Assessment of Adaptation Practices, Options, Constraints and Capacity: The 2007 IPCC Assessment

Testimony of

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[†] Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author and do not necessarily reflect those of Princeton University, the OECD or its Member governments.

1. Introduction

Chairman Gordon, Ranking Member Hall, and other Members of the Committee. Thank you for the opportunity to communicate to you today on some of the recent findings of the IPCC Working Group II Fourth Assessment Report (AR4).

My name is Shardul Agrawala. I am a Visiting Senior Fellow in Science, Technology and Environmental Policy at the Woodrow Wilson School of Public and International Affairs at Princeton University. I am currently on sabbatical from the Organisation for Economic Co-operation and Development (OECD) in Paris, where I have led the work-program on Climate Change and Development for the past five years. I received my Ph.D from Princeton University, and have previously worked on assessments of climate change and variability at Harvard and Columbia universities. At the OECD, I work closely with our Member governments (which include the United States) on policies to better integrate consideration of climate risks in their international development assistance as well as their domestic policies. My publications include two recent books on adaptation to climate change, and another on assessing the benefits of climate policies. I was first involved with the Intergovernmental Panel on Climate Change (IPCC) in 1994-95 during the Second Assessment Report when I served as a Lead Author for Working Group II.

For the IPCC Fourth Assessment Report (AR4), I have had the honor to serve as the Co-ordinating Lead Author (CLA) for Working Group II Chapter 17, *Assessment of Adaptation Practices, Options, Constraints and Capacity*, and as a drafting author for the Technical and Policymaker Summaries. My testimony today will summarize some of the main findings from IPCC Working Group II AR4 as they pertain to adaptation – primarily from Chapter 17, but I will first draw upon Chapter 18 to establish the interrelationships between adaptation and mitigation.

2. Adaptation to climate change is necessary, but not sufficient

Both mitigation and adaptation help to reduce the risks of climate change. Mitigation – through the reduction in sources or enhancement of sinks of greenhouse gases – reduces all impacts of climate change. Adaptation – through adjustments in human and natural systems to actual or expected climatic changes – can be selective. It can reduce negative impacts, and take advantage of the positive.

The costs of both mitigation and adaptation are predominantly local and near term. Meanwhile, the climate related benefits of mitigation are predominantly global and long-term, but not immediate. Owing to lag times in the climate system, the benefits of current mitigation efforts will hardly be noticeable for several decades. The benefits of adaptation are more immediate, but primarily local, and over the short to medium term.

Given these differences between mitigation and adaptation, climate policy is not about making a choice between adapting to and mitigating climate change. Even the most stringent mitigation efforts cannot avoid further impacts of climate change in the next few decades, which makes adaptation essential, particularly in addressing near term

impacts. On the other hand, unmitigated climate change would, in the long term exceed the capacity of natural, managed, and human systems to adapt.

3. Adaptation to climate change is occurring now, but on a limited basis

Societies have a long record of adapting to the impacts of weather and climate through changes in behavior, choices of technology and infrastructure, use of market instruments, and public policies. Crop diversification, weather and seasonal climate forecasting, drought and hurricane early warning systems, flood protection, weather derivates, and establishment of coastal-setbacks are only a few examples of proactive adaptation measures. Adaptation can also be reactive, for example, emergency response, disaster recovery, and even migration.

The IPCC Fourth Assessment Report notes that significant advances have been made in the ability to adapt to seasonal to inter-annual climate variability. This has been due to the development of operational capability to forecast El Niño and La Niña events and their associated impacts. Institutions to produce seasonal forecasts have been established and mechanisms are now in place to facilitate the use of this information for anticipatory adaptation in agriculture, water resource management, food security, and other sectors. The US government, through NOAA and other agencies, has been central to this progress, not only in the domestic context but also in Latin America, Africa, and Asia.

The Fourth Assessment Report also concludes that climate change is likely to require forward looking investment and planning responses that go beyond responding to current climate. This is because climate change poses novel risks outside the range of experience, for example, through accelerated glacier retreat and permafrost melt, and changes in the intensity of heat waves and hurricanes. Countries ranging from Nepal to Switzerland are actively reducing risks of hazards associated with the expansion of glacial lakes and permafrost melt, as a result of rising temperatures. Even when the impacts of climate change are not yet discernible, scenarios of future impacts may already be of sufficient concern to justify adaptation responses into current planning. It may, for example, be cost effective to implement adaptation measures early on, particularly for long-lived infrastructure. For example, a sewage treatment facility on Deer Island in Boston harbor was constructed at a higher elevation, taking into account anticipated sea level rise. This was also the case for the Copenhagen Metro. There are, however, relatively few examples of such infrastructure projects at present.

Comprehensive strategies to adapt to climate change are also being put in place by a few countries, local governments, and international donors. Countries such as Finland, France and the UK are establishing national strategies and policy frameworks for adaptation, while donors ranging from the World Bank to the USAID are undertaking measures to climate-proof their development projects. At the local level, meanwhile, climate change scenarios are being considered by New York City as part of a review of its water supply system. Changes in temperature and precipitation, sea level rise, and extreme events have been examined and an eight step adaptation assessment procedure has been developed. Among the adaptation measures being examined are some that could be implemented relatively quickly, such as the tightening of water regulations in the event of an unusually

severe drought. Also under examination are long-term infrastructure adaptations such as the construction of flood walls around low-lying wastewater treatment plants to protect against sea level rise and higher storm surges. Such examples, however, are still only "boutique" cases and remain fairly limited relative to the scale of the issue.

4. There are substantial limits and barriers to adaptation

Adaptation is not a slam dunk. For many parts of the developing world adaptation is constrained by the existence of low coping capacities and inadequate financial and technical resources to design and implement adaptation measures. However, even developed countries with high aggregate "adaptive capacity" have vulnerable populations, as was brought home by 15000 excess deaths in France during the 2003 heat wave and the devastation caused by Hurricane Katrina in this country in 2005.

There is also evidence that demographic trends and social choices in both developed and developing countries have, in many cases, resulted in *mal*-adaptation. For example, the conversion of coastal wetlands and the development of settlements and infrastructure may boost coastal economies but it also increases vulnerability of critical coastal systems to the impacts of current and future climate. Even measures that have been put in place to reduce current risks – such as levees and dams – could end up exacerbating longer term vulnerabilities if they do not incorporate the full range of risk possibilities.

Adaptation could also entail significant costs. A recent estimate by the World Bank puts the global incremental annual costs to adapt to climate change to be between US $10 billion to US $40 billion. Information on costs and benefits of adaptation, however, remains very preliminary. Some regional and sectoral studies have identified adaptation measures that can be implemented at low cost or with high benefit/cost ratios. The precise estimates of costs and benefits, however, depend critically on the assumptions made. For example, whether investment in coastal protection is a better strategy than letting a particular coastal region be lost to rising sea levels depends upon assumptions about how real estate values would adjust as the coastal land gets submerged. Many of the adaptation cost estimates are also often in a narrow "engineering" sense and do not include the costs of implementation, or the social or economic externalities associated with putting such measures in place.

Adaptation is also constrained by significant gaps in the knowledge base required to undertake such actions. For example, climate information is frequently not available at the time and space scales, or for the specific climate variables, that are needed to inform decisions. Mean temperature – which is typically the variable that can be projected most reliably by climate models – is also often the least relevant for end users. Users often need information on the likelihood of extremes for many operational decisions, which is often less reliable or not available at all. Even when information exists, individuals and groups may have different risk tolerance, as well as different preferences about whether and how to respond to such information. And even when actions are undertaken, the differential power and access to information and resources may promote adaptive responses by some, while constraining the ability of others to adapt.

5. Some Implications

Based on these findings from the Fourth Assessment Report I will conclude with a few personal recommendations.

Adaptation needs to be treated as a core component of a comprehensive climate policy. Consideration of the risks posed by climate change also need to be integrated within broader programmes and budgetary processes, ranging from natural resource management, to disaster risk reduction, to international aid. In many cases, adaptation to climate change would require better enforcement or further strengthening of existing regulations. Buy-in from regulatory agencies is therefore critical.

Many adaptation actions will ultimately be undertaken by individuals, communities and private actors. However, the government can play an important role by promoting the development and provision of usable knowledge that would facilitate decisions by private actors. This may require an integrated suite of climate information products from climate monitoring, to seasonal/interannual as well as climate change projections. Continuing efforts are also needed to provide information on climate variables, and at the temporal and spatial scales in line with user needs. Proactive efforts might also be needed to ensure timely and equitable access to such information.