

“Climate Change and the World Bank Group: Climate Adaptation”

Approach Paper

Background

1. This evaluation is the third in an Independent Evaluation Group (IEG) series that assesses World Bank Group activities related to climate change. The first two focused on policies and projects related to greenhouse gas mitigation. This one relates to climate change adaptation. In addition, as IEG committed at the Committee on Development Effectiveness (CODE) discussion of the first phase, the evaluation series will include a capstone summary of the three phases, described here.

Box 1. Definitions of climate adaptation

The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment defines adaptation as any "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities".

An Organization for Economic Cooperation and Development (OECD) - Development Assistance Committee (DAC) “marker” is aimed at classifying whether particular development aid projects can be classified as targeting objectives established under the 1992 Rio Conventions as a principal or significant objective. It defines climate change adaptation projects as those that "reduce the vulnerability of human or natural systems to the impacts of climate change and climate-related risks, by maintaining or increasing adaptive capacity and resilience. This encompasses a range of activities from information and knowledge generation, to capacity development, planning and implementation of climate change adaptation actions."

In practice, the distinction between adaptation and development is blurry. General development trends – a diminishing share of labor and output in agriculture, increased institutional ability to prepare for natural disasters and to manage water resources, wealthier and better educated households – will strongly increase societal resilience and thus constitute important avenues for adaptation.

Source: OECD DAC; IPCC Fourth Assessment Report;

CLIMATE CHANGE AND CLIMATE ADAPTATION

2. Earth’s climate is already changing, and further change is inevitable. Year 2010 was the wettest year on record, and tied for the hottest (NOAA 2011). The summer extent of the arctic ice cap is dwindling, with planet-wide impacts on weather patterns. While it is not possible to link specific events to climate change, the devastating 2010 Pakistan flood (a 1 in 1000 year event by historical standards (Straatsma, Ettema and others 2010)) and Russian heat-wave (a 1 in 3000 year event) are illustrative of the kinds of extreme events that climate change has already made more frequent (Stott, Stone and others 2004; Min, Zhang and others 2011; Pall, Aina and others 2011). Preparing for these and other changes requires adaptation at all levels of society.

3. The evaluation adopts the OECD-DAC definition of climate adaptation (Box 1). Consistent with World Bank Group (WBG) practice, this encompasses two overlapping but distinct development challenges:
4. **Dealing with today’s climate-related risks.** Many countries and sectors are not well adapted even to current climatic risks, including cyclones, floods, droughts, and heat waves. IEG’s Natural Hazard, Water, and Agriculture evaluations have discussed ways of reducing current climate-related risks, for instance through more efficient water management and via disaster preparedness. Many, but not all, of these adaptations to current risks will increase resilience to future climate change.
5. **Preparing for tomorrow’s climate.** Ongoing changes in the earth system, due to human-caused greenhouse gas emissions, will have profound permanent impacts on the climate. These risks have become increasingly evident as climate science has advanced, though their exact magnitude and incidence is still unclear. Expected negative impacts are shown in Box 2. The burden falls hardest on low-latitude countries. There will be some positive impacts in the medium run in some temperate regions.

Box 2. Impacts of climate change

- Higher temperatures and more frequent and intense heat waves, threatening lives and crops
- More intense rainfall, causing greater flooding
- Loss of winter precipitation storage in snowmass and glaciers, inducing summer droughts
- Increased frequency of serious droughts
- Reduced crop yields
- Sea level rise, threatening river deltas, coastal cities, and small island nations with more storm surges, salinized water, and eventual inundation.
- More intense cyclones
- Loss of coral reefs
- Ocean acidification, with possibly profound impacts on marine ecosystems including fisheries
- Loss of terrestrial biodiversity, profound at higher temperatures
- New areas exposed to malaria and other diseases

Sources: (Parry, Canziani and others 2007; Allison and others 2009; Füssel 2009)

THE WORLD BANK GROUP AND CLIMATE ADAPTATION

6. In the Bank Group, as in the world at large, the challenge of adapting to future climate change has historically garnered less attention than climate mitigation, in part because mitigation has been better understood. A 1999 Environment Department paper (Burton and van Aalst 1999) and a 2000 study of the Pacific Islands (*Cities, Seas and Storms*) were prominent in drawing attention to the adaptation agenda. The 2001 Environment Strategy named adaptation a strategic priority under climate. While prioritizing reduction of vulnerability to current climate, the Strategy said that the Bank would mobilize a “Vulnerability and Adaptation Fund” to cover vulnerability assessments and methodology development. In 2006, the Bank-hosted Global Facility on Disaster Reduction and Recovery began operation. In 2007, the Clean Energy Investment Framework stated that “mainstreaming adaptation to climate risks into the day-by-day activities of the International

Bank for Reconstruction and Development (IBRD) Group is the core focus of the work program” and called for an expanded program of diagnostics, capacity building, and action.

7. More specific WBG-wide strategic guidance on climate adaptation was incorporated in the Strategic Framework on Development and Climate Change (SFDCC) in 2008. The SFDCC gives “priority attention to strengthening the resilience of communities and economies to climate risk.” Specific SFDCC pledges are shown in Box 3. The SFDCC’s adaptation-related indicators are shown in Annex 1.

Box 3. SFDCC commitments to climate adaptation

- “Screen climate-sensitive investments with long life spans, starting with hydropower projects and selected water and agriculture projects”
- “Help some of the most vulnerable countries integrate climate risk management in development processes, on demand and with new financing”
- Support “increasing resilience in agriculture and its linkages with food security, water resources management including support to country-driven trans-boundary programs, and to coastal areas.”
- Sponsor “ongoing analytic work to improve understanding of the nature and costs of adaptation processes with aid developing countries, the international community, and the WBG to better determine the incremental costs of adaptation measures and use this knowledge for raising additional finance.”
- Mobilize “additional resources for adaptation”
- “Customize a series of new insurance and reinsurance products for catastrophic and climate-related risks”
- “Support strengthening technical and policy expertise on development-climate linkages and decision-making capacity at the country level.”

Source: SFDCC

Evaluation Objectives and Scope

8. IEG evaluations are concerned both with accountability and with learning. Learning plays a large role here because of the novelty of the adaptation agenda. Overall, the evaluation hopes to contribute to enhanced climate change adaptation by providing guidance to the WBG, its clients, and development partners on:
 - a. Lessons from past efforts that can accelerate this new agenda
 - b. Information that can inform priority-setting, including the costs and benefits of different adaptation efforts
 - c. Mainstreaming climate adaptation into development

SPECIFIC EVALUATION OBJECTIVES AND QUESTIONS

9. The principal evaluation questions are:
10. ***Adaptation analogs: What have been the outcomes, sustainability, and cost-effectiveness of past efforts to address climate risks?***

While some climate-related risks are wholly novel (glacial loss, ocean acidification), others are familiar (droughts, floods) and have long been addressed by WBG projects, programs and policies. These efforts may not have carried a ‘climate adaptation’ label, but nonetheless may be seen as adaptive and hold important lessons for a climate-aware future. This evaluation defines an ‘adaptation analog’ as a project or policy that reduces vulnerability of a group, place, or sector to a specific climate-related risk, but did not explicitly address future climate change. It includes both investment projects and policy reforms, including policies to address maladaptation and adaptation deficits. For important classes of analogs with evaluable track records:

- To what extent were these efforts successful in achieving and sustaining desired outcomes? What were the determinants of outcome achievement?
- Information permitting, how cost-effective were these efforts?
- Information permitting, how did these efforts reduce vulnerability or increase welfare?

11. *Mainstreaming climate risks into investment project design. Under what circumstances is it most important to incorporate climate change risks into the design and appraisal of investment projects? To what extent, and how, is this being done?*

- To what extent is climate risk appropriately incorporated in current projects?
- Under what circumstances does future climate change imply the need for significant changes in project or program design and implementation?
- For illustrative classes of climate-sensitive projects, to what extent is future climate change appropriately factored into design, appraisal, and implementation?

12. *Planning for an unfamiliar future: What are the lessons from efforts explicitly aimed at climate change adaptation?*

This question primarily addresses investment, policy, and analytic support at the country level, together with selected globally-oriented analytic activities. At the country level, it focuses on case studies of countries with longer track records of explicit adaptation activities. It also includes assessment of PPCR program design issues. It assesses the relevance, efficacy, and efficiency of actions to:

- build human and institutional adaptive capacity,
- develop analytic and data resources
- identify current and future vulnerabilities
- plan and implement adaptive actions

13. *Adaptation under the SFDCC: What has been achieved and learned?*

- To what extent were the SFDCC goals relevant to the promotion of climate adaptation?
- Were appropriate indicators and targets chosen?
- To what extent have goals been achieved?

- What has been the relevance, basis, and utility of efforts to tally the adaptation content of projects?

EVALUATION SCOPE

14. The evaluation focuses on the World Bank and the International Finance Corporation (IFC). While recognizing the distinctive roles of the public and private sector, the evaluation also sees strong commonalities and will present an integrated narrative. Thus both agencies have examples of adaptation analogs; both may look at current climate variability and future climate change in the process of appraising projects and programs; and both have AAA work that is explicitly oriented to adaptation. MIGA projects will be scanned for potential relevance to adaptation but the initial expectation is one of a lower profile for MIGA in this evaluation.
15. The *temporal scope* is linked to the availability of relevant evidence for each topic.
 - Assessment of mainstreaming focuses mostly on the SFDC era (2008-11), when consciousness of climate change is expected to be higher and decisions on project and program design are fresher for examination.
 - Because there have been relatively few completed activities with explicit adaptation objectives, but a spate of very recent ones, the evaluation will identify all significant completed projects regardless of date.
 - Evaluation of the SFDC is tied to its effective period (FY2008-2011) and covers all relevant countries and sectors.
16. The *substantive scope* is necessarily selective, because of the all-encompassing nature of adaptation. Four principles guide the selection of subtopics and of samples of WBG activities. Ideally, priority would go to the ‘most important’ adaptation issues for WBG clients. Unfortunately there are no available measures of relative ‘importance.’ However, the topical coverage includes most of the key adaptation concerns. Second, priority also attaches to novel and potentially scalable instruments (such as weather index insurance) and novel concerns (e.g., loss of glacial water supplies). Third, there should be an evaluable base within WBG experience. The evaluation will refer to broader adaptation experience for context and examples, but cannot undertake a comprehensive assessment of all aspects of adaptation. Thus, the evaluation makes use of IEG’s existing comprehensive sectoral studies in agriculture, natural hazards, and water and for those sectors will reflect the strength of the evidence that those evaluations were able to muster. Fourth, subtopics, case studies, and samples should illustrate generalizable adaptation issues.

Evaluation outline and methodology

17. This discussion of topics and methods follows the proposed evaluation outline (Box 4 and Annex C). Annex B presents a detailed matrix of questions, approaches, and data sources.

Box 4. Tentative report outline

- What is adaptation?: an analytic framework
- Lessons from adaptation analogs
- Factoring climate change into today’s project and program design
- Planning for an uncertain and unfamiliar future: building and using national capacity to prepare for climate change
- Adaptation under the Strategic Framework for Development and Climate Change
- Conclusions and Recommendations

CHAPTER 1: WHAT IS ADAPTATION? : AN ANALYTIC FRAMEWORK

18. Evaluation of climate adaptation is a relatively new field (van den Berg and Feinstein 2009; United Nations Framework Convention on Climate Change (UNFCCC) 2010), presenting distinctive challenges. The evaluation framework faces four of them. *First, defining the scope of adaptation*, which touches most endeavors related to water, agriculture, or disasters. To keep the scope manageable, this evaluation identifies and synthesizes assessments of adaptation analogs in past evaluations of those sectors, supplemented by relevant new material. (See below for a more detailed discussion of the boundaries of adaptation.) *Second, the immaturity of recently-launched efforts with an explicit adaptation orientation*. To accelerate learning from these pioneer efforts, the assesses already-complete aspects, such as design, and reports on progress to date. *Third, the long timeframe of adaptation*. Project or program impacts on climate resilience may be observable only after decades (for slow-onset climate effects) or after a rare event (the hundred year flood). As explained below, the evaluation framework distinguishes aspects that can be evaluated ex post vs. ex ante. Finally, *adaptation comprises an inherently heterogeneous set of location-specific, sector specific issues*. Yet there are cross-cutting, broadly applicable analytic elements that can be used across sectors and throughout the evaluation.

19. This section presents an overall framework; detailed evaluative approaches are discussed in each section.

A Typology of Climate Adaptation Challenges

20. It is useful to distinguish four types of climate adaptation challenges. While there is overlap between them, each one evokes a distinctive set of responses, and has different implications for impact evaluation.

21. **Extreme Events** are those with high severity and low frequency (return periods of, say, 10 to 1000 years or more), including floods, heat waves, droughts and cyclones. These risks can be mitigated through insurance, hardened infrastructure, warning systems, and policies to reduce exposure. For this class of risks, typically the evaluator may be able to observe outputs and outcomes (e.g., enforcement of zoning in floodplains; strengthening of seawalls), but not impacts (e.g., reduced losses from severe but rare cyclones). *So impact evaluation has to rely to a large extent on assessment of project and program design,*

including an assessment of the simulation or analytic tools that were used to anticipate the extreme events in question. A key concern is whether, due to climate change, these risks are already higher than historical experience suggests. With climate change, some rare events may become chronic conditions.

22. **Current Chronic Climatic Conditions** include water scarcity, storms, and chronic flooding and drought. Responses include policies and physical measures; insurance is less relevant for very frequent events. The impact of these responses – for instance on flood damage or agricultural incomes -- is, in principle, observable within the time-frame of this evaluation. *Thus the full armamentarium of evaluative tools, including impact evaluations can be deployed for this class of concerns.*
23. **Inexorable Calamities.** Science unambiguously points to globally rising temperatures and rising sea levels. Hence it is possible to point to significant parts of the globe which will experience irreversible transitions such as inundation, loss of permafrost, changes in vegetation, and loss of glacial water supply. Because these transitions will typically take place over a period of decades, and because there is uncertainty about their rapidity, *adaptive responses can only be assessed ex ante. As in the case of extreme events, the evaluator must concentrate on assessing project design and initial outputs if any.*
24. **Unreckonable Risks.** There are large swathes of the earth for which some climate models predict more rainfall, while others envision less. Such a high degree of uncertainty motivates reliance on development interventions that are robust to a broad range of climate outcomes. As in the previous case, *impacts of these interventions on resilience must be evaluated ex ante.*

A Typology of Climate adaptation Responses

25. Responses or interventions can be evaluated at the global, national, community, or project level. They can address one or more of the challenges described above. A simple typology of responses includes:
- Capacity building
 - Assembly of information and tools (particularly Geographic Information System [GIS] data on climate, hydrology, and assets and population at risk)
 - Training in tool use and application
 - Institution building and networking; improved governance
 - Capacity building for communities and households, including public awareness and education
 - Monitoring, diagnosis, and planning
 - Hydrometeorological systems setup, maintenance, and use
 - Participatory planning
 - Vulnerability assessments
 - Sectoral and national planning including policy analysis and strategy formulation

- Financing and implementation of actions
 - *Insurance* and other risk management tools
 - Policies and projects to reduce *exposure* to climate impacts (e.g. land use planning and zoning; retreat from threatened areas)
 - *Investments to reduce sensitivity* to climate impacts; for example:
 - Structural and non-structural responses and systems to reduce impacts of extreme events (e.g. seawalls, mangrove planting, and disaster warning systems)
 - Infrastructure to deal with chronic climate stress, e.g. reservoirs and irrigation; landscape management for agricultural resilience
 - Investments to mitigate the impact of inexorable calamities, e.g. development of salt-tolerant crops
 - Making mainstream investments more resilient, e.g. designing hydropower plants to be robust to climate change
 - *Policies and programs to reduce sensitivity*, including policy reforms to reduce maladaptation or promote adaptation; e.g. reduction in subsidies to water-intensive crops; building codes to support storm resistance; climate-aware social protection.
- General, non-climate-specific, development policies and investments
 - *Policies that shift the economy* to less climate-sensitive sectors
 - *Policies that enhance overall human and institutional adaptive capacity*
 - *Compensatory investments* that make up for losses due to climate change

26. The table below presents an indicative set of criteria for evaluating these responses (excluding the general, economy-wide ones). The focus is on outcomes and outputs. The ultimate impacts on resilience or vulnerability may or may not be observable, as discussed in paras. 21 through 24. Note that evaluation of outcomes and impacts will be highly dependent on the degree to which projects and programs incorporated adequate monitoring and evaluation systems.

<i>Interventions</i>	<i>Output criteria</i>	<i>Outcome criteria</i>	<i>Impact assessment</i>
<i>Information and tools</i>	Quality, quantity, relevance, and sustainable maintenance of information and information services	Use of information in diagnosis and planning	
<i>Institutional and human capacity building</i>	Quality, quantity and relevance of training; effective linkage to information, tools, and planning	Measures of improved attention to climate by individuals and institutions	
<i>Monitoring, diagnosis and planning</i>	Quality and relevance of vulnerability assessments and plans, including grounding in data, climate models and use of participatory inputs;	Adoption and implementation of plans by communities, provinces, and nations	
<i>Insurance and other</i>	Effectiveness of design;	Take-up, especially among	Welfare gains to

<i>risk management</i>	robustness to moral hazard	disadvantaged; Efficiency in collecting premiums and processing claims;	covered groups.
<i>Policies and projects to reduce exposure to climate impacts</i>	Relevance, a priori efficiency, and acceptability of planned actions,	Degree of implementation of policies and projects; efficiency of implementation; safeguards for affected groups	
<i>Policies and projects to reduce sensitivity to climate impacts</i>	Strength of analytic basis for the effort; a priori efficiency;	Realized efficacy, efficiency or cost-effectiveness	Reduction in climate-related damages (for chronic conditions or low-return period hazards); distributional impact

Is it possible to distinguish between Adaptation and Development?

27. Human alteration of climate has increased the overall cost of development. For example, agricultural yields will decrease and some kinds of infrastructure will become more expensive to construct, or offer lower returns. Poor countries face some of the greatest adaptation burdens, while developed countries that have historically made the greatest contribution to climate change. So there is a strong interest in measuring the overall burden of climate adaptation and quantifying donor response. Developing countries seek to distinguish between ‘adaptation’ and ‘development’ finance in order to ensure that funds for adaptation are *financially additional* to existing development assistance, (Klein 2011), as called for in UNFCCC resolutions. This is reflected in the OECD-DAC ‘marker’ of adaptation (Box 1); and in WBG efforts, under the SFDC, to identify adaptation projects and reckon their total dollar amount. In addition some funding instruments, such as the PPCR, seek *activity additionality* – that is, to support activities that face barriers to finance or implementation.

28. These additionality issues are however distinct from the question of whether it is possible to distinguish between adaptation and development at the project level. At the level of the project or sector, climate is one of a large number of factors contributing to risks, and the evaluation will view adaptation in this ‘mainstreamed’ context. For instance, recent studies of flood risk for coastal cities have found that unsustainable pumping of groundwater is causing cities rapidly to subside, exacerbating the impact of sea level rise. Poor maintenance of urban drainage systems, and paving of wetlands, exacerbates runoff from storms. So addressing urban flood risk requires a holistic set of measures, and it can be difficult at a project level to distinguish the portion of expenditure attributable to climate change adaptation.

29. Moreover, adaptation goes beyond attempts to ‘climate-proof’ particular projects or sectors. Individual climate-proofing efforts might even backfire, increasing long-term vulnerability

by trying to shore up ever more threatened activities. Broad-based development can reduce climate vulnerability by shifting the labor force away from climate-sensitive sectors and by enhancing society-wide resilience – for instance through improved female education (Blankespoor, Dasgupta and others 2010).

30. The evaluation will investigate the operational and strategic impacts of the adaptation/development dichotomy for accessing funding and for mainstreaming of adaptation. This will include a critical assessment of WBG efforts at accounting for adaptation expenditures. The evaluation will also attend to the scope for adaptation efforts that provide mitigation co-benefits, and for ‘no-regrets’ adaptation projects – here understood as those that offer attractive returns that are robust to different realizations of future climate.

Gender and poverty analysis

31. Climate risks are in many cases strongly differentiated by gender and income level. Lacking savings, poor people are less able to recover from droughts or floods. Women’s crops may be more climate-sensitive than men’s. Women are responsible for household water supply, and so may bear a greater labor burden when water becomes scarcer. Higher female mortality has been reported in Bangladesh floods. Climate adaptation responses, likewise, may be biased in ways that reduce vulnerability. Wherever possible, the evaluation will assess the distributional impact (by gender, income level, or disadvantaged status) of adaptive strategies or projects. The ability to do so will be constrained by the availability of household data on climate impacts or project beneficiaries.

Geographic analysis

32. Adaptation is highly site-specific. But across the world there are sets of sites that face similar adaptation challenges. River deltas confront flooding and salinization of high-productivity farmland. Mountain areas face loss of altitude-sensitive habitats, flash flooding, and glacial lake outburst floods. Coral reefs face bleaching. So it is useful and informative, where possible, to compare adaptation experiences within each of these geo-climatic groupings, and to check for the extent of cross-learning within each grouping.

CHAPTER 2: ADAPTATION ANALOGS

33. As noted, a very wide range of WBG projects have necessarily confronted climate-related risks. Comprehensively covering the way these risks have been addressed in agriculture, water, and natural disasters is a daunting task. Fortunately, IEG has recently completed major evaluations in all three areas. This section will review these evaluations for adaptation lessons, and selectively update them. It will group lessons in two areas: making agriculture more resilient, and managing disaster risk (which has a large urban component). Cross-cutting issues include water management and land use planning and zoning.

Analytic framework

34. This section uses, to the extent that information permits, a framework that builds on the standard approach to risk assessment, extending it to include chronic conditions as well as extreme events. The goal is to understand the costs, outcomes, impacts, and benefits of alternative interventions to ameliorate climate impacts. These interventions could range from physical infrastructure to institutional innovation to policy reforms. To do this, the approach will try to ascertain (subject to data constraints):

- Impact on exposure to climate impacts. How did the intervention change the number of people or spatial extent exposed to climate impacts?
- Impact on sensitivity or damage. How did the intervention affect sensitivity of people, places, or assets to climate-related damage, risk or benefits? What were its costs? Who bore the costs and received the benefits?
- Implementation and sustainability. Was the intervention made operational? Did the intervention remain operative? Will it help to increase resilience against continuing climate change? What was its cost-effectiveness?

Making Agriculture More Resilient

35. Global food security will come under increasing stress as population and income growth boost demand while climate change undercuts crop productivity and introduces new risks. A key area is *managing water scarcity*. Globally, water is becoming scarcer due to population growth and agricultural growth. Unsustainable water demand is driven in part by underpricing of water together with maladaptive subsidies for groundwater pumping and for thirstier crops. Climate change will, in many parts of the world, exacerbate water scarcity through increased evapotranspiration, decreased groundwater recharge, loss of glacial water storage, and saline intrusion.

36. Hence increased water storage and irrigation will be key elements of climate change adaptation. So too will be policies that promote increased efficiency of water use in agriculture, which represents 80% of human water use. The current evaluation will consolidate lessons from IEG's water and agriculture evaluations with respect to irrigation, water institutions and rainfed agriculture. It will also draw on recently completed project evaluations, including evaluation of management of the Mekong River Basin and the Mekong Delta.

37. Because of the development importance and climate vulnerability of *African agriculture* it will be important to review IEG's African Agriculture evaluation, together with more recent relevant project and country assistance evaluations, to assess any lessons for managing agriculture in the face of greater climate variability. This will be complemented with a case study of Kenya, where there has been extended WBG attention to agricultural development and flood mitigation in arid and semi-arid areas.

38. *Resilient land management* efforts may directly reduce sensitivity to climate variability. Also, importantly, efforts to narrow the huge gap between actual and potential yields make farmers better-off and thus better able to handle weather shocks to their income. Of

particular interest to adaptation are techniques such as no-till agriculture that may simultaneously boost resilience, profits, and carbon storage. Such experiences will be assessed not only for their specific lessons, but more broadly for lessons of diffusion of new climate-friendly agricultural techniques, such as biochar.

39. An emerging area of practice with potentially large applicability is the use of *index-based agricultural insurance* to protect households and agricultural regions against weather shocks. These programs base payouts on measured rainfall remote sensing, or some other proxy for crop or herd failure – in theory reducing transactions costs and moral hazard compared to traditional insurance and thus making widespread coverage more implementable. The evaluation will undertake a desk review, with possible site visits, of these program’s results to date, drawing where possible on existing impact evaluations.
40. Development of *new seed varieties* may be critical to agricultural adaptation in regions experiencing changes in rainfall or salinity. But since seed development requires a long lead time, it requires ‘placing a bet’ on future climatic conditions. Although there have been only a handful of relevant projects, *in-situ maintenance of agrobiodiversity* (that is, conserving the wild relatives of food and cash crops and animals in their native habitat and maintain genetic diversity on farms) could be crucial in allowing natural selection of genetic traits that are adapted to climate-related changes in temperature, precipitation, or pests.

Disaster Risk Management, including urban issues

41. IEG’s report on *Natural Hazards* (IEG 2006) found the World Bank to be skilled at disaster relief, but pointed to a general neglect of disaster prevention, which is potentially far more effective at saving money and lives. Globally, disaster agencies were coming to the same conclusion, crystallized in the Hyogo Framework for Action.
42. As one consequence, the Global Facility for Disaster Relief and Recovery was established in 2006. The secretariat of this global partnership is housed at the World Bank. In addition to working on general disaster prevention and recovery, the Global Facility for Disaster Reduction and Recovery (GFDRR) reports that it has devoted about two thirds of its assistance to climate change adaptation. IEG is currently conducting a global program review of the GFDRR, and this will feed in to the broader climate adaptation evaluation. To the extent possible, the evaluation will look at outcomes of the GFDRR portfolio of adaptation analogs and projects.
43. Since the publication of IEG’s *Natural Hazards*, the WBG has facilitated *national level catastrophe insurance and financing mechanisms*. The evaluation will describe the early experience of the Caribbean Catastrophe Risk Insurance Facility, in connection with the Caribbean region case study described earlier. The evaluation will also review Bank experience with Deferred Drawdown Options for Catastrophe Risk, and more recent risk pools and insurance facilities.
44. More broadly, many WBG projects are designed to provide *flood and storm protection*. This evaluation will compile lessons from important classes of protective projects, such as

urban drainage and mangrove reestablishment for coastal defense, in addition to warning systems and other nonstructural approaches.

45. *Land use planning and zoning*: People and assets situated in floodplains and low-lying coastlines will increasingly be exposed to flood and storm risk. Adaptation studies for these areas have a standard recommendation: discourage or restrict further development, so as to limit the exposure of people and property to risk. But how can such restrictions or disincentives be put in place and enforced in the face of high land values and strong pressure for immigration? The evaluation will review relevant WBG experience in planning and enforcing urban and rural land use zoning.

CHAPTER 3: MAINSTREAMING CLIMATE RISKS INTO TODAY'S PROJECT DESIGN

46. Risk management should always be an integral part of project and program design. Thus as a matter of due diligence, the design of climate-sensitive projects should identify, and where necessary mitigate, climate-related risk. This is a long-standing principle for instance in the design of dams or the appraisal of agriculture projects. However, this undertaking has become more difficult with the realization that future climatic conditions will differ from the past.
47. The evaluation will assess the degree to which climate change risks have been appropriately incorporated into project appraisal. This assessment will consist of a multisectoral survey and in-depth analysis of at least two highly climate-sensitive sectors.

Multisectoral survey

48. World Bank project appraisal documents systematically identify and rate critical risks to projects, together with proposed mitigatory actions. Risks are also discussed for IFC projects, and ex post may be identified in the DOTS system. The evaluation will create a database of risk factors for projects appraised during the SFDCC era (FY2009-11). This will facilitate analysis of the perceived importance of climate risk (on an absolute basis and relative to other risks) as a function of the project's sector and location. For Africa and Latin America (where there exists comprehensive geolocation data for projects), project location will be mapped against current climate variability, expected climate change, and climate-sensitive zones (coastal zones, deltas and estuaries, floodplains, mountain regions).
49. This database will be used to take stock of the degree and nature of mainstreaming of climate risks, using the WBG as a kind of laboratory for risk detection. The analysis will answer the following questions:
- Are climate risks identified during appraisal for projects in climate sensitive sectors that are located in areas with high objective measures of climate risk? If not, why?
 - To what extent are risks of *future* climate change identified, and mitigating actions proposed? Does appraisal account for risks that extend beyond WBG involvement?
 - Are climate risks identified during appraisal in sectors and geographical regions with a low *ex ante* expectation of climate sensitivity? If so, why and under what conditions?

- For different kinds of projects, what is the magnitude of climate risk relative to other kinds of risk?

Sectoral Analysis

50. Some projects may need to take climate change into account during design and appraisal. One would expect, *a priori*, that long-lived, inflexible¹ projects would be singled out.
51. This evaluation identifies two such sectors for in-depth analysis. (Others may be identified in addition.) *Hydropower* is explicitly prioritized in the SFDC for climate screening. We would expect for instance that run-of-river hydropower (i.e., without a storage reservoir) would be exquisitely sensitive to changes in the variability of water flows. The size of dam spillways, a major cost component, is sensitive to the scale of the maximum probable flood, which may be affected by climate change. Hydropower is an apt choice for study because it has a long history of using climate data and analysis and hence could represent a benchmark for incorporation of adaptation concerns into infrastructure. *Protected area and ecosystem services* projects are intended to conserve threatened biodiversity or maintain ecosystem processes in perpetuity. However, well within this century, some protected areas could face changes in temperature or precipitation that threaten the viability of the biodiversity they harbor.
52. For these sectors, the evaluation will develop stylized normative models which indicate the conditions under which climate change might make a substantial difference to project design and appraisal². Against this benchmark, a review of project design documents, supplemented where necessary with task team interviews, will determine whether climate change was appropriately incorporated in project design or appraisal. The review will also consider quality of the climate or hydrological projections and the manner in which these projections were used.
53. In addition, special attention will be devoted to classes of private sector (IFC) projects in climate-sensitive sectors such as tourism and coffee plantations.

CHAPTER 4: PREPARING FOR AN UNFAMILIAR FUTURE: BUILDING AND USING CAPACITY TO ADDRESS CLIMATE CHANGE

54. There has been an explosion of activities at the WBG – many of them are Analytic and Advisory Activities (AAA) – explicitly oriented towards adaptation. Many of them are too young for outcome assessment. This evaluation looks at some of the more mature efforts that offer broadly applicable lessons.

¹ Inflexible projects are for instance those where projections of future climate must literally be cast in concrete and where subsequent adjustments are difficult. For instance, underground urban storm drains should be sized to accommodate future storm loads; it might be prohibitively expensive to resize them after construction.

² The modeling approach will be similar to that used in IFC's *Climate Risk and Business* study.

National and regional adaptation programs

55. Particular interest attaches to the longest-running programs of support for national and regional climate adaptation capacity and action, since these can provide some insight into the outcomes of engagement at the country and regional level. The Evaluation will undertake case studies of four of the most mature of these efforts: the Caribbean; Colombia; the Pacific islands, with emphasis on Kiribati and Samoa; and Kenya. The case studies will assess the impact and sustainability of training and institutional development; trace the effect of analytic support, training, and information support on national planning and priority setting, and track the follow through of planning to implementation. The Caribbean case study will draw heavily on a Project Performance Assessment Report (PPAR) of two adaptation projects, and will benefit from a concurrent GEFEO review of OECS (eastern Caribbean) projects. The evaluation will also look at long-standing adaptation-like programs in Vietnam and Bangladesh.
56. Pilot Program for Climate Resilience (PPCR) projects are part of the vanguard of international funds for adaptation. Because they are new, the evaluation will focus on assessing the quality of project design and its congruence with Country Assistance Strategy (CAS) and other national priorities. To put the Bank Group's work in global perspective the evaluation will also draw on GEFEO reviews of longer-standing adaptation funds including the Strategic Priority on Adaptation and the Least Developed Countries Fund.

Vulnerability assessments and resource studies

57. The World Bank has supported vulnerability assessments at the national and thematic level (e.g. vulnerability of coastal cities in East Asia and in Northern Africa). Since these are thought to be building blocks for adaptation efforts, an assessment of their quality and impact is worthwhile. Likewise, a sample of Country Water Resource Studies will be assessed for their adaptation content.

Development Policy Operations

58. A set of 8 Development Policy Operations (DPOs) with climate adaptation goals represent \$5 billion of funding, dwarfing allocations for other explicit adaptation efforts. Many of these coincide with the expansion of Bank lending during the financial crisis, and will be examined also in conjunction with IEG's financial crisis evaluation. Largely via desk study, the evaluations will assess relevance of the adaptation goals, and the linkage between those goals and DPO-related analytic work, policy triggers, and policy reforms. Where possible, program performance will be tracked.

Hydrometeorology

59. A key area for follow-up is the experience of projects that support hydrometeorological data and institutions. Reliable data on weather and water flows is essential for adaptation planning. Challenges include data gathering, data quality assurance, inconsistent formats and standard, data storage, and a frequent reluctance of hydrometeorological agencies to

share information. The evaluation may survey supported hydromet agencies to assess the outcomes of WBG support, especially with regard to data dissemination and use.

Facing new climate threats

60. The World Bank has sponsored analytic work devoted to the most distinctively new climate threats, the inexorable calamities: glacial loss, Amazon dieback, coastal and island inundation. These will be reviewed for quality of analysis and impact on policy and projects.

CHAPTER 5: CLIMATE ADAPTATION UNDER THE SFDCC

61. This section assesses the formulation and implementation of the WBG’s work on adaptation under the SFDCC, focusing on the questions in paragraph 13. It will assess the relevance of, and achievement of, the goals listed in Box 3 and Appendix A. The assessment will draw on topics covered in earlier chapters, review of SFDCC progress reports, and gap-filling assessments where necessary.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

62. The conclusion section will draw key lessons for adaptation finance and implementation. It will identify priority areas for action, including those with high returns and those where urgent action is needed. It will discuss the WBG’s comparative advantage in undertaking activities, with attention to the need for global public goods and coordination. It may sketch options for action under different scenarios for the volume of adaptation funding. And it will suggest directions for improved indicators and monitoring of adaptation.

Capstone Summary of IEG’s Climate Evaluation Series

63. A follow-on brief will constitute a capstone summary of the Climate Evaluation Series. This summary will summarize and synthesize the findings and recommendations of the three phases of the climate evaluation, updated in light of developments at the WBG and in the international climate arena. It will include limited updating and gap-filling of the earlier reports, as follows. First, it will assess the relevance of, and achievement against the SFDCC’s results indicators, complementing the adaptation review in para 61. Second, it will review the formulation and implementation of investment plans and WBG-executed projects under the Climate Investment Funds. Third, it will review the progress of the Forest Carbon Partnership Fund, drawing on the FCPF’s self-evaluation and existing external evaluations. Finally, it will examine the role of climate change DPOs in supporting mitigation as well as adaptation policies.

Staffing, timing, and dissemination

DISSEMINATION AND TIMING

64. The audiences for this evaluation, in addition to CODE, include WBG staff and management, and the broader development and climate change community. During the

evaluation, regular meetings with the WBG's climate adaptation staff will be used as one means of improving the accuracy, relevance, and take-up of evaluation findings and recommendations, while always safeguarding the evaluation's independence. Dissemination will take place via internet and through workshops and presentations, in addition to print.

65. The timeline is as follows:

Approach Paper submission to CODE	May 20, 2011
One-stop Review	March 7, 2012
Report submission to OPCS/IFC	
Management for comment	April 4, 2012
Report Submission to CODE	May 16, 2012

STAFFING

66. The evaluation will be directed by Kenneth Chomitz, under the general supervision of Vinod Thomas. The core team will include Dinara Akhmetova, Ann Flanagan, Ade Freeman, and Stephen Hutton. This approach paper has benefited from peer review of an earlier draft by Fatima Denton (Program Leader, Climate Change Adaptation in Africa, IDRC), Richard Klein (Theme Leader, Reducing Climate Risk, Stockholm Environmental Institute), Susmita Dasgupta (Lead Environmental Economist, DECRG) and Claudio Volonte (Chief Evaluation Officer, GEFEO). An external advisory committee will provide guidance and review midterm results.

Annex A. SFDC results indicators related to adaptation

- Actions to strengthen climate resilience are supported by several CASs , with an estimated demand by at least 10 countries with high vulnerability to climate risks
- Strategy updates for relevant sectors (Urban, Energy, Social Development, Environment) include consideration of climate risks and support to climate actions.
- A plan for strengthening synergies between support to disaster risk management and support to adaptation developed and implementation started
- Screening of relevant projects for climate risks introduced, starting with hydropower projects, extending to other vulnerable sectors within regional context
- Develop an outcome-based results framework: A set of definitions and outcomes developed
- Improved climate-related portfolio tracking, with the focus on projects addressing climate risks and vulnerability in International Development Association (IDA) countries
- Access to climate risk management products and reinsurance markets increased
- Work by CGIAR on climate resilient agriculture technologies scaled up (measured by increase in funding)
- The global economics of adaptation study completed and improved the knowledge of adaptation processes, costs and benefits
- WDR2010 on climate change launched and contributed to global knowledge and dialogue
- Monitoring on global climate action improved, through joint effort with the UN and OECD, and reported in flagship WBG knowledge products (such as WDI).
- Good practice guidelines to help relevant operations account for social and gender dimensions of climate change prepared
- Toolkits and decision-making guides for adaptation to climate change in agriculture and water sectors developed and applied
- Wide coverage of staff and managers by specialized training programs on development and climate change; climate issues included in other training programs, as appropriate.

Annex B. Evaluation Design Matrix

<i>Questions</i>	<i>Indicator or outcome</i>	<i>Information sources and approach</i>
Adaptation analogs: What have been the outcomes, sustainability, and cost-effectiveness of past efforts to address climate risks?		
<i>What are the costs and benefits of efforts that promote resilience of agriculture to climate variability and to climate change?</i>		
	Costs, benefits, and lessons from, interventions to reduce sensitivity of agriculture to water availability (including irrigation and water allocation policies)	IEG agriculture evaluation report, background papers and project database; recent PPARs and XPSRs
	Measures of risk reduction or welfare improvement from weather index insurance programs; lessons on insurance implementation.	Project documents, external evaluations and research papers; possible analysis of primary data
	Costs, actual and projected benefits, and lessons from seed and livestock development and from <i>in situ</i> and <i>ex situ</i> conservation of agrobiodiversity	Project documents, CGIAR interviews, external evaluations
	Costs, benefits, and lessons on promoting diffusion of, resilience-enhancing land management techniques	Project documents; review of external research; review of external literature and data
<i>What are the costs and benefits, of disaster risk reduction and management efforts?</i>		
	Costs, outcomes, sustainability and actual/projected benefits of physical risk reduction efforts (mangroves, seawalls, dykes)	Review of IEG <i>Natural Hazards and Water Evaluations</i> and background papers; project documents, GFDRR program review; possible GIS/remote sensing analysis of mangrove project outcomes
	Economic analysis of catastrophic risk management and insurance products	Project and program document analysis and interviews with WBG and Caribbean Catastrophe Risk Insurance Facility (CCRIF) staff
	Lessons from land use planning and zoning	Comprehensive screening of WB project documents; staff and stakeholder interviews.
Hydrometeorology and use of climate data (cross cutting issues)		
<i>What are the benefits of investments in hydrometeorology institutions, data, and services?</i>	Returns to better hydrometeorology information in hydropower design; role of hydromet data in disaster risk management, catastrophe and weather risk insurance, and climate vulnerability assessments; sustainability of hydromet services	<i>Water</i> evaluation background papers; project documents; country case studies; interviews with national and international hydromet agency staff; hydropower study

<i>What are the appropriate uses of climate forecasts for different kinds of adaptation issues?</i>	Rough indication of prediction errors at different geographic and temporal scales, for different aspects of climate	Literature review, interviews with climate scientists
Mainstreaming climate risks into project design; Under what circumstances is it most important to incorporate climate change risks into the design and appraisal of investment projects? To what extent, and how, is this being done?		
<i>In what kinds of projects does consideration of future climate change entail significant changes in design and implementation? To what extent is climate risk appropriately incorporated in current projects?</i>	Tabulation of the perceived salience of climate risk by sector and location, based on a priori identification of climate-sensitive sectors and locations; review of identified risk mitigation measures	For World Bank, assemble a comprehensive project-level database for 2005-10 based on the Risk Identification Worksheet; for IFC and MIGA, sample key appraisal documents, and code risks. For geocoded projects, check location against objective measures of climate variability and climate risk. Review Water Anchor's project level assessment of climate risk.
<i>To what extent is climate change appropriately incorporated in the design and appraisal of hydropower projects?</i>	Use of a normative model of optimal hydropower design to benchmark appropriate use of info on climate and climate change; Assessment of the degree of incorporation of such information in design and appraisal of selected projects	Construction of a normative model (based on hypothetical or observed hydrological flows); construction and application of evaluative criteria for recent investment projects (World Bank and MIGA)
<i>To what extent is climate change appropriately incorporated in the design and appraisal of protected area projects?</i>	Assessment, for recent protected area and other landscape level biodiversity projects, of the degree to which protected area selection and management takes into account the effect of changing climate on the viability of biodiversity slated for protection.	Analysis of project documents; consultations with biodiversity experts; use GIS to assess habitat risk and connectivity
<i>To what extent is climate change appropriately incorporated in the design and appraisal of selected private sector investments?</i>	In addition to hydropower, selected classes of highly climate-sensitive private sector investments will be examined (e.g. tourism; plantations). Assessment of the de	
What are the lessons from country, regional, and global efforts explicitly aimed at climate change adaptation?		
	Assessment of the relevance and efficacy of comprehensive national and regional efforts to plan for and implement climate adaptation	Development of a framework to assess planning, capacity building, climate and vulnerability information assessment. Application of the framework in four case studies, and to a sample of PPCR projects. PPAR of Caribbean adaptation projects. PPAR of Mekong Water Utilization project. Review of a sample of CAS/CPS with adaptation content.
	Assessment of the role of DPOs in promoting climate adaptation policies	Review of project documents including CAS/CPS, interviews with staff and stakeholders

	Evaluation of vulnerability assessments at the thematic or national level	Review of AAA activities; review of GEFE0 evaluations.
	Evaluation of AAA and other projects addressing distinctive new climate threats	Review of project documents; country case studies.
Assessment of adaptation efforts under the SFDC		
<i>To what extent were SFDC goals relevant to the promotion of climate adaptation? Were appropriate indicators and targets chosen? To what extent were goals achieved?</i>	Assessment of relevance of goals. Assessment of achievement of goals.	Review of SFDC documents including progress reports. Synthesis of evaluation findings from earlier chapters and volumes. Staff and stakeholder interviews. Review of FPCF and Climate Investment Funds documents (CIF)
<i>Is it possible and meaningful to tally expenditure on adaptation?</i>	Assessment of World Bank system for tagging adaptation projects; critical synthesis of research on adaptation cost	Literature review on adaptation costs; critical review of methodology for adaptation tagging

Annex C. Preliminary outline (subject to substantial revision)

1. What is adaptation?

a. Stage setting

- Why adaptation is important
- Why evaluate now

b. A framework of damages and responses

- A typology of climate risks
- Major classes of impacts with rough indications of the time scale, spatial scale, and population involved for each class of impact
- Discussion of current climate risks vs. future climate risk.
- A typology of adaptive responses
- Implications for evaluation.

c. Adaptation and Development

- Reviews the interrelationship between adaptation and development; stresses that general development is an important avenue for climate adaptation.
- Critically reviews estimates of the global cost of adaptation (including the Bank's estimates)
- Critically reviews attempts, including WBG's, to quantify expenditure the adaptation content of projects.

d. Adaptation at the WBG

- Brief review of adaptation history at the WBG
- Adaptation in the Strategic Framework on Development and Climate Change
- Overview of adaptation programs at the Bank, including its role in Adaptation Fund, PPCR, etc

e. Evaluation goals, scope, and approach

- This is a learning-focused volume that does not attempt an encyclopedic overview of adaptation activity at the WBG
- Structure of the volume
- Evaluation questions
- Cross-cutting methodology questions

2. Adaptation analogs

*Topics marked with * draw heavily on past IEG evaluations*

a. Disaster risk management

- Optimally balancing prevention, warning, insurance, and recovery*
- Physical and behavioral interventions (seawalls, drains, mangroves, warning systems)*
- Exposure reduction via land use planning and zoning
- National level disaster insurance and risk management

b. Making agriculture more resilient

- Policy interventions (water pricing, allocation)*
- Physical interventions (irrigation)*
- Landscape management
- Innovative insurance for crops and livestock
- Seed development and extension (including *in situ* agrobiodiversity)

c. Conclusions: scope for and returns to adapting to today's climate variability

2.5 Interstitial chapter: Hydrometeorology data and services

- Uses of hydromet data for climate change adaptation
- Experience with support for hydromet data and institutions
- Global coordination and public good issues

3. Mainstreaming climate change into project design

- Which sectors and locations are most vulnerable
- Risk identification at the WBG: climate risks identified and not identified
- Review of limitations of information on future climate
- Case study: hydropower
- Case study: protected areas
- Climate risk management in private sector projects
- Conclusions

4. Planning for an unfamiliar future: building and using capacity to address climate change

- Assessing vulnerabilities at the sector and national level
- Building and exercising capacity
- Planning and policy reform
- Preparing for inexorable calamities: new climate change threats (glacial loss, Amazon dieback, coastal inundation, etc.)
- Summary

5. Adaptation under the Strategic Framework for Development and Climate Change

- Relevance of SFDCC goals

- Achievement of SFDC goals
- Review and suggestions on indicators and results framework

6. Conclusions and recommendations

- Key lessons for implementation
- Priority areas for action by the Bank Group
- Recommendations on monitoring and evaluation

Annex: country and regional case studies

Annex: Methodological notes, by chapter

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