrepant effects of climate on health, for certain demographics and income levels, differentiated by gender and socio-economic status. Their analysis focuses on the impacts of extreme heat, and the effect of climate change on asthmatics, drawing on a large and growing base of literature dealing with these two issues in the US and elsewhere.
Chapter 5, by Anthony Patt, Angie Dazé and Pablo Suarez, analyzes the differential impacts of climate change on women – a group which frequently lacks empowerment and participation in decision-making. It points to the fact that women are demonstrably better at decision-making of the type that climate adaptation requires. This includes embracing change, trusting and incorporating scientific knowledge, learning how to make decisions under conditions of uncertainty, and thinking long term. This suggests opportunities for win–win outcomes through greater empowerment and inclusion of women in decision-making at all scales. Patt, Dazé and Suarez argue that greater inclusion may reverse the inequitable distribution of impacts. Furthermore, greater inclusion could improve adaptive decision-making in general, reducing the negative impacts of climate change on the entire community. Case studies from Bangladesh and Tajikistan illustrate the challenges and opportunities that exist when addressing the gender dimension of adaptation initiatives.

In Chapter 6, Roy Boyd and María Ibarrarán address the differential impacts of greenhouse gas mitigation efforts in Mexico – a country with great inequality among incomes, vast energy resources and increasing environmental problems. Historically, the distribution of income in Mexico has been highly skewed with relatively large areas of extreme poverty. Currently, energy and environmental policies are being discussed in order to mitigate climate change. Boyd and Ibarrarán point out that these policies have a significant impact on equity and income distribution. Further, they argue that such equity issues cannot be ignored since any viable policy should be thought of as ‘fair’, and policy-makers cannot easily bypass the needs and wishes of a large portion of their constituency. Using a dynamic computable general equilibrium model Boyd and Ibarrarán simulate the impact of these policies on economic growth, carbon emissions, the capital stock and the economic welfare of a number of income groups. Proportionally, the highest usage of energy occurs in the lowest-income groups. Consequently, increased investment and exploration in the natural gas sector have had distributionally progressive effects. For the same reason, investments in energy-saving technologies have also had the largest positive impacts on low-income groups. The same cannot be said for efforts relative to the deregulation of electricity prices and carbon taxes. Existing subsidies to electricity use were designed to benefit agricultural production and consumption by low-income groups. Boyd and Ibarrarán show that, as a result, the removal of those subsidies largely benefit the wealthy. Similarly, carbon taxes have a more severe impact on lower-, as opposed to higher-, income groups.

The distributional implications of climate change cannot only be seen in developing countries and poor, rural regions but are also in urban areas.
of industrialized nations. Matthias Ruth, Paul Kirshen and Dana Coelho explore these implications in Chapter 7. They discuss expected impacts in urban areas of the industrialized world, drawing from recent literature and case studies. Thereafter, Ruth and his colleagues explore the causes behind differential urban vulnerabilities based upon analyses of urbanization, urban infrastructure and metabolism, and environmental quality. Their analysis presents options to manage better the inevitable differences that exist in urban areas in order to reduce vulnerabilities.

Between the identification of options and their implementation often lies the field of information dissemination – dissemination regarding climate change, impacts, vulnerabilities and adaptation options. This dissemination occurs (or should occur) amongst both higher-level decision-makers as well as individuals in the affected population. Although information about anticipated climate conditions can support adaptation, its mere availability is not a sufficient condition to ensure vulnerability reduction among those whose current situation deserves the highest priority. Without adequate consideration to equity issues, widespread generation of climatic forecasts disconnected from the real obstacles to their communication and use could result in a socially differentiated distribution of benefits. Accordingly, in Chapter 8, Pablo Suarez, Jesse Ribot and Anthony Patt discuss the following three models of the role of predictions in decision-making for reducing vulnerability: perfect information (which assumes optimal dissemination and use of forecasts), vulnerability to hazard (which focuses on improving responses to events that cause harm), and vulnerability to outcome (which proposes to reverse processes that make people vulnerable in the first place). The authors argue that if the development of climate forecasts remains embedded in (and directed by) the perfect information paradigm, those with the most pronounced needs are not likely to reap the benefits of improved climate predictability. Participatory initiatives can integrate these approaches – helping to improve predictions and their communication channels, coping with predicted events and triggering community-based processes aimed at reversing marginalization and vulnerability.

Unabated, increased vulnerability and marginalization will likely result in increased social tensions and conflict. Like the direct impacts of climate change, many of the conflict-related risks associated with climate change are likely to impact the poor most severely. This unfortunate fact is acknowledged by those who study resource scarcity as a driver of conflict. Still, there remain other important, less direct connections between climate change and human conflict. These connections bring another level of discussion into the distributional analysis. In Chapter 9, Timothy Gulden argues that civil conflicts in the less developed parts of the world can also pose real threats to wealthy nations; and that technological responses, if
not handled with adequate care, have the potential to threaten even the wealthiest citizens of the most powerful countries.

Drawing on their experiences in both developed and developing countries, in Chapter 10 Hellmuth Lange, Heiko Garrelts, Winfried Osthorst and Farid Selmi address the question of how adaptation becomes an issue of political decision-making and leads to conceptual changes in the realm of the political-administrative system. The focus of their analysis lies in policy and institutional design, the choice of policy instruments and the timing of interventions.

To highlight the core mechanisms influencing conceptual adaptation to risks in terms of policy change, the authors compare three empirical cases: the only gradual adaptation of coastal protection towards climate change in Germany, the introduction of new flood management regulations in Germany after a riparian flood in 2002, and a new disaster risk management regime in Indonesia as reaction to a series of severe disasters during recent years. Lange and his colleagues show that these processes of adaptation differ in terms of scope and pace. However, in contrast to widespread conceptualizations of adaptation, they do not prove to be pure problem-oriented, straightforward processes. Rather, threats and impacts represent just one factor that explains the amplitude in terms of pace and scope. Further relevant factors are innovative risk-related management concepts. In the cases studied, such alternatives already existed within public or professional discourse before the extreme events occurred. Thus they were also available immediately afterwards.

Lange, Garrelts, Osthorst and Selmi argue that the decisive factors which influence risk management and adaptation actions are: actors, conflicts of interest and institutional settings. The mediums of these factors are competing discourses. Beyond their effect on social groups, discourses legitimize or delegitimize institutionally underpinned concepts and habits. Thus, discourses have an explicit distributional quality since they assign roles and resources to actors and institutions.

This book begins to fill a gap in the existing literature by covering the differentiated impacts of climate change. It raises important equity issues that become relevant at global, regional, national and subnational levels in terms of what the expected effects of climate change are in a wide variety of topics, and how adaptation actions may help reduce vulnerabilities. We conclude in Chapter 11 by summarizing and synthesizing insights encapsulated in the chapters here, and by discussing possible solutions to cope with the distributional effects from climate change and their social and economic implications.