THE ECONOMICS OF ADAPTATION TO CLIMATE CHANGE

Concept Note and Study Plan – 4/18/2008

FOREWORD

Current estimates of the cost of the impacts of climate change in developing countries and of the needed adaptation measures are in very short supply, and the available ones are rather crude. To a large extent this is because this is a very new research area and no agreed methodology exists to assess the economics of adaptation to climate change, particularly in the context of more limited data. An understanding of the full array of adaptation options and their costs and benefits including institutional and policy changes, and fostering of private sector and community-level engagement on adaptation, is crucial to facilitate prioritization of the most effective strategies at international, national, sectoral and local levels. In turn, estimates of the overall budget implications of the resulting 'climate resilient development' is essential to enable developing countries to implement their national strategies and plans and, in turn, to address implications for international assistance. In order to address some of these limitations, a partnership between the World Bank and the governments of the Netherlands and the UK was formed. It was agreed that the World Bank would lead on the technical aspects of the study, while the Netherlands and the UK would fund the exercise. In this sense, this study is not a standard World Bank product. There will be flexibility to enable other donors to engage in the study as it is developed.

I. Background

1. Climate change is now widely recognized as a man-made problem with significant long-term economic and social effects. The latest report of the Inter-governmental Panel on Climate Change (IPCC) concludes that human activities are almost certainly the primary cause of observed climate change. Addressing its causes and impacts has become an international priority.

2. While all regions will eventually experience the effects of climate change, the spreading effects will be disproportionate across and within developing countries – particularly on vulnerable and poor communities, notably women who play a traditional role in providing food, fuel and water – who have contributed least to the problem. Changes in climate will amplify the existing challenges posed by poverty and vulnerability, weak governance and institutions, adverse living conditions, heavy dependence on agriculture and natural resources, rapid population growth, and an overall limited capacity to cope with climate shocks, variability and change.

3. Climate change risks increasing inequality levels, if the right national and international policies are not put in place. According to the IPCC some impacts of climate change are already unavoidable and can only be addressed through adaptation. There is thus a pressing need to help inform decision makers on the benefits and costs of a full array of adaptation options available, from lower cost 'no-regrets' measures to future climate change specific infrastructure, to facilitate prioritization of the most effective strategies at national, sectoral and local levels without increasing distributional inequalities (spatial, environmental, and socio-economic), poverty indices and degree of vulnerability among income group and heterogeneous communities (differentiated by gender, ethnicity etc…). This in turn should also help to inform support provided by international partners, by reinforcing existing financing mechanisms as well as designing innovative adaptation financing instruments under the UNFCCC.

4. Demand for this type of analysis has been called for by governments from developing countries. This was most recently seen in the Bali Action Plan agreed in December 2007 where the

Conference of Parties will consider "financial and technical support for capacity-building in the assessment of the costs of adaptation in developing countries, in particular the most vulnerable ones, to aid in determining their financial needs". There are various country and regional analyses of the economics of climate change planned or underway, and it would be timely to build on these and other relevant initiatives to help generate more encompassing country analyses on the economics of adaptation.

5. Governments can play a pivotal role in addressing climate risks to their development goals, integrating adaptation measures within their national and sectoral plans. Policy-led or 'planned' adaptation[1] by governments plays an important role in providing incentives and tools to promote sustainable adaptation to climate change by households, communities and the private sector. While some adaptation will autonomously occur by private agents responding to changes in climate, government policies should aim to facilitate and further autonomous adaptation, including helping poor households avoiding mechanisms that increase their long-term vulnerability through provision of support (e.g. facilitate micro-credit, increase the allocation of social protection, create and/or strengthen redistribution mechanisms via public instruments, and provide new employment opportunities to avoid dependency).

6. The current estimates of the costs of adaptation in developing countries are rather crude and focus predominantly on the additional costs of including adaptation in current and future investments. These estimates are in the range of tens of billions of dollars per year. Despite admitted inaccuracies, they help provide a sense of the scale of the challenge ahead and the need for additional resources. However, they provide little support to governments in practical planning and understanding the financing requirements to implement climate resilient development plans and how to address institutional and policy changes, and fostering of private sector and household/community-level engagement on adaptation.

7. Developed countries have committed to support developing countries in achieving and sustaining the MDGs. As The Human Development Report emphasizes this will not be possible unless development is made climate resilient, which will entail an additional cost that the international community must help to meet, as recognized in both the Marrakesh Accords and the recent Bali Action Plan. Hence, developed countries have to cooperate closely with developing countries in sharing and developing knowledge on adaptation and facilitating implementation of adaptation strategies. More analysis on the benefits and costs of a portfolio of adaptation strategies is needed to support the prioritization and sequencing (simultaneous or successive) of actions at both national and local level, as well as the development of an effective and appropriate international response to the adverse impacts of climate change.

II. Study Objectives

8. The overall objective of this study is to help decision makers in developing countries to better understand and assess the risks posed by climate change and to better cost, prioritize, sequence and integrate robust adaptation strategies to their development plans and budgets in a context of high uncertainty, competing needs and potentially high future costs. In addition, it will

[1] According to the IPCC, adaptation is the "Adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished: (i) *Planned adaptation* – adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.; (ii) *Autonomous or spontaneous adaptation* – Adaptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems.

inform the international community's efforts, including UNFCCC and the Bali Action Plan, to provide access to adequate, predictable and sustainable support and to provide new and additional resources to help developing countries, in particular the most vulnerable, to meet the costs of adaptation. The focus of this work is on government led adaptation, encompassing responses ranging from planned activities such as public infrastructure investment, changes in regulation or social protection measures, to the allocation of budgets at the local government or community level where adaptation decisions will need to be taken.

9. The study is planned to improve technical knowledge on the economics of adaptation, presenting the costs and benefits of different adaptation options based on considerable effort to gather data and sound indicators for a range of countries and local-specific contexts and to develop and assess a range of methodologies for measuring, modeling and assessing adaptation. These objectives will be pursued through intense learning from field experience in the country case studies as well as robust analyses on the economic, social and environmental rationale and resource implications of adapting development and poverty reduction agendas to different scenarios of climate change. Work will also be done through a lens of capturing and enhancing private-sector and market-driven adaptation opportunities, including the potential role of innovative technologies. This technical research should feed into in-country processes and expertise to develop decision-making support tools.

10. The study will attempt to identify broadly the roles, responsibilities and capacity development needs of different actors (individuals, civil society, private sector, government) and how they interact in implementing different options at different levels (community, local, provincial, regional, national, global). This should also shed light on the heterogeneous responses from individual actors and social groups, including measures that can have a leveraging function on autonomous adaptation by providing the tools, incentives and, in some cases, finances to adapt.

11. The six specific objectives of the study are to:

(i) Identify and evaluate the expected impacts of climate change in developing countries at different levels under different climate change scenarios and assess and measure the implied major social, environmental and economic impacts (including, when feasible, non-monetary);

(ii) Collate case studies of best practice in adaptation projects, programs and policy design, including community driven development, and finance on adaptation, and lessons learned from less successful experiences;

(iii) Identify plausible adaptation pathways in different countries and disaggregated contexts within countries, assess their social, environmental and economic returns, and their ranking in terms of cost-effectiveness and robustness to uncertain climate scenarios as well as possible trade-offs between economic, environmental and social priorities;

(iv) Better understand the resource implications of adapting development plans, in particular in more climate sensitive sectors and livelihood systems;

(v) Integrate the analyses of the efficient and effective adaptation options into decision making support tools eventually being used in developing countries to ensure climate resilient growth, paying particular attention to the eventual unequal distribution of costs and benefits among different social groups, as well as macroeconomic and social priorities within countries.

(vi) Inform the development of effective international financial mechanisms for adaptation by providing better estimates of aggregated costs and benefits of adaptation in all developing countries.

12. To achieve the study objectives two phases are planned, the first informing and guiding the second. During Phase 1 a working methodology will be developed and the scope of the analysis to be used in Phase 2 will be defined. This Phase of the study will include a literature review and the assessment and identification of what the key methodological and research questions are to support this study, and the mapping out of variables that i) ideally and ii) practically can be included in economic analyses of this type.

13. Phase I of the study will also include the scoping required for country case selection and production of reviews of the context and rationale for country choices. The country case studies will be selected based on overall vulnerability to major climate change impacts, and differing social, economic, and environmental conditions[2] - see Annex. Country interest and buy-in at high government level will be fundamental to selecting the case studies[3]. This phase will also involve extensive consultations and partnerships, including with a related international effort to examine the costs and benefits of disaster risk reduction.

14. The objective of the second phase is to undertake the research and analysis at the country level, drawing on both new research in the six country-specific case studies and existing evidence in other developing countries. These country studies will be developed by local institutions and experts with support and guidance from the study team. Based on the identification of a wide range of adaptation options, prospective micro (bottom-up) and macro (top-down), national, sectoral and local levels of analyses are planned to generate country-specific estimates and inform national and global adaptation assessments. Adaptation options will focus particularly on poor people and those most vulnerable to climatic changes, and thus most dependent on public assistance, disaggregated into groups according to e.g. their access to resources, vulnerability etc. This requires a combination of measures that provide direct support at the local level, coupled with ensuring the resilience of the economy as a whole which is important to the adaptive capacity of poor people. For example, through provision of employment or to ensure sustained investment in wider social services and public infrastructure, themselves essential to the adaptive capacity of poor people. Identifying ways in which to capture these two essential priorities within a government's decision making process is a key objective for this study.

15. Information systematically organized and newly generated from this study will serve to deepen and focus the current debate on adaptation to climate change. Findings will be disseminated to decision makers and the public at large. A detailed communication and dissemination strategy will be worked up within the first month of the research program to ensure engagement and demand among decision makers, and to identify opportunities to maximize the impact of the study.

III. Methodology

16. In order to achieve the stated objectives of this study, a seven-pillar strategy is envisaged. These pillars are presented as a rough guide which may be modified accordingly as more information is obtained from initial country level analyses, and discussions held identifying the details of the work:

- **Identification of the key concepts and variables that need to be included in an assessment of climate change impacts and adaptation options;** assessment of data/knowledge requirements;

[2] It is also important to have a solid body of available country knowledge/information, empirically grounded, longitudinal research on how households/communities have coped with climate-related hazards in the past.

[3] A provisional short-list of countries includes: Ghana, Ethiopia, Mozambique, South Africa, India, Bangladesh, Nepal, Vietnam, Bolivia, Peru, Grenada, Tuvalu or the Maldives. Based on expected costs and budget availability, 6 countries will be selected.

development of a framework for grouping variables and accounting for linkages between them; and scoping of methods to best address the research questions.

- **Identification and quantification of the expected damage of different scenarios of climate change and their respective costs (and possible benefits) in the absence of planned adaptation.** Work here will include evaluating the expected impacts of climate change at the local level (including non-monetized goods and services and distribution of these impacts), sectoral and macro economy level, what autonomous adaptation actions are expected naturally to occur, and what are the risks of autonomous and planned adaptation increasing vulnerability through externalities and/or socially sub-optimal responses[4].

- **Identification of a range of feasible adaptation actions.** Even though households, communities, sectors and most national governments have previously had to deal with climate (and non-climate) shocks and variations, knowledge on the various types of responses by different groups is scattered. Potential adaptation measures in both private and public sector will need to be considered for each sectoral impact under different projected climate scenarios, from awareness raising to infrastructure, from spontaneous to planned, from low cost to high cost, from urgent to long-term. This will start with a comprehensive literature review, and will also be the focus of the initial field work in the six case study countries. An important part will be to identify the process through which such actions and strategies are planned and implemented in terms of participation of various stakeholders. New research may be undertaken to help address some of the key gaps in adaptation knowledge, and may include household level analyses.

  Assessment of the different adaptation strategies through cost-benefit analyses[5] considering economic, social and environmental perspectives. Data permitting, this will include adaptation responses in the non-monetary economy (e.g. services from non-timber forest products through to the provision of food and water and healthcare services in the 'reproductive economy', the primary focus of unpaid work by women). In specific contexts and where data permit, a Household Economy Approach, as currently used in the food security agenda, may be used to better understand the impacts and costs of climate stress at the household level. The analysis will also try to identify and evidence key vulnerabilities emanating from various systems (markets, societal, ecosystems, geophysical), and to what extent they have different degrees of adaptive capacity based on risk, exposure and hazard factors. Results from this interaction between physical impacts and vulnerabilities in systems will reveal the ones that are the most affected and then provide insights on how to prioritize the adaptation options depending also on their degree of regrets (no, low or high regrets). For instance, insurance catastrophe models incorporate risks measurement, hazards, and potential adaptation responses, particularly in the agricultural sector.

- **Impact evaluation of adaptation policies – microeconomic, macroeconomic and integrated approaches – and comparative analysis of relative value of various modeling approaches in assessing cost-effective adaptation.** As part of the methodology development, identification and

[4] Typical examples maybe increased use of irrigation water, which may deplete the water source, or migration to areas with inadequate infrastructure, which may lead to congestion and worse health outcomes; or actions by households to liquidate or dispose of key assets (e.g. land, livestock, trees and other forms of natural capital) in the absence of appropriate public action on social protection and insurance.

[5] From an economic perspective, standard benefit-cost analysis based on expected utility will be greatly impaired by the high degree of uncertainty. As suggested by Weitzman (2007), "In principle, the impact of an uncertain scale of damages on cost-benefit analysis outweighs the impact of discounting". This simply puts a question mark on the appropriateness of expected discounted utility – and benefit-cost analysis to evaluate alternative actions and their timing. Another challenge is how to incorporate potential future losses into current planning and decision-making activity. Also, putting economic values to many assets and services is controversial and difficult to be done.

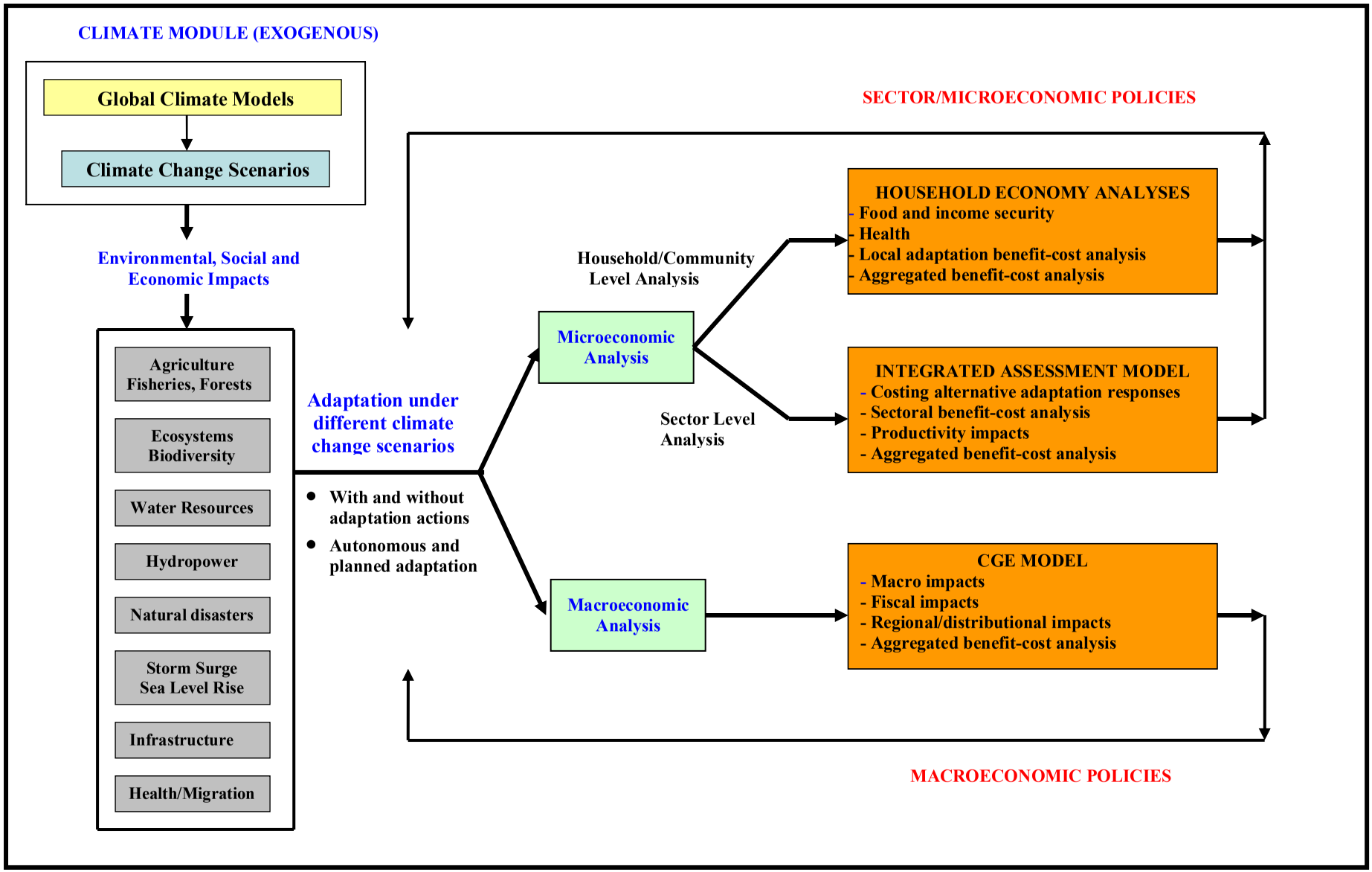
costing of local adaptation measures will be scaled-up to represent realistic adaptation responses of sectors at a more aggregate level. Integrated assessment models (combining climate and economic models) will then be used to analyze the microeconomics of the expected sectoral impacts of climate change and alternative adaptation responses. Data allowing, this will be made at a more disaggregate level, accounting for regional social and cultural differences.

- **A Macroeconomic analysis will be made to allow for a better understanding of the potential sectoral interactions of different adaptation responses**, ensuring the consistency of the sectoral and household level analysis. National computable general equilibrium (CGE) models will be used to do such macroeconomic analysis that will also try to capture the multiplier effect of a combination of measures resulting from market forces and the implications for economic growth. Given the large uncertainties involved, relatively crude assumptions may be required, and option- and sector-based analyses will have to be continually developed in Phases I and II – Diagram 1.
- **Integrating with broader development policies.** Throughout the research study generic lessons and approaches will be drawn from the methodologies and analytical work that are identified, developed and assessed, and serve as input to existing government development policies. This will require identification of appropriate entry points into such existing processes, and working with others to help turn the methodologies developed as part of this research study into more user-friendly tools that are not too complex in their construction or data requirements. This will need to be supported by scaled up efforts to enhance national awareness and technical capacity to measure and integrate adaptation benefits and costs into decision-making frameworks, and inform national planning and budgeting processes. This capacity development role will not be undertaken by the research team directly but will represent a contribution to parallel work by partner organizations.
- **Development of approaches for aggregating study findings, and scaling up the results beyond the six case study countries.**

18. The research study will consider impacts and adaptation responses for a range of temperature and rainfall scenarios and range of time frames. The study will reflect the adaptation measures that are essential in order to manage the risk of climate impacts to which we are already committed, through to the risk and cost of (mitigation) inaction and benefits and costs of feasible adaptation measures to manage these projected climate impacts.

19. The study will aim to gather evidence on costs and benefits of adaptation options in a context of large uncertainty. Disasters are happening promptly and often abruptly, so the assumption of imperfect information and unpredictability of the environment make the mechanisms of rational decisions and actions difficult. Conducting a risk management approach takes into account these complexities and interactions, and evaluates the impacts of climate change and the effects of adaptation options resulting from decisions of agents under uncertainty. Using a set of explicit assumptions, likely at the sectoral level, the study will scale up the results for the six case-study countries to become representative for a wider range of developing countries thus informing discussions on international financing mechanisms for adaptation, including under the UNFCCC and the Bali Plan of Action.

DIAGRAM 1 – MAIN STUDY BLOCKS AND INTERACTIONS



20. The key issues and challenges to be addressed in the methodology development include:

- Explicitly dealing with increased climate variability and changes in trends
- Addressing major knowledge gaps, uncertainty and country-level data limitation
- Linking proposed adaptation options to development actions
- Explicitly incorporating distributional impacts & disaggregating groups of people most vulnerable and exposed to climate impacts
- Phasing in adaptation measures
- Linking different levels of analyses – bottom-up and top-down
- Recognizing institutional and cultural issues
- Explicitly incorporating technological progress
- Adjusting discount rates compatible with climate change
- Establishing a practical time horizon
- Quantifying and incorporating the residual impacts in the analyses
- Incorporating the value of ecosystems services and of biodiversity
- Explicitly identifying the respective roles of public and private sectors
- Incorporating value of work in unpaid economy, especially women involved in providing food, fuel, water and care

Phase 1: <u>Development of a working methodology, identification of, and agreement with case-study countries, and scoping/partnership with other relevant research</u>

21. In this phase the identification of sources of information, and development and/or modification of appropriate methodologies and models to capture climate change impacts and adaptation responses will be developed. The phase consists of seven main activities:

- Comprehensive and detailed literature review (desk-based and consultation), drawing wherever possible on longitudinal, ethnographic studies of household and community-level responses and adaptation strategies in the face of climate hazards in the past
- Broad consultation process with relevant institutions and scoping of complementary work already undertaken or underway, and establishment of partnerships, within and outside the Bank
- Identification of the six case-study countries through a highly consultative process, and based on key criteria such as susceptibility to drought, flood, storm, sea level rise, importance of agriculture to livelihoods, geographic and economic conditions
- Analysis of country institutional capacity to identify potential study partnerships and identification of bottlenecks for targeted support
- Collection and rough analysis of readily available country data to produce preliminary results for the special purpose of guiding the second phase, identification of knowledge gap in terms of country statistical tools, and potential development of additional data for further analytical and result-based instruments to be used in the next step.
- Development of a "toolkit" of appropriate methodologies and models for use by the case-study country teams
- Design of communication strategy, including dissemination and use of outputs

22. Phase 1 will include scoping of options (specific investments, policy changes, technology development, risk transfer/sharing mechanisms, others); **theoretical advancement** (to better capture more complex issues associated with climate change, such as carbon fertilization, technology progress, etc); **and economic, social, and environmental analysis** (collection and analysis of available quantitative data

and participatory measures in the six country case studies). Theoretical and analytic work will run in tandem, building on the advancements of each.

Phase 2: <u>Implementation of reviewed and developed methodologies to derive economic estimates of the benefits and costs of adaptation and, in turn, prioritized and costed climate resilient national development strategies</u>

23. This phase needs to be further developed, but here various options of translating the most promising research methodologies into products that developing countries can use to assess the relative merits of the various adaptation options will be pursued. This effort will be conducted in close collaboration with potential users in developing countries as well as a wider team of development partners. Capacity building through technical assistance and training will eventually be an integral component of this work, although not an objective to be specifically lead by the core study team.

24. Adaptation measures will be classified according to the robustness to different climate scenarios (based on climate information science as well as assessment of current exposure, vulnerability, and resilience in systems) to the level of 'economic regrets' they generate: a) 'no-regrets' – measures that make (social, economic and environmental) sense even in the absence of climate change; b) 'low-regrets': measures that are justified by climate change but with a relatively low marginal cost e.g. changing infrastructure design prior to construction (versus retrofitting); and c) 'high-regrets': measures that might be essential but are optimal for only a small number of climate scenarios. Then, identification of the agents (society and economy) and sectors most likely to be affected will be drawn from this assessment.

25. A review of more specific government instruments is further required to assess to what extent policies that support adaptation to climate change are efficient particularly in assisting countries to build resilience. Strategies can differ and may require for instance, provision of institutional infrastructure (agriculture extension services, insurance market); public expenditure in coastal protection, flood control, disaster services, subsidized disaster insurance, water services, as well as building human development adaptive capacity throughout public expenditures in education, health, and so forth. Other areas of public policy interventions aiming at reducing vulnerability could rely on substantial investment programs; subventions in sectors sensitive to climate-threats (agriculture, water); targeted transfers to compensate income losses for farmers or more vulnerable groups. These instruments can potentially be implemented to bring the greatest benefits to the economy as a whole, as well as for individuals and vulnerable groups.

<u>Sector Perspectives</u>

26. This study will focus on the most climate sensitive sectors and themes – hydrology and water resources, agriculture, human health and health systems, natural disasters, sea level rise and impacts on coastal and urban areas, and other country specific issues of significant concern. The analysis will be aggregated within the six country case studies in order to generate a better understanding of possible adaptation needs and financial requirements at a national level. The relevance and focus of different sectors will vary between the case studies. Sectoral analysis will also be undertaken and aggregated using existing evidence for a wider range of developing countries. The exact analytical approach will be decided after an extensive review of the existing literature. Sectoral analyses will explicitly capture impacts and costs related to the poor, particularly including female-headed households.

27. Given the peculiarities of every individual country, not all problems are equally relevant and significant in each case. The proposed note does not include important issues such as forestry,

biodiversity and ecosystems, fisheries, human migration, and others which may be of primary importance in specific contexts. Phase 1 of the study will also include a proposed methodology for addressing some of these additional problems which should be tailored to, and based on, existing local efforts and initiatives in the respective sector.

IV. Budget, Timetable and Organizational Structure

28. The study is to be fully funded by the Dutch and the British Governments, with lead responsibility by the World Bank (ENV and DEC). A total budget of €4.4 million is set aside for this research study over a 2 year period. This consists of: €100,000 for pre-launch, €500,000 for Phase 1 for a period of ± 6 months (together they represent ≈ $ 900,000), and €3.5–4.0 million for Phase 2 for a period of 18 months. There will be flexibility to extend the program if other donors express an interest to participate in this work going forward, and if deemed necessary. However, regardless of changes in planning and scope, the final report for the main body of the assessment will be released in October 2009, ahead of UNFCCC COP-15 in Copenhagen.

Timetable and milestones of Phase I

Concept note review meeting	12/04/2007
Formal study launch	12/11/2007
1st Chair/Panel Meeting	05/31/2008
Identification of countries and local institutions	05/31/2008
Overall methodological approach partial report	05/31/2008
First consolidated draft	06/15/2008
2nd Chair Meeting	06/15/2008
Completion of 1st phase	06/30/2008

Tentative timetable and milestones of Phase II

TORs and contracts with 6 country cases signed	July 08
1st Country Cases Workshop	August 08
1st Country Case drafts	December 08
2nd country case workshop	February 09
First consolidated draft	August 09
Consultations and Reviews	September 09
3rd Chair review	September 09
Final Report	October 09
Dissemination and follow-up	Until March 10

Organizational Structure

29. An Advisory and Review Panel will provide the leadership and credibility for the work. It will advise on direction and approach for the overall study, and review findings on a bi-annual basis. The Review Panel consists of three very senior development and climate change economists. It will be chaired by a high-level development figure. Panel members are expected to interact more directly with the Research Team.

30. The **Research Team,** based in the World Bank (ENV), will be comprised of economists, a social development adviser, an environment adviser and sectoral experts from the World Bank and research institutions in developed and developing countries. Other organizations may join the Study in separate collaboration arrangements to be defined upon completion of Phase I.

31. A **Steering Committee** comprised of donors (UK and The Netherlands governments), the World Bank, governments of the six country case studies, and civil society representation who will undertake overall oversight of study progress, including reviewing and advising on technical aspects of the study, dissemination, and promotion aspects. On the Bank side, SDN will represent the Bank in this function, serving as focal point for communications with donors (ENV Director).

33. In addition to these formal oversight structures, the consultations are an integral part of the study and an important source of inputs and feedback.

ANNEX – Brief Note on Country Selection Criteria

According to our concept note, "country case studies will be selected based on overall vulnerability to major climate change impacts, differing environmental, social, and economic conditions, and adequate data at the national level. A provisional short-list of countries includes:

- Full analysis (i.e. all sector up to CGE): Ethiopia, Mozambique, Vietnam, Ghana, India (two states), and Peru.
- Others countries will be partially analyzed such as Brazil (ongoing); the Maldives (Tourism, Seal level rise, extreme events) and Bangladesh (extreme events).

Country interest and buy-in at high government level will be fundamental to identifying which countries are selected as case studies. Based on the country case studies, adaptation options will pay particular attention to the poor, the most vulnerable to climatic changes and consequently dependant on assistance."

As in most analyses requiring the selection of case studies, it is difficult to *ex ante* identify the most suitable candidates. This is because the key objective of the study is precisely to identify vulnerabilities and analyze how developing countries could address the potential climate threats to which they are exposed to, and extract lessons to be replicated in other contexts. There will inevitably be some degree of *a priori* judgment as to what the most illustrative cases are likely to be.

In terms of the physical impacts, the table below shows some of the most vulnerable developing countries according to different impacts (according to the IPCC).

Six Climate Threats: Top 12 Countries Most at Risk from Each

Drought	*Flood*	*Storm*	*Coastal 1m*	*Coastal 5m*	*Agriculture*
Malawi	Bangladesh	Philippines	All low-lying Island States	All low-lying Island States	Sudan
Ethiopia	China	Bangladesh	Vietnam	Netherlands	Senegal
Zimbabwe	India	Madagascar	Egypt	Japan	Zimbabwe
India	Cambodia	Vietnam	Tunisia	Bangladesh	Mali
Mozambique	Mozambique	Moldova	Indonesia	Philippines	Zambia
Niger	Laos	Mongolia	Mauritania	Egypt	Morocco
Mauritania	Pakistan	Haiti	China	Brazil	Niger
Eritrea	Sri Lanka	Samoa	Mexico	Venezuela	India
Sudan	Thailand	Tonga	Myanmar	Senegal	Malawi
Chad	Vietnam	China	Bangladesh	Fiji	Algeria
Kenya	Benin	Honduras	Senegal	Vietnam	Ethiopia
Iran	Rwanda	Fiji	Libya	Denmark	Pakistan

Source: *Bank Staff calculations, presented at the Bali Breakfast by President Zoellick, April 2008.*

It would also be valuable for the study to depict a representative spectrum of countries based on the diversity of continents, size, population and income level of the country, as well as richness of data and local capacity to work with the core team to apply the proposed methodology in the country. Since there are far more criteria than countries to be selected (in addition to these there are health, biodiversity, distributive issues, migration, and many other), we have to select countries fulfilling most criteria possible, balancing the number with the severity of the different criteria (for example, a country might be

moderately vulnerable to 4-5 main criteria and another be severely vulnerable to 2). The crucial political buy-in would be identified as the team eventually approaches different countries, although even here there is also some preliminary information as to the most likely candidates.

Initially, therefore, the team proposes to begin with a list of 12 countries and decide on a final list of 6 based on the political interest eventually shown. The proposed initial list is thus (ranked in decreasing priority):

Africa (3): Mozambique, Ethiopia, Malawi, Ghana (most criteria, very poor)
South Asia (1-2): Bangladesh (most criteria, very poor), India (most criteria, large country)
East Asia (1-2): Vietnam, Philippines (most criteria), Indonesia (same + large country)
Latin America (1): Peru, Colombia (glacier countries + coastal), Bolivia (glacier, very poor)
Small Island country (1): The Maldives, one East Pacific Island or a Caribbean Island