Climate Investment Funds

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THE SELECTION OF COUNTRIES TO PARTICIPATE IN THE PILOT PROGRAM FOR CLIMATE RESILIENCE (PPCR)

Report of the Expert Group to the Subcommittee of the PPCR

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ACKNOWLEDGEMENTS

We wish to acknowledge the substantial volume of information and support provided to us. While we have made good use of much of it, we also wish to record that due to the extreme time constraints under which this work has been completed, the Expert Group has been unable to fully digest all the information provided. Details of the support and advice provided are as follows:

Three members of the Expert Group participated in the COP 14 meetings in Poznan, Poland (December 1st – 14th 2008) where they held three consecutive briefing and consultation sessions for Parties and other stakeholder organisations. In addition, representatives of many countries and organizations were consulted on an individual basis. We acknowledge all those who gave time to this process. A report on all consultations undertaken by the Expert Group in Poznan can be found in Annex 4.

We also wish to acknowledge the support of the World Bank PPCR Team, and the very useful inputs from World Bank regional and programme experts, the African Development Bank, the Asian Development Bank and the Inter American Development Bank. Other inputs from bilateral donors are also gratefully acknowledged.

The members of the Expert Group also wish to express their thanks to Jessica Ayers of the International Institute for Environment and Development who provided assistance at the Poznan briefing sessions and for the Washington meeting. Jessica played a major role in assembling draft sections of the report and in helping to edit them for style and internal consistency. Her assistance has been invaluable.

EXECUTIVE SUMMARY

The TOR of the Expert Group (EG) (presented in Annex 3) requested the selection of 5 to 10 countries to participate in the Pilot Program for Climate Resilience (PPCR). For each of the countries selected, the possibility was suggested of also nominating an alternate. In addition the Expert Group was advised that one or more of the 10 "countries" could in fact consist of a number of countries or a regional group.

The methodology adopted by the EG was to employ a risk assessment framework to guide country selection, using exposure to climate change hazards as an entry point to identify regional climate change "hot-spots". Quantitative indicators and expert judgement were then employed to identify high-risk countries within these regions, while also considering criteria such as country preparedness. This approach draws upon the main strengths and expertise of the EG, and allows countries to be selected in a very short timescale, and in a coherent and transparent manner.

Ten cases have been selected. Seven are single countries: Bangladesh, Bolivia, Nepal, Niger, Mauritania, Tajikistan, and Zambia. For the remaining three cases, no single country is proposed and regional groups are suggested for the Caribbean (Guyana, Dominica, and Haiti) with the possibility of adding others; for the Pacific island region, the EG has been unable to identify specific island countries to be included. The third regional group consists of Cambodia, Vietnam and the Philippines, (the Southeast Asia group). In recognition of the under-representation of African LDCs in this selection, the EG propose that Mozambique could be selected as an optional addition or alternative to any of the above countries.

Table I below lists the ten priority selections and where appropriate the alternatives. The third column includes some suggestions for regional groupings.

	Country (region)	Alternate	Regional Approach
1	(Caribbean region). No single choice is made and a regional group is recommended. First choice countries: Guyana, Dominica, Haiti and possibly others.		
2	(Pacific Small Island region). The Expert Group considers that this region should be included in the PPCR but has not been able to specify or select a small group of countries.		
3	Bolivia (S. America Andean)	Peru	Bolivia, Peru, Columbia, and Ecuador could be formed into a regional group.
4	Bangladesh (South Asia)	India	A regional group could be created to include Bangladesh, Nepal, Bhutan, India and the Maldives, but is not recommended.
5	Nepal (South Asia)	Bhutan	Nepal and Bhutan could be formed into a regional group.
6	Cambodia, Vietnam and Philippines as a regional group (Southeast Asia group).		
7	Tajikistan (Central Asia)	Uzbekistan	A regional group focused on Tajikistan and Uzbekistan might also include some involvement from Turkmenistan, the Kyrgyz Republic and Kazakhstan given the broadly similar climate issues faced by these countries.
8	Mauritania (North Africa)	Morocco	No regional group proposed.
9	Zambia (Southern Africa)	Angola	No regional group proposed.
10	Niger (Sahel)	Chad	A regional group consisting of Niger plus Chad, Mali and/or northern Sudan could be created given the similar climatic and development issues across these countries, if this is logistically feasible.
Optional additional countries to increase representation of African LDCs (majority of LDCs). May be selected in addition to, or instead of one or more of, above countries (1-10).			
11	Mozambique (African LDCs)	Ethiopia, Sierra Leone	No regional group proposed.

Table II below shows the breakdown of the priority list of ten countries by development category and by climate change risk:

Least Developed Countries (LDCs)	**Small Island Developing States (SIDS)**
Bolivia	Caribbean Selection
Bangladesh	Pacific Selection
Nepal	**Coastal zone and sea-level rise**
Cambodia	Bangladesh
Zambia	Caribbean region
Mauritania	Pacific region
Mozambique	Southeast Asia group
Niger	
Haiti	
Mountain Region (snow and ice melt, with water supply, ecological zone and other consequences)	**Drought risk and water availability.** Zambia
Bolivia	Mauritania
Nepal	Niger
Floods	
Bangladesh	
Cambodia	
Vietnam	
Guyana	
Philippines	
Nepal	

1. PREFACE AND INTRODUCTION

This report has been prepared by an Expert Group (EG) established by the sub-committee responsible for the Pilot Programme on Climate Resilience (PPCR-SC). The PPCR is a component of the Climate Investment Funds established by the World Bank with voluntary trust fund contributions from donor countries.

The membership of the PPCR Expert Group is as follows:

1. Suggested Area of Expertise: Climate Scientist/Climatologist
Nick Brooks, Independent climate change consultant and Visiting Research Fellow, University of East Anglia, U.K
2. Suggested Area of Expertise: Development/Climate Change Policy Specialist
Nobuo Mimura, Director, Institute of Global Change Adaptations Science, Ibaraki University and Vice President Extraordinary, Ibaraki University, Japan
3. Suggested Area of Expertise: Economist
Shardul Agrawala, Principal Economist, Climate Change, OECD, France
4. Suggested Area of Expertise: Environmental Specialist
Leonard Nurse, Senior Lecturer, Centre for Resource Management and Environmental Studies, (CERMES) Faculty of Pure and Applied Sciences, Cave Hill Campus, Barbados
5. Suggested Area of Expertise: Governance and Institutions
Ian Burton, Scientist Emeritus position with Environment Canada and Emeritus Professor with the University of Toronto, Canada / U.K.
6. Suggested Area of Expertise: Rural Development Specialist
Saleemul Huq, Director of the climate change programme at the International Institute for Environment and Development (IIED), Bangladesh / U.K
7. Suggested Area of Expertise: Social Development Specialist
Rosa Perez, Project Leader, Ayala Foundation, and Project Leader, International Development Research Centre (IDRC) of Canada through the Environment and Economy of Southeast Asia Program (EEPSEA), with PAGASA, Philippines
8. Suggested Area of Expertise: Natural Resource Management Specialist
Balgis Osman-Elasha, Senior Researcher, Higher Council for Environment & Natural Resources (HCENR), Sudan

The EG was requested to provide advice to the sub-committee on the selection of countries to be included in the PPCR by January 20th 2009. The full Terms of Reference for the Expert Group are provided in Annex 3. Work began with the first conference call of the EG on November 25th. The EG has therefore worked under extreme time constraints, and as such it has not been possible to carry out an in-depth selection process. While we have completed the task assigned to us in the time allotted, outcomes have been constrained both by these time constraints and by the limitations of the approach adopted by the PPCR-SC, including:

- *Top-down selection vs demand-led selection*

Doing a top-down (or even expert judgment-based) selection as opposed to a demand led selection process poses problems of inclusion/exclusion of countries that will seem arbitrary and open to challenge (e.g. another group of experts might come up with a different list of priority countries). The delay of demand driven activities until after the country selection also opens the process up to the danger of a lack of sufficient country ownership and buy-in.

- *Data availability and expertise of Expert Group members*

The TORs for the Expert Group require the selection and recommendation of up to 10 countries (with alternates) based on a set of eight questions/criteria (see Annex 3 for full TOR). However, some of the questions/criteria are more amenable to analysis (e.g. related to climate change hazards and vulnerability), and lie more within the expertise of the Expert Group members than others (such as country capabilities). These latter criteria required consultation and reliance on other, subjective, sources of information and advice. Thus the recommendations of the EG are based to a large extent on expert judgment supported by data, rather than the product of a data-driven approach. The data used to support the country selection process were selected on the basis of expert judgment combined with considerations of data availability, and the limitations of the datasets employed must be acknowledged.

The consultation process undertaken by the EG (see Annex 4) also highlighted a number of issues we recommend the PPCR-SC take into account when considering the conclusions of the EG:

- The trade-off between "country capability" and vulnerability is problematic: A focus on the former will favour a relatively small set of countries with high capability at the expense of many highly vulnerable countries with low capability, further marginalising the most vulnerable countries and populations.
- Tradeoffs between considering countries vs communities/sectors/sub-regions within countries: For some (e.g. small island) countries the climate change problem may indeed represent an "existential threat" to the entire population of the country, while for others (e.g. larger countries) the threat of climate change impacts may not be country-wide but might nevertheless affect a large population within a sector/state/sub-region of that country. Treating each country as equal may favour smaller countries with a high percentage of their population exposed/vulnerable to climate change, at the expense of large vulnerable populations within some larger countries.

Given these caveats, the EG has done its best to adhere to its terms of reference (TOR) from the sub-committee, to provide selection of countries based on the questions/criteria listed in the TOR. However, we suggest that the PPCR-SC consider the possibility of adopting a more demand-driven and participatory approach, which is possible without creating undue complexity and delay. Such an approach could be guided/supported by the findings of the EG, which provides a broad risk assessment within which some of the countries and regions likely to be most at risk from climate change have been identified.

We also recommend that the PPCR-SC acknowledge that the experience of most developing countries that have received external funding on climate change adaptation so far has been mostly at the planning (e.g. for NAPAs), or at project level (see box 1, Annex 2). There is still little experience of scaling up to programmatic or strategic levels of action (with some exceptions). Thus, it may require considerable capacity development within each candidate country to scale up experience from planning or projects to programme or strategic level action.

2. METHODOLGICAL APPROACH

"Not everything that can be counted counts, and not everything that counts can be counted"

\- Albert Einstein

The approach to country selection adopted by the EG was driven by considerations of climate change risks. The framework employed was one in which risk at the country level is viewed as resulting from the combination of (i) a country's exposure to long-term, large-scale climate change hazards with the potential to have systemic adverse impacts at the country level, and (ii) a country's underlying vulnerability to these hazards. This approach led to a two-stage risk assessment process. Each of these stages is outlined below.

2.1 The screening process

Stage 1: Identification of regions

The first stage in the selection process involved the screening of continental-scale regions in order to identify climate change "hot-spots": regions at the sub-continental scale where exposure to key large-scale, long-term climate change hazards is high. This selection was based on a combination of climate projections from the IPCCP AR4 (Christensen et al., 2007) and expert judgment, with certain regions being associated with certain systemic hazards. For example, within Africa; North Africa and the Maghreb, and southern Africa, stand out in climate change projections as having extremely high exposure to long-term desiccation associated with higher temperatures and reduced rainfall, whereas the key long-term hazard for Southeast Asia is likely to be sea-level rise and changes in tropical cyclones.

These long-term, systemic hazards will also be associated with a number of "secondary" hazards, meaning that this approach implicitly considers a variety of climate hazards associated with variability and extremes[1]. For example, sea-level rise will be associated with enhanced risks from cyclones, storm surges, erosion, flooding, and saltwater intrusion. Long-term climatic desiccation driven by higher temperatures and reduced rainfall will be associated with increased drought risk, more frequent and severe heat waves, as well as elevated risks from other hazards such as flash flooding and wildfires, and changes in the distribution and prevalence of certain types of pests and diseases.

Once regions had been selected, the countries situated wholly or partly in those regions were identified to provide regional country groupings.

The regional "hot-spots" selected as a result of this geographical screening on the basis of considerations of climate change hazards are listed below. Countries in each regional group are identified in the relevant regional sections.

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[1] The distribution, nature and severity of hazards associated with climate extremes and short-term variability will be different in the future. Such extremes generally cannot be represented in climate models, meaning that an assessment of such hazards in the future is impractical (although the behaviour of some of these hazards might be inferred through statistical studies which are outside the scope of this assessment). A focus on large-scale hazards associated with long-term changes in mean conditions therefore represents the most reliable and practical means of assessing hazards associated with future *climate change*, rather than historical climate variability.

1. The Caribbean
2. The Pacific
3. South America: Andean Region
4. South Asia
5. Southeast Asia
6. Central Asia
7. North Africa/Maghreb
8. Southern Africa
9. The Sahel

Stage 2: Selection of countries from within regions

The second stage involved screening countries within the sub-continental scale regions selected in Stage 1, on the basis of vulnerability as represented by a number of key indicators. Countries in regions with high exposure which scored high in terms of various measures of vulnerability (represented by indicators as discussed below and in Annex 1) were defined as potentially "high-risk". One or more countries deemed to be at "highest risk" within each region, on the basis of their combined exposure to climate change hazards and their underlying vulnerability, were then selected. At this stage other criteria such as eligibility and country preparedness were also considered. The outcome of this analysis was a set of countries exhibiting a combination of high exposure to climate change hazards, high underlying vulnerability to these hazards, and a degree of preparedness that should enable donor-funded resilience building measures to be pursued with a high probability of success.

2.2 Selection and application of indicators

A general discussion of the use of indicators is provided in Annex 1, along with a full description of the indicators used in this analysis. A summary of these indicators is provided below in Box 2. Indicators were selected as far as possible to be specifically relevant to climate change hazards and risks, and represent a combination of exposure, sensitivity and adaptive capacity as assessed at the national level. An indicator for country preparedness was also employed. A number of widely available indicators of "vulnerability to climate change" were not used in this study, as they did not capture the aspects of vulnerability pertinent to this study. Many of these indicators pay little attention to how climate change may manifest itself, and are based on variables whose reliability as indicators of vulnerability to or risk associated with climate change remains unproven. A fuller discussion of these indicators and their shortcomings is presented in Annex 1.

While indicators were selected for their relevance to the contexts represented in this study, it was not possible to select climate-specific indicators to represent all aspects of vulnerability. The shortcomings of universal, national-level indicators that by their very nature cannot capture context-specific aspects of vulnerability must be recognised. This problem might be alleviated somewhat by the construction of indicators specifically designed to address certain elements of vulnerability to the types of climate change hazard identified in Stage 1. However, such indicators are not currently available, and the development of new indicators is time and resource intensive, and was not practical in the timescale under which the EG was operating. These shortcomings (discussed in more detail in Annex 1) constitute a key reason for using a combination of quantitative indicators and expert judgment, rather than a purely indicator-driven approach.

Not all indicators selected for use in this study were used to assess vulnerability in each region. Instead, a subset of indicators that were deemed appropriate to the geographical, developmental and hazard contexts of each region were employed. To a certain extent this approach addresses the problems associated with the use of generic, "universal" indicators. For example, where the principal regional climate risks were associated with long-term desiccation, water stress and potential knock-on effects on food production, indicators relating to water and food security were emphasised. Where sea-level rise and associated coastal risks were paramount, indicators relating to exposure populations in the low-lying coastal zone were emphasised. The indicators used for each region are listed in the regional assessments in the results section (section 3). .

Box 2: Indicators used to assess vulnerability and country preparedness

- **LECZ**: % population in low elevation coastal zone, from CIESIN GRUMP dataset (proxy for exposure of country to sea-level rise and related hazards)
- **IWS**: % population with access to improved water source, from 2007 HDR (proxy for vulnerability to reduced water availability)
- **CVI**: Climate Vulnerability Index, developed by University of Oxford to combine considerations of water-related vulnerability with geographically specific contextual information (proxy for vulnerability to climate change impacts on water availability and related factors, broader in scope than the IWS)
- **FI**: % population undernourished, from 2007 HDR (proxy for vulnerability to food insecurity resulting from climate change hazards such as climatic desiccation, transient extremes, loss of agricultural land)
- **HDI**: Proxy for broadly defined adaptive capacity at the national level based on Human Development Index (HDI) ranking from the 2007 Human Development Report. A low ranking in the HDI (indicated by a high number), is interpreted as indicative of low adaptive capacity.
- **CDVI**: Climate Disaster Vulnerability Index, based on Brooks et al., 2005: Number of occurrences of a country in the upper fifth of a vulnerability ranking based on a composite vulnerability index constructed from 11 developmental indicators which are strongly related to mortality from climate-related disasters, subject to different weightings. Values from 0-13, with 13 indicating very high vulnerability regardless of weighting.
- **CDRIa**: Climate Disaster Risk Index (a), representing cumulative numbers affected by climate-related disasters from 1978-2007, scaled by 2007 national population, from World Bank IDA-related dataset, based on CRED EM-DAT dataset (proxy for historical risk from climate-related disasters, focusing on exposure and implicit vulnerability)
- **CDRIb**: Climate Disaster Risk Index (b), representing average performance across five indicators based on absolute numbers killed, percent of population killed and affected, and ratios of killed to affected, for climate-related disasters in the 1990s, from Adger et al., 2004 (proxy for historical risk associated with climate extremes, including considerations of coping capacity)
- **EVI**: Environmental Vulnerability Index (proxy for sensitivity of physical environment to short-term and long-term climate hazards, (used only for Pacific region)
- **RAI**: Resource Allocation Index, from World Bank IDA-related dataset (proxy for country preparedness in terms of ability to absorb funds and manage funds and projects, although not climate-specific)

See Annex 1 for a more comprehensive description and full discussion of each indicator and its relevance.

Consideration of criteria other than exposure to hazard and vulnerability

The EG are conscious that the TORs also highlight the need to consider "coherence and value addition"; "replicability and sustainability"; and "scalability and development impact" as third order selection criteria. To a large extent these criteria will depend on the nature of programmes or projects and how they are implemented within specific national contexts. These criteria cannot be represented meaningfully using readily available indicators, and their inclusion requires detailed knowledge of individual national contexts. While the EG represents considerable regional expertise, such considerations are beyond the expertise of the group. Nonetheless, the risk-based approach adopted by the EG, which starts with the identification of groups of countries facing common climate hazards, and experiencing related climate change risks within similar development contexts, favours learning and the replication of resilience-building interventions within regions and across countries. The focus on vulnerability, coupled with considerations of country preparedness as represented by the RAI, should ensure that cases are identified where development impacts can be highly significant. Country selection with a well-defined risk framework provides coherence in the approach to country selection.

2.3 Strengths of the risk-based approach

The risk-based screening approach provided a formal analytical framework that allowed quantitative information to be combined with expert judgment, avoiding approaches that would have been either unjustifiably reductionist (given the quality of the available data) or overly subjective. This approach enabled the rapid identification of a number of countries as potential PPCR participants, an important consideration given the extremely short timescale within which the analysis was carried out. The risk-based approach is a more systematic alternative to common ad hoc approaches which generally consider a basket of factors related to current climate extremes, developmental baselines and political conditions, but which tend to pay little attention to longer-term climate threats. This more common approach often results in the marginalisation of countries facing extremely challenging climate change risks in the foreseeable future, in favour of interventions in countries where donors are concerned about current climate variability and development baselines, but which may be at much lower risk from long-term climate change.

A systematic approach based on a strategic assessment of climate change risks should ensure that donor assistance addresses real and pressing climate change problems that are relevant over large geographic scales, and which may be replicated at the regional scale (e.g. in neighbouring countries). An entry point to the analysis based on considerations of climate change hazards avoids some of the problems associated with approaches driven by the application of universal, national-level "vulnerability indices". Such indicators generally fail to address the highly context specific nature of risk and vulnerability, often ignore the role of hazards in framing climate change risks (effectively assuming all countries are equally exposed to the manifestations of climate change), and are likely to produce somewhat arbitrary results. In the analysis presented here, indicators were used to guide and support, rather than drive, country selection.

3. RESULTS

3.1 The Caribbean

Climate Change Risk Overview

As in the case of Pacific and Indian Ocean nations, it is well-established that the countries of the Caribbean are among the most vulnerable to global climate change (IPCC, 1995, 1997, 2001, 2007). While the severity of the impacts will vary from country to country, there is a suite of priority concerns directly linked to climate change that is virtually ubiquitous across the region. Sea level rise will combine a number of factors resulting in accelerated coastal erosion, increased flood risk and in some areas permanent loss of land. This may be exacerbated further by any increase in the destructiveness of tropical storms, the impacts of which will be greater due to sea-level rise even without increases in storm intensity. The impacts of sea-level rise will be further exacerbated by the loss of protective coastal systems such as coral reefs. The Caribbean has experienced widespread coral loss in recent decades due to a variety of interacting factors including bleaching, which has become more frequent due to higher ocean surface temperatures, a trend which will continue into the future as a result of climate change (Gardner et al., 2003, 2005; Oxenford et al., 2007). Loss of coral will also affect livelihoods, for example those dependent on tourism and fisheries. Sea-level rise will also be associated with saline intrusion into coastal aquifers, affecting the availability of freshwater, which will combine with drought to increase water stress. The IPCC projections indicate a reduction in precipitation across most of the Caribbean throughout the year, with the largest reductions occurring in the boreal summer (Christensen et al., 2007). Hurricane intensity may increase as a result of anthropogenic climate change, although there is uncertainty about the future behaviour of hurricanes and tropical storms in general (Vecchi et al., 2008).

Apart from climate-related risks, Caribbean states face similar sustainable development challenges, including limited natural and human resources, fragile ecosystems, proneness to natural hazards, high dependence on imports and a narrow range of economic activities, relatively high population densities and the effects of globalization. Most of the countries are also low-lying, with some coastal areas below mean sea-level (e.g. Guyana, parts of Belize and The Bahamas). In all countries a high percentage of the population and much critical infrastructure are located along the coast[2]. These factors will be exacerbated by the projected adverse effects of climate change.

List of Countries in the Region

The countries considered in this region are: Antigua and Barbuda, Barbados, Belize, Cuba, Dominica, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, The Bahamas, and Trinidad and Tobago.

Screening process and the use of indicators

Careful examination of the available data for the percentage population living in low-lying coastal areas (LECZ indicator) suggested that this indicator is too unreliable to provide objective country comparisons. With possibly one exception (The Bahamas, 88%) all values given in the data set appear to be gross underestimates when checked against other country-specific sources, including coastal vulnerability studies conducted

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[2] See the First National Communication to the UNFCCC sub mitted by CARICOM countries.

under the CPACC project, and information reported by the countries in the First National Communication to the UNFCCC. This observation is not entirely surprising, given the caveats provided by the Centre for International Earth Science Information Network (CIESIN) of Columbia University, the source of the data.[3] Hence, although presented in Table 1, this indicator was not considered useful as a tool for differentiating among Caribbean states.

The impact of climate-related disasters is considered to be a critical consideration in Caribbean vulnerability. Hence, the CRDIa index is considered to be an appropriate, direct measure that could provide some reasonably indicative country comparisons of risk from climate hazards. The index represents the cumulative % of population affected by climate-related hazards over the period 1978-2007, which is an aggregate indicator of historical risk associated with these threats (see box 2).   When this filter is applied, the following countries show the highest risk: Antigua and Barbuda (188 %), Cuba (114 %), Dominica (132 %), Guyana (212 %), Jamaica (80 %) and Haiti (62 %). All other countries rank relatively low on this index.

The climate disaster vulnerability Index (CDVIb) was used as a further screen for underlying vulnerability. When this composite index is applied, the only Caribbean country that falls within the top quintile is Haiti. With a CDVI of 13 (on a scale of 0-13), Haiti would rank as one of the most vulnerable countries in the world, based on this index (Refer to Box 2 and Annex 1).

However, while Antigua and Barbuda, Cuba, Dominica, Guyana and Haiti rank high on the vulnerability scale, only the latter country stands out among the group when agreed socio-economic indicators are applied. With respect to freshwater availability, the region scores high on this parameter with all countries, except Haiti, reporting in excess of 80% access (some countries have 100% access). Haiti with 54% access therefore stands out, with Guyana being ranked the next lowest with 83% access. Similarly, the available data also suggest that some 46 % of Haiti's population is undernourished, while the figure for all other Caribbean countries is 10% or less. Similarly, when the Human Development Index (HDI) is used as a further filter, Haiti again stands out with the lowest ranking (146 out of 177 countries), followed by Jamaica (101) and Guyana (97). Haiti is therefore the only Caribbean state that falls within the bottom quartile of countries on the HDI scale.

Recommendations

No country retains a consistent ranking when agreed criteria are applied. However, the two countries that appear to have the highest ranking with respect to vulnerability indices and the lowest on socio-economic indicators are Guyana and Haiti. Dominica also scores high on vulnerability, though its ranking based on socio-economic criteria is not as low as that of either Haiti or Guyana.

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[3] "The spatial detail of census data varied greatly between countries and 1km resolution was considered the highest resolution that could be supported globally. The SRTM data utilized was at a resolution of 1km to facilitate a 1 to 1 spatial match with the population data. By degrading the resolution of the SRTM data to 1km, the estimates shown likely underestimate the population counts in the zone. A 10 meter elevation ceiling was chosen in part because of the error documented in SRTM data precision globally" (see http//sedac.ciesin.columbia.edu/gpw/lecz).

Both Guyana and Dominica rank relatively high on the basis of capacity and governance criteria (3.4 and 3.9 on a scale of 1-6, IDA Resource Allocation Index, RAI). However, Haiti with an index of 2.9 ranks low on these criteria. Nevertheless, the fact that it ranks high on vulnerability and very low on socio-economic indicators should be compelling reasons for recommending it as a potential PPCR country. Moreover, Haiti is the only LDC in the entire Western Hemisphere, an additional consideration that cannot be easily ignored.

Based solely on the preceding analysis, no single country emerges as the most vulnerable in the Caribbean region. However, the leading candidates would appear to be Guyana, Haiti and Dominica.

However, the EG holds the view that a regional approach would be the most appropriate way to proceed in the case of the Caribbean region. While there are some differences, these countries can all be classified as highly vulnerable, they generally share similar vulnerabilities, there is good absorptive capacity, and the Caribbean has considerable experience in the successful execution of regional climate change adaptation projects[4]. Moreover, The Caribbean Community Climate Change Centre (CCCCC) was established in Belize as a regional centre of excellence in 2004. The Centre was the executing agency for the MACC and is the Implementing agency for the SPAC projects, both of which are funded by the GEF.

The EG there fore recommends a **regional project** for the Caribbean that includes the three countries identified above: **Guyana, Haiti and Dominica.**

Table 1: Vulnerability indicators for the Caribbean region

ISO3V 10	Country	LECZ	CDRIa	IWS	FI	HDI	CVI	CDVI	CDRIb	RAI
ATG	Antigua and Barbuda	31	188	91	-	57	-	-	-	-
BHS	Bahamas	88	27885	97	8	49	-	-	-	-
BRB	Barbados	4	3	100	<2.5	31	-	-	-	-
BLZ	Belize	40	62	91	4	80	-	-	-	-
CUB	Cuba	13	114	91	<2.5	51	-	-	-	-
DMA	Dominica	7	132	97	8	71	-	-	-	3.85
GRD	Grenada	6	58	95	7	82	-	-	-	3.68
GUY	Guyana	55	212	83	8	97	-	-	-	3.42
HTI	Haiti	9	62	54	46	146	-	13	5	2.86
JAM	Jamaica	8	80	93	9	101	-	-	-	-
KNA	Saint Kitts and Nevis	17	29	100	10	54	-	-	-	-
LCA	Saint Lucia	4	50	98	5	72	-	-	-	3.97
VCT	Saint Vincent	9	20	-	10	93	-	-	-	3.83
SUR	Suriname	76	5	92	8	85	-	-	-	-
TTO	Trinidad and Tobago	13	0	91	10	59	-	-	-	-

[4] These include 'Caribbean Planning for Adaptation to Climate Change' (PACC, 1997-2001, WB-GEF); 'Mainstreaming Adaptation to Climate Change in the Caribbean' (MACC, 2004-2008, WB-GEF); 'Special Program on Adaptation in the Caribbean' (SPAC, 2007-2011, WB-GEF); 'Adapting to Climate Change in the Caribbean' (SPAC, 2007-2011, CIDA).

3.2 The Pacific

Climate Change Risk Overview

Small Island States of the Pacific are extremely vulnerable to the impacts of climate change. Working Group II of the IPCC Fourth Assessment Report describes the vulnerability of Small Islands as follows: "[Small islands] comprise small land masses surrounded by ocean, and are frequently located in regions prone to natural disasters, often of a hydro-meteorological and/or geological nature. In tropical areas they host relatively large populations for the area they occupy, with high growth rates and densities. Many small islands have poorly developed infrastructure and limited natural, human and economic resources, and often small island populations are dependent on marine resources to meet their protein needs. Most of their economies are reliant on a limited resource base and are subject to external forces, such as changing terms of trade, economic liberalisation, and migration flows." (IPCC WGII, Ch.16. pp.690-691). The Pacific contains a large number of inhabited low-lying atolls, which are particularly vulnerable to the impacts of climate change, in particular, sea-level rise.

Although these notions apply to most small islands, Pacific islands are particularly at risk. Sea-level rise poses a major long-term threat to Pacific Island States through episodic and permanent inundation, coastal erosion, and saltwater intrusion into fresh water lenses, all of which will have severe impacts on the habitability of small islands. Tropical cyclones and extreme weather events associated with El Niño (the future behaviour of which is uncertain) also represent significant disaster risks. These threats are particularly severe for low-lying atoll islands, making the Pacific a region of especially high risk. Even in larger islands with high relief, impacts on coastal zones are serious because large populations and valuable infrastructure are concentrated in coastal regions. Adaptation to the impacts of sea-level rise and extreme events is therefore an immediate priority for small island countries in the Pacific.

List of countries in the region

The PPCR EG examined all sovereign island states. They are: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Republic of Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, and Vanuatu

Screening process and the use of indicators

A number of screening criteria were considered by the EG to identify priority countries. Some of the indicators proved problematic as critical data were lacking for many states. Of the data that were available for a majority of the states in this region, the EG concluded that the following data were most relevant in the identification of possible priority countries:

- % of Population in Low Elevation Coastal Zones (normalised exposure to sea-level rise, LECZ)
- % population affected by climate related disasters (CDRIa)
- Adaptive capacity as indicated by HDI
- IDA Resource Allocation Index (response capacity / governance of recipients).
- Environmental Vulnerability Index (EVI), used as an additional indicator for this region in order to compensate for the lack of data for Pacific islands in many of the other indicators

Based on Table 2, some observations can be made: Almost all countries in the list have fairly high environmental vulnerability, identified as "extremely", "highly" and "very" vulnerable. A majority of states also have a significantly high % population in low lying coastal zones. Among them, Kiribati, Marshall Islands and Tuvalu have extremely high risk in terms of the population in the low elevation areas with about 100% LECZ value, while some others, due to very high populations, may still have significant exposure in absolute terms. These states may be high priority for PPCR funding. A few countries have high capacity and/or incomes as reflected in high HDI values (e.g. Cook Islands, Tonga), or high GDP/capita (Nauru, Niue, Palau). They may consequently be a lower priority for PPCR funding.

County preparedness indicators (IDA Resource Allocation Index) are not available for many countries. For the countries where the indicator values are available, most scores are moderately high implying that screening on the basis of this criterion is not appropriate.

Recommendations

The indicator analysis does not lead to a clear identification of a particular country or collection of countries for prioritisation. The EG therefore **recommends one regional project in the Pacific Island states**, but cannot identify any particular subset of countries as part of such a regional initiative. Some of the indicators discussed above, as well as other considerations, can be used by the Sub-committee in identifying a suitable subset of countries for such a regional project.

Table 2. Vulnerability indicators for the Pacific region

ISO3V10	Country	LECZ	CDRIa	EVI	HDI	GDP/Capita (2002)	RAI
COK	Cook Islands	42	-	Extreme	62	2651	-
FJI	Fiji	18	135	High	92	2281	-
KIR	Kiribati	100	83	Very high	129	530	3.07
MHL	Marshall Islands	100	9	High	121	2008	-
FSM	Micronesia	31	34	Extreme	120	1864	-
NRU	Nauru	42	-	Extreme		3742 ($AUS 2006)	-
NIU	Niue	15	-	Vulnerable		10048 ($NZ 2003)	-
PLW	Palau	51	0	High		7264 (2005)	-
PNG	Papua New Guinea	3	23	At risk	137	523	3.32
WSM	Samoa	24	152	High	74	1484	3.88
SLB	Solomon Islands	19	56	Vulnerable	128	541	2.73
TLS	Timor-Leste	3	2				-
TON	Tonga	43	171	Extreme	54	1347	3.03
TUV	Tuvalu	99	-	Extreme	118	345	-
VUT	Vanuatu	5	108	Vulnerable	118	1138	3.25

3.3 South America: Andean Region

Climate Change Risk Overview

The Andes is a high mountain environment where the impacts of climate change will be very serious in the short to medium term. These impacts are associated principally with the loss of glaciers, the seasonal melting of which provides a high proportion of the region's water resources (Bradley et al., 2007). The IPCC Fourth Assessment Report (WGII, chapter 13) notes that "the trend in glacier retreat has intensified in this region, reaching critical conditions in Bolivia, Peru, Colombia, and Ecuador". Changes in temperature and humidity are the primary cause of the observed glacier retreat during the second half of the 20th century. Peru has witnessed a 22% reduction in total glacier area, a 12% reduction in freshwater in the coastal zones (where 60% of the population live), and an overall estimated loss of 7,000 M3 of water over the past 35 years (IPCC WG II, 2007). Colombia meanwhile has seen an 82% reduction in glaciers between 1990-2000, while in Bolivia, the Chacaltaya glacier has lost half of its surface and two-thirds of its volume and could disappear by 2010. The Zongo glacier has lost 9.4% of its surface since 1991 and could disappear by 2050, while the Charquini glacier has lost 47.4% of its surface since 1940. Ecuador has also witnessed a gradual decline in glacier length, reduction in water supply for irrigation, clean water supply for the city of Quito, and hydropower generation for the cities of La Paz and Lima. (IPCC WGII 2007: ch. 13, page 589).

These trends have serious implications for water availability as well as hydropower generation, making the Andean region a critically "at-risk" region. Adaptation to these impacts of climate change on glacier melt in Andean countries is therefore an urgent priority. In addition to threats to water supplies, any change in the behaviour of El Niño will have implications for disaster risks in some parts of the Andean region. While the future behaviour of El Niño is uncertain, modelling studies suggest that El Niño-like conditions may become more prevalent, and the IPCC projections indicate increased precipitation over parts of north-western South America, which may be associated with increased flood risk (Christensen et al., 2007).

List of countries in the region

Within this region the PPCR EG examined the following countries: Bolivia, Chile, Columbia, Ecuador, and Peru. All are ODA recipients, in accordance to the list released by the Development Assistance Committee (DAC) of the OECD, effective for 2008 to 2010 flows.

Screening Process and the Use of Indicators

A series of "screens" were subsequently applied based on the other criteria given to the EG (as well as those deemed relevant by the EG) with a view to identifying candidates for a PPCR pilot:

Screen 1: Excluding "High Human Development" Countries. Countries Ranked in the top third of the HDI ranking were excluded. The rationale being that these countries might have sufficiently greater capacity and resources to respond on their own (or via other modalities).This screen led to the exclusion of Chile (Ranked 40 on the HDI ranking).

Screen 2: Prioritising Countries with existing high sensitivity/vulnerability. The rationale here is that the impacts of climate change would further aggravate existing vulnerabilities. Here the following indicators were considered:

- % of population undernourished. Based on this screen Bolivia is most vulnerable, followed by Columbia and Peru. Ecuador is considerably less vulnerable, and is excluded.
- Historical exposure to weather related hazards (CDRIa). Based on this indicator, Bolivia has significantly higher exposure, followed by Peru. Columbia has significantly lower exposure and is therefore excluded.
- Country Preparedness and Other criteria: The IDA Resource Allocation Index was considered as an indicator to screen for country preparedness for rapid results. However, values of this indicator were not available for most of the countries, so the index was therefore not used as a screening criterion.

Table 3. Vulnerability indicators for the South American Andean Region

ISO3V10	Country	CDRIa	FI	HDI	IDA
	Bolivia	60	23	117	--
CHL	Chile	8	4	40	--
COL	Columbia	10	13	75	--
ECU	Ecuador	10	6	89	--
PER	Peru	37	12	87	--

Recommendations

Bolivia is recommended as candidate for a PPCR pilot, with **Peru** as alternate. The possibility of a **regional** initiative involving **Bolivia, Peru, Colombia and Ecuador** should also be explored.

3.4 South Asia

Climate Change Risk Overview

The South Asia Region comprises the sub-Himalayan countries and typically consists of India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan, Maldives, and the British Indian Ocean Territories. It is home to around a fifth of world population. The region is exposed to three major long-term hazards with the potential to have profound and systemic impacts on natural and human systems:

i. Sea-level rise poses a risk to many low-lying coastal areas, particularly in Bangladesh. Sea-level rise will increase disaster risks such as those associated with the passage of tropical cyclones, is likely to lead to permanent inundation in the medium to long term, and will threaten coastal freshwater resources through saltwater intrusion.

ii. Melting of Himalayan glaciers will be associated with increased flood risk in the short term, and with a loss of water resources, principally in the dry season, in the medium to long term (by around 2035). The IPCC indicates that rivers such as the Ganga, Indus and Brahmaputra could become seasonal as a result of the loss of glacial melt, affecting dry season resources for hundreds of millions of people (Cruz et al., 2007).

iii. Changes in the strength and behaviour of the Asian monsoon may be associated with a range of impacts. IPCC projections indicate an intensification of the Asian monsoon (Christensen et al., 2007), increasing flood risks in the summer months. However, monsoons are potentially highly sensitive to global change, and collapse, increased variability, and/or changes in the geographical range of the Asian monsoon are possibilities (Zickfeld et al., 2005).

The above hazards mean that South Asia is exposed to a complex web of potential climate change impacts, including elevated disaster risk, the loss of productive land and water resources, and possible abrupt changes in regional climate. With its high population (500 million people live on the Gangetic plain alone), coastal megadeltas and megacities, high levels of poverty, and existing exposure to disaster risk, climate change risks to the South Asian region are extremely high.

Countries in the Region

The countries considered under the South Asian region are India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan, Maldives, and are all ODA recipients, in accordance with the list released by the Development Assistance Committee (DAC) of the OECD, effective for 2008 to 2010 flows.

Screening Process and the Use of Indicators

Using the CDRI risk indicators shown in Table 4, five candidate countries in South Asia were selected as a first approximation. As explained in Box 2, the CDRIb with a value of five indicates a high degree of risk from climate-related events. When this criterion is applied India, Bhutan, Pakistan, Bangladesh and Nepal are the most likely candidate countries in South Asia. A second 'screen' using the % of population affected (CDRIa) narrows the list to India and Bangladesh. Considering further the % of population that is potentially exposed to rising sea level (LECZ), Bangladesh is the most likely candidate from South Asia for PPCR funding. India, also with a high score, ranks high on this index.

Although Maldives does not appear to be as highly affected by climate-related risks, being a low-lying, small island country it is also severely threatened by future sea level rise.

With respect to vulnerable mountain environments, the EG also chose Nepal and Bhutan as candidate countries, given the potentially serious implications associated with rapid glacial melt that confront these countries. With further screening using Adaptive Capacity criteria liked to the HDI index, Nepal obtains a higher priority rating than Bhutan as the latter has a higher HDI, implying that Nepal is more vulnerable. India may be considered a potentially vulnerable mountainous region as well, with a HDI ranking not vastly dissimilar to that of Nepal.

Application of the resource allocation index (RAI) does not suggest much differentiation among countries, with all states showing approximately similar levels of preparedness.

Recommendations

For South Asia the following countries are recommended for PPCR funding: **Bangladesh and Nepal as principal countries; and, India and Bhutan as alternate countries.**

Table 4. Vulnerability indicators for the South Asia Region

ISO3V10	Country	LECZ	CDRIa	IWS	FI	HDI	CDVI	CDRI b	RAI
LKA	Sri Lanka	11.8	89.9	79	22	99	--	--	3.46
MDV	Maldives	100	8.4	83	10	100	--	--	3.56
IND	India	6.3	145.4	86	20	128	--	5	3.85
BTN	Bhutan	0	10.1	62	..	133	1	5	3.89
PAK	Pakistan	2.9	22.7	91	24	136	13	5	3.58
BGD	Bangladesh	45.6	140.3	74	30	140	1	5	3.48
NPL	Nepal	0	24	90	17	142	4	5	3.44

3 .5 Southeast Asia

Climate Change Risk Overview

Although climate change is affecting the ecological system of the whole world and poses a threat to all countries, some regions and countries are especially vulnerable to this alarming rise of temperature due to their special geographic features and weak adaptation capacities. This is clearly the case for most countries of Southeast Asia that are located in tropical areas, some of them littoral, archipelagic or island states with long coastlines.

Southeast Asia is characterized by tropical rainforest, monsoon climates with high and constant rainfall, heavily-leached soils, and diverse ethnic groups. Extreme weather events associated with El-Niño were reported to be more frequent and intense in the past 20 years. One of the projected impacts of climate change in the region is sea-level rise (IPCC 2007), which will bring about inundation of low-lying areas, saltwater intrusion into surface and ground water of the coastal areas, reduced output of the fishery industry, and destroy mangroves and the habitats of various benthic organisms due to changes in salinity. Coastal areas, especially heavily-populated mega delta areas, will be at greatest risk due to increased flooding from the sea and, in some instances, flooding from the rivers. Sea level rise increases the risks of disasters from storm surges associated with intense tropical cyclones. Endemic morbidity and mortality due to diarrheal disease primarily associated with floods and droughts are expected to rise in Southeast Asia due to projected changes in the hydrological cycle.

Countries in the Region

The Southeast Asian countries shown in Table 5 that are ODA eligible as indicated in the list of ODA recipients issued by the Development Assistance Committee (DAC) of the OECD, are Cambodia, Philippines, Vietnam, Laos, Thailand, Indonesia, and Malaysia.

Screening Process and the Use of Indicators

The EG used the risk indicator CDRIb to choose candidate countries in Southeast Asia as a first approximation as in the South Asia case. This gives us Cambodia, Vietnam, Philippines and Laos as the most likely candidate countries in Southeast Asia. All these SE Asian countries are highly prone and vulnerable to extreme events, particularly to tropical cyclones and heavy monsoon rains, usually causing severe floods. This list is also supported by the % of population affected by climate-related risks (CDRIa).

For the next phase of 'screening', the EG thought that future sea level rise would be used to further differentiate among the set of countries. Application of this index (LECZ) eliminates Laos from the list.

In the absence of data for the Philippines, the RAI indicator cannot be used to compare the relative preparedness of each country. However, from interviews and teleconference with staff from the World Bank and Regional Development Banks, it can be safely concluded that all these countries are quite prepared because of the number of projects on climate change that are presently done nationally and regionally, in both mitigation and adaptation categories.

Recommendations

In consideration of the fact that these three countries: **Cambodia, Vietnam and Philippines**, are subject to the same climatic risks including sea level rise, and are in close proximity geographically, it is strongly recommended that they be considered as a **regional group** for PPCR funding.

Table 5. Vulnerability indicators for the Southeast Asian Region

ISO3V10	Country	LECZ	CDRIa	IWS	FI	HDI	CDVI	CDRI b	RAI
KHM	Cambodia	23.87161858	111.3356753	41	33	131	1	5	3.21
PHL	Philippines	17.70388255	103.971777	85	18	90	--	5	
VNM	Vietnam	55.09671369	87.58910663	85	16	105	--	5	3.79
LAO	Laos	0	87.11530641	51	19	130	9	5	3.14
THA	Thailand	26.31904032	69.27259131	99	22	78	--	--	--
IDN	Indonesia	19.62096374	3.614541794	77	6	107	--	--	--
MYS	Malaysia	23.50622082	2.063178699	99	3	63	--	--	--

3.6 Central Asia

Climate Change Risk Overview

Central Asia was selected as regional climate change hot-spot because of its exposure to large projected increases in temperature coupled with a notable projected decline in rainfall. This warming is most pronounced in summer, when a coherent warming in excess of 4° C extends southwest from southern Russia and western Mongolia through Central Asia into the Caucasus (Christensen et al., 2007, p. 883; Figure 1). In the annual and winter projections the magnitude of warming is slightly reduced over Central Asia, and is highest over the Tibetan Plateau. In the annual and winter projections, a region of significant precipitation reduction extends from Western into Central Asia south and southeast of the Caspian Sea. This region of reduced precipitation shifts north during the summer.

The climate projections in the IPCC (Christensen et al., 2007) suggest that, as with many other regions considered here, the principle hazard confronting central Asia will be climatic desiccation, which will be associated with impacts on water resources, agriculture and food security. Desiccation due to *in situ* changes in temperature and rainfall will be augmented by reduced snow-melt that currently contributes significantly to the flow of rivers such as the Syr-Darya[5].

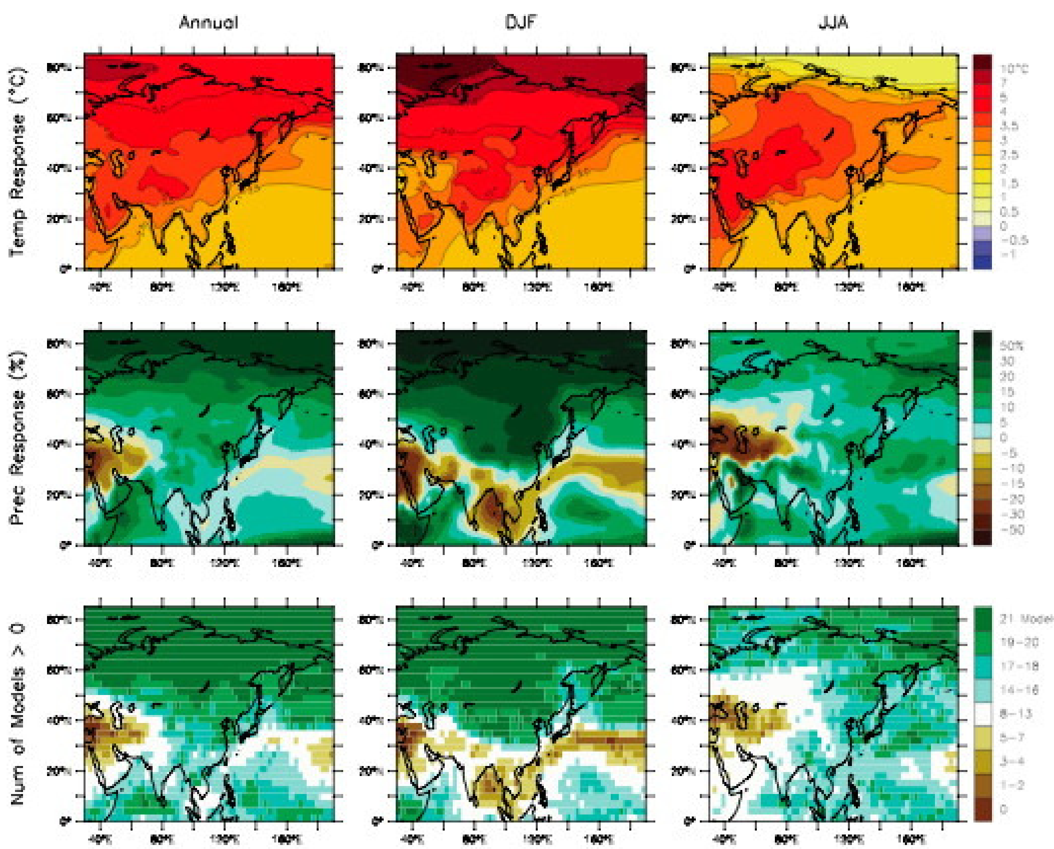

Figure 1. Top: Projected annual, December-January and June-August temperature changes over Asia between 1980-1999 and 2080-2099, averaged over 21 models driven by data from the A1B

[5]http://www.waterandclimate.org/dialogue/Adapt/documents/Adapt%20Syrdarya%20100203.pdf

scenario. Middle: Comparable fractional change in precipitation. Bottom: number of models out of 21 that project increases in precipitation. Data from the IPCC AR4 (Christensen, 2007, p.883).

Countries in the region

The countries situated in the Central Asia region which are spatially coincident with the area of projected warming and drying are: Afghanistan, Iran, Kazakhstan, The Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan. As this coherent signal in the climate projections extends into the Caucasus, Armenia, Azerbaijan and Georgia are also included in the analysis.

Screening process and the use of indicators

The most important vulnerability indicators for Central Asia, given the projected changes in rainfall and temperature and the inferred, probable long-term desiccation of the region, will be those relating to water resources and food security. On this basis, Tajikistan appears as the most vulnerable country by far, with 56% of its population undernourished and 41% without access to an improved water source, numbers far in excess of those for other countries in this region (Table 6). With the lowest HDI rank, Tajikistan has the lowest inferred adaptive capacity. In addition, it scores highly in terms of recent historical risks associated with climate-related disasters (CDRI a and b). While its preparedness, as indicated by the RAI score, is lower than most other countries in the region for which data are available, its RAI score is reasonable when compared to other countries that are being proposed as participants in the PPCR.

Other countries that score high in terms of vulnerability as measured in terms of food insecurity are Uzbekistan and Armenia, although vulnerability to water stress in these countries is relatively low (particularly in Armenia) when measured in terms of the existing population with access to an improved water source. Kazakhstan scores more highly on the Climate Vulnerability Index (CVI), and Turkmenistan occurs in 2 of the possible 13 occurrences of the upper quintile of the climate vulnerability index of Brooks et al. (2005) (CDVI), but these countries are considerably less vulnerable according to the other indicators employed here.

Final recommendations

It is recommended that **Tajikistan** is considered as the representative of Central Asia for inclusion as a participant in the PPCR, on the basis of its high vulnerability to water stress and food insecurity, and its relatively low inferred adaptive capacity. On the basis of existing food insecurity, a significant (but much smaller) percentage of population without access to an improved water source, low adaptive capacity and low but still reasonable preparedness, **Uzbekistan** might be a suitable alternative candidate.

Table 6: Vulnerability indicators for the Central Asian Region

ISO3V10	Country	CDRIa	IWS	FI	HDI	CVI	CDVI	CDRIb	RAI
TJK	Tajikistan	55.4	59	56	122	3	0	5	3.24
TKM	Turkmenistan	0.01	72	7	109	3	0	1	-
AZE	Azerbaijan	20.6	77	7	98	-	2	3	3.77
KGZ	Kyrgyz Rep.	0.38	77	4	116	2	0	4	3.67
GEO	Georgia	15.9	82	9	96	3	0	2	4.26
UZB	Uzbekistan	2.24	82	25	113	3	0	3	3.13
KAZ	Kazakhstan	4.27	86	6	73	4	0	3	-
ARM	Armenia	10.1	92	24	83	3	0	2	4.35
IRN	Iran	57.5	94	4	94	3	0	4	-

3.7 North Africa / Maghreb

Climate Change Risk Overview

North Africa and the Maghreb region already experience significant water stress, due to a climate that ranges from hyper-arid to semi-arid, a growing population, and developmental and demographic trends that are driving increased use of resources including water. The IPCC projections indicate that the region is very likely to be subject to extreme desiccation in the coming decades, with projected temperature increases in excess of 4°C throughout the Maghreb in summer, and reductions in rainfall exceeding 30% in some regions for the A1B scenario (Figure 2: Christensen et al., 2007). The zone of severely reduced rainfall in the IPCC projections extends throughout the Mediterranean region and the northern Sahara, and inland from the Atlantic coast down to about 15° N (figure 2).

A sensitivity study by Agoumie (2003) suggested that a 1°C temperature increase over the catchment of Morocco's largest dam (with no change in rainfall) could result in a reduction in surface runoff of 10%, equivalent to the loss of one dam per year if extrapolated across the whole country. Much larger increases in temperature coupled with large reductions in rainfall would clearly have profound consequences for water resources in this region, and as a result for development and human well-being. Giorgi (2006) identifies North Africa and the Mediterranean as one of the regions most physically sensitive to climate change.

The main climate change risks in the North African / Maghreb region will almost certainly be linked to long-term climatic desiccation and drought associated with climatic variability. Water stress is of huge importance, and decreases in water availability may have severe impacts on food security. Some coastal areas are also at risk from sea-level rise, although this may be seen as a secondary hazard at the regional scale. While the Nile Delta is at risk of erosion and inundation, this is due in large part to the reduction in sediment transport to the delta since the construction of the Aswan Dam, and is thus only partly driven by climate change.

Countries in the region

This region includes all the countries of North Africa bordering the Mediterranean (Morocco, Algeria, Tunisia, Libya and Egypt) and Mauritania. Mauritania is included in standard definitions of the Maghreb region, and also lies within the coherent zone of projected drying stretching from Egypt through the Maghreb and south into the western regions of the Sahara.

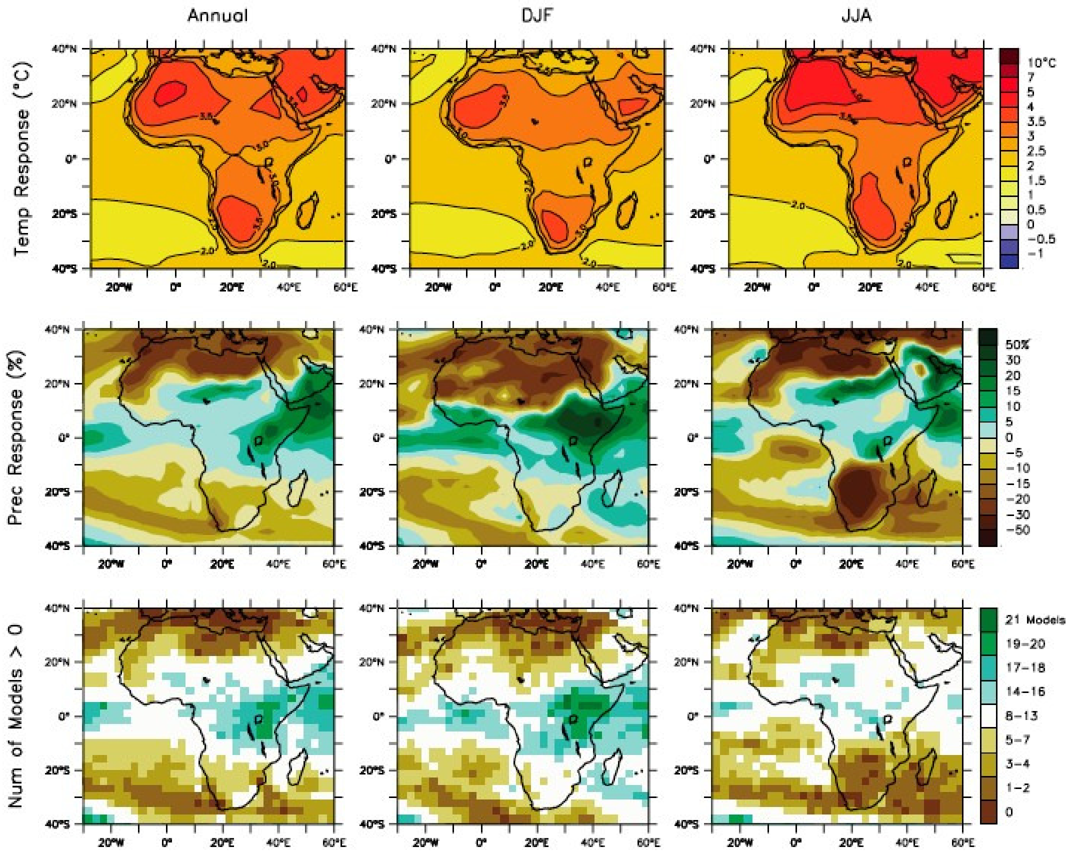

Figure 2. Top: Projected annual, December-January and June-August temperature changes over Africa between 1980-1999 and 2080-2099, averaged over 21 models driven by data from the A1B scenario. Middle: Comparable fractional change in precipitation. Bottom: number of models out of 21 that project increases in precipitation. Data from the IPCC AR4 (Christensen, 2007, p.869).

Screening process and use of indicators

The largest projected temperature increases for this region are for the Maghreb west of Libya. Heavily populated coastal areas in Morocco and Algeria are projected to experience some of the largest temperature increases in summer, while winter temperatures are projected to rise most over inland Mauritania and Mali. Decreases in crucial winter rainfall are projected to be greatest over Morocco and northern Algeria, parts of Mauritania, and the sparsely populated inland Sahara. Temperature and precipitation projections suggest that the western parts of this region are likely to be exposed to the most severe desiccation hazards.

The most important vulnerability indicators in the context of desiccation risks in this region will be those relating to water stress (IWS and CVI) and food insecurity (FI) (see table 7). All countries score consistently highly in the CVI. However, the country that scores most highly by far in terms of its vulnerability in the IWS and FI indicators is Mauritania, with only 53% of its population having access to improved water sources and 10% of its population undernourished. Mauritania has an equivalent of 190% of its 2007 population recorded as affected by climate-related disasters (principally drought) since 1978, scores consistently highly in the different versions of the index of vulnerability to mortality from climate-related disasters developed by Brooks et al (2005) (CDVI indicator), and has the lowest adaptive capacity as inferred from its ranking in the HDI. Its lower score in the CDRIb climate disaster risk index is due to this index focusing on the 1990s, whereas Mauritania experienced severe droughts in the 1970s and 1980s associated with multi-decadal scale climatic variability. Mauritania is the only country in this region for which a Resource Allocation Index (RAI) value is available, and this is reasonably high, indicating a reasonable level of preparedness for participation in the PPCR. Although coastal risk was not a significant consideration for this region, it might be noted that Mauritania contains the second highest percentage of population in the low-elevation coastal zone after Egypt. Mauritania clearly stands out as the most highly vulnerable country in this region on the basis of the indicators considered.

Morocco follows Mauritania in terms of food insecurity, population without access to improved water sources, and low adaptive capacity as indicated by a low HDI ranking. Apart from Tunisia, Morocco is the only country to appear in the upper quintile of the Brooks et al (2005) disaster risk index (CDRIb). In addition, Morocco is situated within a part of the North African region projected to experience some of the highest-magnitude increases in temperature and decreases in rainfall. Morocco also has a considerably higher population density than other countries in the region, and lacks access to certain key natural resources such as oil and gas that provide considerable income for countries such as Libya and Algeria.

Table 7. Vulnerability-related indicator values for North African / Maghreb countries.

ISO3V10	Country	LECZ	CDRIa	IWS	FI	HDI	CVI	CDVI	CDRIb	RAI
DZA	Algeria	3.96	0.71	85	4	104	4	0	4	--
EGY	Egypt	38.19	0.33	98	4	112	4	0	4	--
LBY	Libya	15.60	0	-	<2.5	56	0	0	..	--
MRT	Mauritania	29.25	190.22	53	10	137	4	13	3	3.38
MAR	Morocco	8.04	1.32	81	6	126	4	1	4	--
TUN	Tunisia	14.77	2.13	93	<2.5	91	4	1	4	--

Final recommendations

It is recommended that **Mauritania** be selected as the principle candidate for participation in the PPCR in this region, on the basis of high exposure and a vulnerability profile that exceeds by far other countries in the region. However, there is also a strong case for **Morocco**, and it is recommended that Morocco be included as an alternative, second candidate. A single-country approach is recommended due to the difficult political situation in the region which mitigates against cooperation between countries.

3.8 Southern Africa

Brief overview of region with respect to climate change risk

As with North Africa and the Maghreb, the principal long-term climate change risks in southern Africa are likely to be associated with changes in water availability. The IPCC projections (Figure 2: Christensen et al., 2007, p.869) indicate large increases in average temperatures over much of southern Africa, particularly in central and western regions (Figure 2). Rainfall is projected to decline (except possibly in south-eastern regions), with the greatest reductions in south-western Africa in the coastal Namib Desert region. Thomas et al. (2005) concluded that increases in global mean temperature above 2° C might be associated with the collapse of vegetation systems and the remobilization of dune systems throughout the greater Kalahari region, translating climatic desiccation into desertification and ecological collapse on a regional scale, with potentially profound consequences for agriculture and pastoralism, which form the basis of livelihoods for many people in the region. This confluence of projected warming, reduced rainfall and possible ecosystem collapse coupled with desertification led to the selection of southern Africa as a key climate change “hot-spot”.

Southern Africa is also significantly affected by regional circulation changes associated with the El Niño Southern Oscillation (ENSO), the future behaviour of which is highly uncertain (Meehl et al., 2007). Eastern coastal regions (e.g. Mozambique) are also exposed to tropical storms. In summary, a the major long-term hazard for southern Africa is likely to be progressive, long-term desiccation, perhaps coupled with a collapse in landscape productivity. A variety of other hazards associated with climatic variability (e.g. driven by ENSO) and, in some regions, coastal exposure, will play a secondary regional role on the regional scale, but may be severe at the sub-regional scale.

Countries in the region

The southern African region as defined here includes the countries south of the Democratic Republic of Congo (central Africa) and Tanzania (eastern Africa). All of the countries in this region are wholly or partly located within the contiguous areas of projected drying in the annual projections in the IPCC (Figure 2: Christensen, 2007, p. 869). The countries in the southern African region as defined here include: Angola, Botswana, Malawi, Mozambique, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.

Screening process and use of indicators

The greatest temperature increases in southern Africa are projected for central and western regions away from the coast. The largest reductions in annual and December-February rainfall are projected for the south-western regions, and in June-August rainfall in central regions coinciding approximately with the region of greatest projected warming. This region also coincides spatially with the greater Kalahari region, identified as at risk of collapse. This sub-region may be viewed as one of high sensitivity to climate change, or a climate change “hot-spot”, including all or part of Angola, Botswana, Namibia, South Africa, Zambia and Zimbabwe

The countries at greatest systemic risk from climate change are likely to be those in this highly exposed sub-region which exhibit the greatest underlying vulnerability, measured principally by indicators related to water availability, agriculture and food security, as well as adaptive capacity as indicated by HDI rank (see table 8). Due to the high dependence of agriculture in this region, an additional indicator, the population employed in agriculture, was used for this region. This was taken from the 2007 Human Development Report, and was used as a secondary indicator as data were not available for every country in the southern African region. Using these criteria, the two countries which stand out in Table 8 in the central/western sub-region are Zambia and Angola (Zimbabwe being ruled out due to the obvious difficulties of inclusion in the PPCR in the current political climate). Out of the countries for which data are available, Zambia has the highest proportion of its population employed in agriculture. Angola occurs in the upper quintile of climate disaster risk in the index of Brooks et al (2005) regardless of how the constituent indicators are weighted (CDVI).

Of the countries outside this sub-region, Mozambique exhibits the highest vulnerability across a range of indicators, and is the only country apart from Angola to occur in the upper quintile for all weightings of the Brooks et al (2005) index (CDVI). Mozambique, Malawi, Botswana, Swaziland and Lesotho all score highly in terms of cumulative numbers affected by climate-related disasters (CDRIa).

Table 8 shows vulnerability indicators for southern African countries, arranged in descending order of food insecurity. Countries in the central and western sub-regions projected to experience the greatest warming and drying, and in the potentially desertification-prone greater Kalahari region, are highlighted. Of this subset, Zambia and Angola exhibit the greatest proportion of population undernourished and without access to improved water sources, and the least adaptive capacity as inferred from HDI rank.

Final recommendations

Based on a combined consideration of exposure to climate change hazards and underlying vulnerability, it is recommended that **Zambia** be selected for participation in the PPCR, with **Angola** constituting an alternative choice. Zambia scores reasonably well in terms of country preparedness (RAI), while Angola's RAI suggests that considerable capacity development may be required. These countries might provide opportunities to develop integrated, long-term strategies to address a set of key, related climate change risks that are reproduced at the regional scale, generating a need to develop responses that can be replicated within the wider region. Nonetheless, it must be recognised that other countries in the region are exposed to a suite of climate change related hazards, and that vulnerability in some of these countries is acute (e.g. Mozambique, Malawi). To a certain extent this is addressed by the selection of a number of African LDCs through an analysis driven by considerations of vulnerability, described below.

Table 8: Vulnerability-related indicator values for Southern Africa

ISO3V10	Country	LECZ	CDRIa	IWS	FI	HDI	CVI	CDVI	CDRIb	RAI	% in agr.
ZMB	Zambia	0	72.98	58	46	165	3	0	5	3.48	70
MOZ	Mozambique	11.79	155.51	43	44	172	4	13	5	3.61	--
MDG	Madagascar	5.52	43.6	50	38	143	4	0	4	3.68	78
AGO	Angola	5.28	19.53	53	35	162	4	13	4	2.73	--
MWI	Malawi	0	213.79	73	35	164	4	0	4	3.41	--
BWA	Botswana	0	124.15	95	32	124	4	0	3	--	23
NAM	Namibia	2.59	57.27	87	24	125	4	0	3	--	31
SWZ	Swaziland	0	328.61	62	22	141	2	0	4	--	--
LSO	Lesotho	0	140.6	79	13	138	4	0	3	3.53	57
ZAF	South Africa	1.05	38.47	88	<2.5	121	4	0	4	--	10

3.9 The Sahel

Brief overview of region with respect to climate change risk

The Sahel is the semi-arid transition zone situated between humid equatorial Africa and the arid to hyper-arid Sahara desert. Rainfall is strongly seasonal (concentrated in the summer months) and highly variable on interannual to multi-decadal timescales and longer, as a result of changes in the strength of the monsoon, which in turn are associated with oscillations in the position of the Sahel-Sahara desert boundary (Brooks, 2004). High spatial and temporal variability has encouraged the development of a number of risk-spreading practices that enable the inhabitants of the Sahel to exploit these variable resources, the most widespread and notable example of which is mobile pastoralism (Brooks, 2006). However, many of these practices have been undermined as traditional practices yield to a modernity that favours productivity over risk spreading.

The expansion of agriculture into historically marginal areas in the unusually wet 1950s and early 1960s, and the associated marginalisation of pastoralists, was followed by a multi-decadal period of desiccation, the onset of which resulted in the collapse of commercial agriculture and widespread famine in the early 1970s (Thébaud and Batterby, 2001). The recent history of the Sahel may be characterized as one of maladaptation, driven by development that failed to consider long-term (i.e. decadal scale and longer) climatic variability (Heyd and Brooks, 2009).

Since the early 1990s rainfall has increased throughout much of the Sahel. Sensitivity studies and climate model projections indicate a strengthening of the monsoon across the central and eastern Sahel, resulting in a coherent band of projected higher rainfall extending from Mali in the west to northern Sudan in the east (Figure 2: Christensen et al., 2007, p.869). A number of regional models suggest a continued "greening" of the Sahel and southern Sahara (Brooks, 2004). However, these projections are associated with considerable uncertainty and disagreement between models. Furthermore, any strengthening of the monsoon may not be sustained, raising the prospect of further maladaptation if Sahelian nations respond to increased rainfall by intensifying and expanding their agriculture without considering long-term variability. The major climate change hazards facing the Sahel may therefore be defined as intensified climate variability coupled with greater uncertainty about climate variability over a range of timescales. This will be coupled with potentially problematic changes in variability and extremes on interannual and intra-annual timescales, such as changes in the seasonal distribution and predictability of rainfall (already observed throughout the Sahel), more intense rainfall events and associated flash flood risks, changes in the distribution and occurrence of pests and diseases (e.g. locusts, malaria), and possible changes in the occurrence of dust storms.

Countries in the region

Many countries in Africa north of the equator include areas that are in geographically located in the Sahelian climatic zone. However, this analysis focuses on countries coincident with the band of projected but uncertain increased monsoonal rainfall, which will face challenges of how to respond to changes in climate variability over multiple timescales and increased climatic uncertainty. These countries are Mali, Niger, Chad, Sudan and Burkina Faso. With the exception of Burkina Faso, all of these countries span large latitudinal zones which means that they are faced with both the opportunity to exploit increased rainfall in currently arid areas (which could lead to maladaptation if badly managed), and the challenge of coping with increase unpredictability and variability.

Screening process and the use of indicators

A number of indicators are especially relevant for the Sahel. Given the high level of existing food insecurity across the region, the FI indicator is relevant as it is indicative of the baseline vulnerability to hazards that might adversely affect food production and availability. These include floods as well as droughts (Grolle, 1997). Access to an improved water source is relevant given the dominant role of water availability in human security in the region, although it should be recognised that improved water sources are generally associated with urban areas and sedentary lifestyles, and food livelihood strategies based on mobile pastoralism might not led themselves to access to improved water sources as generally understood in terms of western-style development.

Given the role of climatic variability and extreme events in the region, indicators based on data relating to climate-related disasters are particularly relevant. Adaptive capacity is important in dealing with climatic variability, although again it should be realized that the proxy for adaptive capacity (the HDI rank) may not capture certain elements of adaptive capacity related to traditional practices and livelihoods, which are particularly important in parts of the Sahel dominated by mobile pastoralism. These caveats notwithstanding, an assessment of relative vulnerability based on a number of indicators was carried out.

Of the Sahelian countries listed in Table 9, Niger exhibits the greatest vulnerability as represented across a number of indicators. It has the second highest percentages of population undernourished and without access to an improved water source, after Chad. It has the highest cumulative proportion of population affected by climate-related disasters (CDRIa), and occurs in the top quintile for all versions of the index of vulnerability to climate-related disasters (CDVI). It has the second lowest HDI rank, indicating low adaptive capacity. Like many of the other Sahelian countries assessed here, it has the highest possible score in the Climate Vulnerability Index and the Climate Disaster Risk Index based on Adger et al. (2004) (CDRIb). In addition, it has a reasonable level of preparedness as indicated by the Resource Allocation Index (RAI).

Chad is represented as slightly more vulnerable than Niger in terms of food insecurity and vulnerability to water stress, but has a much lower cumulative proportion of its population affected by climate-related disasters and is missing data for the CDVI and CDRI indices. Its HDI ranking is marginally higher than that of Niger, and its preparedness is significantly lower.

Other countries exhibit high vulnerability as inferred from selected indicators. For example, Sudan scores highly in terms of the disaster-related risk and vulnerability indicators (but exhibits the lowest level of preparedness as indicated by the RAI, and has the highest HDI rank, the highest proportion of population with access to an improved water source, and the lowest CVI score). Burkina Faso has the lowest HDI rank, but the second highest proportion of population with access to an improved water source and the lowest percentage of undernourished people (although these figures still indicate considerable vulnerability when compared with countries outside the region).

Final recommendations

Based on the common exposure to climate change hazards and the differentiation of vulnerability as represented by the indicators in Table 9, **Niger** is proposed as the principal candidate for participation in the PPCR. Any of the remaining countries in this region could reasonably be proposed as an alternative choice. On the basis of access to improved water sources and levels of food insecurity, Chad would be the most appropriate second choice (and the lack of data for two of the indices must be taken into account when considering Chad). Taking indicators of risk and vulnerability associated with climate-related disasters, Sudan would be a reasonable choice, although in terms of food insecurity and access to improved water sources, it scores considerably lower in terms of vulnerability than does Mali. **Chad** is suggested as an alternative choice, although a **regional grouping consisting of Niger, Chad, Mali and northern Sudan** (which shares similar environmental conditions to these other countries) might be proposed if it was deemed to be politically feasible. Mali or Sudan would be reasonable choices if neither Niger nor Chad were able or willing to participate in the PPCR, but Niger stands out as a clear first choice.

Table 9. Vulnerability indicators for the Sahel region,

ISO3V10	Country	CDRIa	IWS	FI	HDI	CVI	CDVI	CDRIb	RAI
TCD	Chad	27.96	42	35	170	5	-	-	2.58
NER	Niger	116.78	46	32	174	5	13	5	3.30
MLI	Mali	36.19	50	29	173	5	5	4	3.71
BFA	Burkina Faso	41.28	61	15	176	5		5	3.69
SDN	Sudan	74.87	70	26	147	4	13	5	2.51

3.10 African LDCs

Climate change risk overview

The risk based approach employed in the above regional analyses represents a robust, consistent and climate change-relevant methodology for identifying a subset of countries facing the most serious, systemic, and coherent climate change risks driven by a combination of exposure to large-scale, long-term hazards and underlying vulnerability. Nonetheless, it must be recognised that countries not identified using this methodology may also face considerable climate change risks associated with more subtle and complex interactions between hazard and vulnerability than are represented by the broad risk assessment employed here. In particular, very poor countries with low capacities to respond and adapt to climate change hazards and extremes may be at high risk as a result of their underlying systemic vulnerability. This is likely to be particularly true of LDCs, the majority of which are located in Africa.

The feeling among the EG was that additional representation of Africa was appropriate, given the high and systemic vulnerability of many African countries as measured by a number of indicators, and the fact that Africa contains 32 out of a total of 49 LDCs (Brooks et al., 2005; Huq and Ayers, 2007). The EG therefore decided to suggest additional African LDCs as potential participants in the PPCR, based on considerations of vulnerability alone. These countries might be invited to participate in the PPCR in addition to, or in place of some of, the countries selected via the regional risk assessment, at the discretion of the PPCR-SC.

Countries in the region

A vulnerability-driven analysis was applied to African LDCs that had not been identified as priority participants in the PPCR through the combined hazard-vulnerability risk assessment applied to select high-risk countries within regional climate change "hot-spots" (including the EG's first choices of countries or groups within these regions and alternate choices). This resulted in a long-list of 29 LDCs throughout sub-Saharan Africa.

Screening Process and the Use of Indicators

All seven of the vulnerability-related indicators used in the regional risk assessments, and the preparedness indicator, were employed in the screening of the remaining African LDCs. The dataset of 29 countries with associated indicator values was sorted for each indicator, in order to identify groups of countries exhibiting the highest vulnerability, and the highest preparedness (Table 10). The number of occurrences in these "high vulnerability" and "high preparedness" groups was then calculated for each country, yielding a potential score of 0 to 8 for each LDC. Countries scoring of 1 or more are listed in Table 11.

Recommendations

The three countries with the highest scores are **Mozambique, Ethiopia and Sierra Leone.** All three of these countries score highly in terms of vulnerability across six indicators. Mozambique also scores highly in terms of country preparedness, while Ethiopia and Sierra Leone do not. These results suggest that adaptation interventions in Ethiopia and Sierra Leone are likely to require a greater emphasis on capacity development. It is recommended that these three countries are considered as potential PPCR participants in addition to the countries selected on the basis of the regional risk assessments, or in the event that any of the countries selected from the regional groups do not participate in the PPCR. The identification of these three countries as particularly vulnerable should not be interpreted as indicating that other African LDCs are not especially vulnerable to climate change, as vulnerability is widespread throughout Africa. Many African countries not selected in this analysis may well be more vulnerable than countries selected from other geographical regions.

Table 10. Countries with the highest vulnerability according to seven vulnerability indicators, and the highest preparedness according to the RAI index.

[For the majority of indicators, which are represented by continuous scales, the "top ten" countries are listed. For the CVI and CDRI(b) indices, which are associated with integer scores, the countries with the highest possible scores are listed.]

CDRI(a)	**LECZ**	**IWS**	**FI**	**HDI**	**CVI**	**CDRI(b)**	**RAI**
Malawi	Djibouti	Ethiopia	Eritrea	Sierra Leone	Sierra Leone	Sierra Leone	Uganda
Mozambique	Gambia	Mozambique	Dem. Rep. Congo	Burkina Faso	Burkina Faso	Burkina Faso	Tanzania
Djibouti	Senegal	Equatorial Guinea	Burundi	Guinea Bissau	Mali	Burundi	Senegal
Lesotho	Guinea Bissau	DR Congo	Sierra Leone	Mali	Ethiopia	Rwanda	Mali
Eritrea	Benin	Guinea	Ethiopia	Mozambique	Burundi	Eritrea	Burkina Faso
Sudan	Liberia	Madagascar	Central African Republic	Central African Republic	Rwanda	Guinea Bissau	Madagascar
Ethiopia	Togo	Mali	Tanzania	Ethiopia	Eritrea	Mozambique	Rwanda
Senegal	Mozambique	Togo	Mozambique	Dem. Rep. Congo		Central African Republic	Mozambique
Gambia	Sierra Leone	Sierra Leone	Guinea Bissau	Burundi		Dem. Rep. Congo	Benin
Benin	Guinea	Congo	Madagascar	Cote d'Ivoire		Gambia	Lesotho
						Equatorial Guinea	
						Somalia	
						Togo	
						Sudan	

Table 11. Number of indicators in which a country occurs in the high-vulnerability or high-preparedness group.

[Only countries occurring in these groups in one or more indicators are shown].

Occurrence in group of 10 most vulnerable or 10 most prepared over 8 indicators					
Mozambique	7	Central African Rep.	3	Sudan	2
Ethiopia	6	Gambia	3	Tanzania	2
Sierra Leone	6	Eritrea	3	Congo	1
Burundi	4	Rwanda	3	Côte d'Ivoire	1
Dem. Rep. Congo	4	Senegal	3	Liberia	1
Guinea Bissau	4	Togo	3	Malawi	1
Madagascar	4	Djibouti	2	Somalia	1
Mali	4	Equatorial Guinea	2	Uganda	1
Benin	3	Guinea	2		
Burkina Faso	3	Lesotho	2		

4. CONCLUSIONS AND FURTHER RECOMMENDATIONS

The EG adopted a risk-based approach to country selection, in which the climate change risks facing a country are viewed as resulting from a combination of the exposure of that country to the long-term, large-scale manifestations of climate change (i.e. climate change hazards), and the underlying vulnerability of the country to these hazards. This approach provided a framework within which countries were identified using a risk assessment approach based on considerations of the distribution and magnitude of long-term climate hazards in combination with national vulnerability profiles.

Ten countries, with alternates and some suggested regional groupings, were identified (Table 12). In addition, an analysis of African LDCs based solely on indicators of vulnerability and historical climate risks, without considering projected changes in climate, identified Mozambique as a potential priority country, with Ethiopia and Sierra as alternates. This vulnerability-led assessment of African LDCs was undertaken in response to concerns within the EG that Africa was under-represented given its systemic vulnerability as measured by a variety of indicators, and the high proportion of LDCs in sub-Saharan Africa.

Table 12. Recommended countries and regions. Priority countries (left-hand column) as identified through a risk assessment approach. Alternate countries are also suggested, as are regional groupings where this was deemed appropriate. Mozambique and its alternates were identified through a consideration of the vulnerability of African LDCs not selected as a result of the risk assessment approach.

	Country (region)	**Alternate**	**Regional Approach**
1	(Caribbean region). No single choice is made and a regional group is recommended. First choice countries: Guyana, Dominica, Haiti and possibly others.		
2	(Pacific Small Island region). The Expert Group considers that this region should be included in the PPCR but has not been able to specify or select a small group of countries.		
3	Bolivia (S. America Andean)	Peru	Bolivia, Peru, Columbia, and Ecuador could be formed into a regional group.
4	Bangladesh (South Asia)	India	A regional group could be created to include Bangladesh, Nepal, Bhutan, India and the Maldives, but is not recommended.
5	Nepal (South Asia)	Bhutan	Nepal and Bhutan could be formed into a regional group.
6	Cambodia, Vietnam and Philippines as a regional group (Southeast Asia group).		
7	Tajikistan (Central Asia)	Uzbekistan	A regional group focused on Tajikistan and Uzbekistan might also include some involvement from Turkmenistan, the Kyrgyz Republic and Kazakhstan given the broadly similar climate issues faced by these countries.
8	Mauritania (North Africa)	Morocco	No regional group proposed.
9	Zambia (Southern Africa)	Angola	No regional group proposed.
10	Niger (Sahel)	Chad	A regional group consisting of Niger plus Chad, Mali and/or northern Sudan could be created given the similar climatic and development issues across these countries, if this is logistically feasible.
Optional additional countries to increase representation of African LDCs (majority of LDCs). May be selected in addition to, or instead of one or more of, above countries (1-10).			
11	Mozambique (African LDCs)	Ethiopia, Sierra Leone	No regional group proposed.

The countries selected span a range of climate change risks and represent a diversity of national developmental and environmental circumstances. All the countries listed in Table 12 are representative in some way of particular geographic regions or contexts, meaning that they provide opportunities for widely-relevant learning, and replication of measures to enhance resilience to climate change at larger scales. The selection of countries representing wider regional or geographic situations and contexts addresses the criteria of *Hazard Types*, *Country Distribution* and *Replicability and Sustainability* as specified in the TOR. The criterion of *Country Vulnerability* is addressed explicitly by the vulnerability profiling carried out under Stage 2 of the risk assessment. *Country Eligibility* was addressed during the vulnerability assessment stage of the selection process, insofar as candidate countries that were ineligible according to the terms of this criteria were ruled out of the selection.

Country Preparedness is inferred from the Resource Allocation Index (RAI). Crucially, the EG felt that countries should not be ineligible for participation in the PPCR on the grounds of low capacity or preparedness, as this would exclude many high-risk countries, exacerbating their vulnerability and entrenching and enhancing existing inequalities. Furthermore, capacity development is an essential element of resilience building. Even countries with high RAI scores may be poorly prepared to confront climate change, as the index is not climate change-specific. Thus, while the RAI was identified as the most appropriate readily available indicator of preparedness, it should be treated with caution, and it is the view of the EG that countries should not necessarily be excluded from the PPCR based on their RAI score. Careful consideration will need to be given to the balance between the implementation of specific resilience-building measures targeted at particular areas, groups and sectors on the one hand, and more general capacity-building measures on the other. Where a country's RAI score is low, as is the case with a small minority of countries selected as principal or alternate choices, an emphasis on the latter will be appropriate.

The *Coherence and Value Addition* and *Scalability and Development Impact* criteria cannot be represented by any readily available indicators, and assessment of these criteria requires detailed country-specific knowledge. Furthermore, these criteria will depend to a large extent on the nature of resilience-building measures and how these measures are implemented. Development impact will also be a function of risks or damages mitigated or avoided, quantities which are difficult to assess even at the sub-national level.

The risk-based approach provides a consistent, transparent, and relatively systematic and robust way of combining expert judgment with analysis based on quantitative data, and enabled the EG to identify a number of countries for possible participation in the PPCR in a very short time period that precluded detailed sub-national scale analyses. This approach circumvents some of the problems associated with the use of contested "universal" indicators on the one hand, and with the subjectivity inherent in expert judgment on the other. Nonetheless, this approach has its limitations, and the time constraints under which this study was undertaken (together with some more fundamental issues related to the uncertainties associated with future changes in climate) mean that a number of caveats must be highlighted.

The use of coherent, large-scale projected manifestations of climate change as an entry point in a global risk assessment identifies regions in which exposure to climate change hazards is likely to be high, and potentially extreme. However, it must be recognised that countries will also be exposed to many complex hazards that are not captured in this analysis. Some of these hazards may be unforeseen, while others are inherently unpredictable and may interact with each other. Others, such as changes in the behaviour of extremes, may have a cumulative impact. In this sense the hazard-identification process employed here is somewhat simplistic.

While the projections employed in this study are associated with high or reasonably high levels of confidence, it must be recognised that climate projections are associated with uncertainty, and that the projections employed here are based on particular scenarios and sets of climate models. Atmospheric greenhouse gas concentrations are rising more rapidly than represented in the IPCC scenarios, and these scenarios may be conservative, underestimating the magnitude of anthropogenic greenhouse warming (Raupach et al., 2007; Pittock, 2008). Consequently, the evolution of climate change hazards throughout the 21st century may be different from that assumed in this analysis, and other large-scale, long-term hazards may arise that are not captured in the projections employed here.

A number of caveats must also be highlighted regarding the use of vulnerability indicators, related to their representativeness, reliability, appropriateness, applicability to future changes in climate as opposed to existing climate variability, and their ability (or rather inability) to capture all the various factors that determine populations' and countries' vulnerability and capacity to adapt to climate change. These issues are discussed in more detail in Annex 1.

The methodology employed here has the potential to be extended and refined in order to provide a more robust and detailed risk assessment framework that may be applied at the global, regional, national and sub-national level. This would require the development of hazard and vulnerability indicators appropriate to specific hazard and developmental contexts, normalized so that different units of analysis (e.g. countries, regions at the sub-national level) could be compared. This would be a major undertaking, but would move the field of climate change risk assessment forward beyond the current reliance on simplistic and highly contested "universal" indicators of vaguely defined "vulnerability" that are of limited utility. This issue is discussed in more detail in Annex 1.

The risk assessment approach adopted by the EG is a "top down" approach, which raises issues of country ownership and the extent of country buy-in as highlighted in the Preface. A more participatory, "bottom up" approach would go some way towards addressing this issue. However, a completely participatory approach may be incompatible with a strategic risk assessment, resulting in a selection process that favours those countries with the greatest capacity and preparedness, rather than those that are most at risk. This could result in the further marginalization of the most vulnerable countries, entrenching existing inequalities between countries. Some combination of "top down" and "bottom up" approaches therefore might be appropriate. This might involve opening the PPCR process to more countries based on an initial strategic risk assessment that identifies a larger group of high-risk nations, followed by a more participatory approach driven by the countries themselves.

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Food and Agriculture Organization: http://www.fao.org/corp/statistics/en/

EM-DAT Emergency Events database:
http://www.emdat.be/Database/Maps/maps.html

World Resource Institute: http://www.wri.org/

UNDP Adaptation Country Profiles: http://sdnhq.undp.org/gef-adaptation/profiles/

SOPAC and UNEP, Environmental Vulnerability Index:
http://www.vulnerabilityindex.net/EVI_2005.htm

Annex 1. Indicators

Indicators are variables that act as proxies for quantities or factors which require some form of quantitative or semi-quantitative representation, for example in an analysis that requires a number of varying quantities or factors to be represented in a simple form so that these quantities or factors can be easily compared, e.g. across countries. Indicators may be single, measurable variables that represent a wide set of conditions (e.g. household income as a proxy for economic well-being). Alternatively, an indicator may be constructed by aggregating a number of variables, for example by averaging, assigning scores to the entities represented (e.g. countries, households) based on their positions in ordered rankings, and so on. Composite indicators are often referred to as indices.

Indicators are used widely to assess economic, social, political and environmental conditions, and in recent years increasing attention has been focused on the development of indicators for use in the area of climate change, for example to assess the vulnerability and adaptive capacity at the national level. The study by the PPCR EG employed such indicators in order to identify countries for potential participation in the PPCR, and these are described below. However, a number of general caveats need to be considered when using indicators, particularly when these indicators represent conditions at the national level with respect to a complex issue such as climate change.

Limitations of indicators

Various indicators have been developed to assess the "vulnerability" of countries to climate change, and these might be used as "off the shelf" datasets in the selection of countries as candidates for participation in the PPCR development assistance. However, such generic or universal indicators are problematic and have a number of severe limitations, not least a lack of definitional rigour coupled with ambiguity about what precisely is being measured.

While most of these indicators are described as measures of vulnerability, many of the associated studies lack coherent conceptual frameworks and fail to define vulnerability clearly. The studies in question encompass a range of (explicit or implicit) conceptions of vulnerability, some of which treat vulnerability in terms of the underlying social factors that might make countries sensitive to climate change. Other formulations follow the more general definition in the IPCC (2001, 2007) which is similar to many definitions of risk in that it treats vulnerability as comprising both underlying sensitivity and exposure to hazards (see Brooks (2003) for a fuller discussion). The TOR for the PPCR EG specifies that indicators of both vulnerability and hazard should be employed in identifying countries to participate in the PPCR, suggesting a formulation of vulnerability as one component of risk, and separate from country-level exposure to hazard. Using this formulation, many "vulnerability indicators" are actually measures of risk.

Few indicators purporting to measure vulnerability to climate change consider the way in which climate change will manifest itself, which is through a combination of transient and long-term hazards associated with changes in climatic variability and average climatic conditions, and the impacts of these changes on various natural and human systems. Furthermore, universal indicators generally do not address the fact that climate change hazards operate via different developmental contexts in different countries, and pay little or no attention to the mechanisms through which climate change hazards might be translated into adverse developmental outcomes. Consequently, the relevance and validity of many vulnerability indicators to assessments of climate change risks remains unproven. The long-term nature of climate change risks also means that validation of indicators through comparisons between predictions and outcomes is extremely problematic. Even those indicators that do capture elements of climate change risk will be more appropriate to some contexts than others countries, leading to potential biases in indicator-based assessments.

Examples of existing vulnerability indicators

Various indicators of "vulnerability" to climate change have been identified by a number of authors, and a variety of composite vulnerability indices (constructed by aggregating individual indicators) have been developed. Generally, these indices have been developed to assess national-level vulnerability so that different countries may be compared, and many have been used to produce country vulnerability rankings. While most of these indices are described as measures of vulnerability, many of the associated studies lack coherent conceptual frameworks and fail to define vulnerability clearly, as a result. Some of these indices measure aspects of the intrinsic vulnerability of societies to the vaguely defined threat of "climate change", without addressing the specifics of future climate risks or potential climate change hazards. Some measure vulnerability to particular types of climate change hazard, relying solely on development-related indicators. Others include considerations of the degree of exposure to climate change related hazards, and might be described as indices of risk within the framework employed by the PPCR EG (where risk is seen as a function of exposure to hazard and the underlying vulnerability of the exposed societies). With a very few notable exceptions, the vast majority of indices incorporate little or no attention to the processes, mechanisms and pathways associated with the impacts of climate change and their developmental outcomes, due to a combination of low spatial resolution and a lack of attention to the highly contextual nature of vulnerability and risk.

A number of indices have been developed that aim to capture the underlying or "social" vulnerability of countries to climate change or its manifestations. These indices do not include any information about projected changes in climate, and are constructed from data relating to existing social, economic, political and environmental conditions (thus incorporating elements of environmental vulnerability). Three key indices of social vulnerability, particularly relevant in an African context, are the Water Poverty Index (WPI) (Sullivan, 2005), the Climate Vulnerability Index (CVI) (Sullivan and Meigh, 2005), and the Social Vulnerability Index (SVI) developed for Africa by Vincent (2004). All three of these indices focus on water resources, and involve the subjective selection of indicators informed by studies and evidence of the drivers of vulnerability to water scarcity. The CVI is an extension of the WPI. Another index of vulnerability (the Climate Disaster Vulnerability Index or CDVI) has been developed by Brooks et al. (2005), constructed from indicators exhibiting a statistically significant relationship with climate-related disasters over for the final two decades of the twentieth century.

These indicators attempt to characterise the underlying vulnerability of societies to specific climate related stresses, namely water scarcity and climate-related disasters. The WPI and CVI are designed to be applied in a range of contexts and at different scales, while the SVI and CDVI have been developed explicitly for the assessment of vulnerability at the national level. None of these indices provides a comprehensive picture of vulnerability to the diverse impacts of climate change, instead addressing vulnerability to certain types of hazard that are associated with climate variability in general (although the CVI has been developed to incorporate contextual information that may include representations of the manifestations of climate change).

Brenkert and Malone (2005) used a Vulnerability-Resilience Indicator Model (VRIM) to produce a vulnerability index for 100 countries, separated into components representing sensitivity and adaptive capacity. This is a generalized index meant to address vulnerability to a range of hazards or stresses, and does not explicitly address specific hazard contexts or impacts pathways that link hazards to outcomes. These indices do not incorporate any consideration of the potential future evolution of climate-related hazards. Yohe et al. (2006) have built on the assessment of "social" vulnerability by Brenkert and Malone (2005) to produce an index of (biophysical) vulnerability (or risk), which incorporates considerations of exposure to climate change. The exposure component is based on projections of temperature for different climate change scenarios and different estimates of climate sensitivity (defined as the increase in global mean surface temperature associated with a doubling of atmospheric CO2). However, this dataset is of limited utility, as temperature increase is a crude proxy that does not address mechanisms or pathways associated with the impacts of climate change and their outcomes. Furthermore, for certain contexts (e.g. high sensitivity and high emissions), the majority of countries (particularly in Africa) are simply characterise as exhibiting "high vulnerability". Data are missing for many countries in Africa and parts of Asia. The values of climate sensitivity used are 1.5º and 5.5º C, significantly lower and higher than the most recent scientific estimates, which suggest a likely climate sensitivity or around 3º C. (Meehl et al., 2007).

A variety of other indices have been proposed for the assessment of vulnerability, such as the Environmental Sustainability Index and the Environmental Vulnerability Index, both of which attempt to capture exposure to environmental stress and represent socio-economic drivers of stress. However, climate change is not explicitly represented in either of these datasets.

Other general development indicators exist, such as the human development index, and human development and poverty are widely assumed (explicitly and implicitly) to be proxies for vulnerability. However, such assumptions are overly simplistic and do not address the highly contextual nature of vulnerability and adaptive capacity, nor to they consider how the factors that mediate vulnerability and adaptive capacity will vary depending on hazards and types of outcome, as discussed above. Although the poor are likely to be vulnerable to the impacts of climate change for a variety of reasons (e.g. poor housing, health, lack of access to resources and information), poverty does not map simply onto vulnerability. For example, primary subsistence producers may be more immediately affected by variations in temperature and rainfall that impact agricultural yields, while urban dwellers are able to purchase food from a variety of sources, decoupling their food intake from climate variability. However, where climate change or variability leads to widespread declines in food production, "poorer" rural populations able to engage in subsistence may be less vulnerable than non-producers such as urban dwellers who cannot access food due to a combination of scarcity and rising prices. Wealthier populations may also experience greater exposure to climate hazards, depending on the nature and geographical distribution of these hazards. For example, populations with relatively high incomes living in small island states may suffer greater exposure to climate change via hazards such as sea-level rise and changes in storm behaviour than poorer populations in areas where the manifestations of climate change are less problematic or even (in some cases) beneficial (e.g. extended growing seasons, higher rainfall).

Indicators of risk therefore must move beyond the simplistic equation of vulnerability to poverty, and pay attention to the contexts in which vulnerability and climate change impacts will be played out, including the exposure of human populations to climate hazards, the nature of which will vary geographically and over time.

Use of indicators in country selection for possible participation in PPCR

For the reasons outlined above, the identification of countries for potential participation in the PPCR was not driven by an analysis based on universal indicators, but on expert judgment supported by indicator-based analyses. Where indicators were employed, they were selected on the basis of their relevance to specific developmental and hazard contexts defined for regional country groupings, and different indicators were emphasised for different contexts. Consequently a number of existing "vulnerability" indicators were not used, due to questions about their relevance to the hazards identified as the drivers of climate change risks and their ability to capture key elements of vulnerability as relevant to outcomes within regional and national development contexts. Nonetheless, the shortcomings of the indicators employed in this study must be acknowledged, and these are discussed below where appropriate.

A number of indicators were employed to support the country identification process for each region. Some of these are composite indicators developed to examine national-level vulnerability and/or risk, while others are single-variable indicators chosen for their relevance to a particular national or regional context (based on the combined consideration of key hazards and developmental baselines, and potential adverse outcomes arising from the interaction of hazards and development baselines which mediate vulnerability). Individual indicators are described below, along with explanations of the rational behind the choice of each. Each indicator represents a particular type or element of risk or vulnerability (including exposure to particular types of hazard), indicated by the main upper case subheadings. Indicator acronyms as used in the regional tables are given in brackets.

It must be emphasized that the indicators employed in the EG study are not independent, and in some cases different indices are derived from similar datasets. For these reasons, and also in recognition of the multi-faceted nature of climate change risk and vulnerability, indicators were not aggregated into a single composite index. Instead, assessments of the relative vulnerability of countries within a particular regional group were based on consideration of a number of indicators together, and countries were selected based on their inferred high vulnerability across a range of relevant indicators (not all indicators were considered for all regions, as some indicators are more relevant in certain regional contexts than in others). Country selection was therefore based on considerations of consistency in a country's score across multiple indicators, rather than a country's high score or rank in a single index. This approach also accommodated the fact that the indicators used were expressed in a number of different units and using a number of different scales. For example, the CDRIb uses a scale of 1-5, whereas the RAI uses a scale of 1-6. Using "raw" indicators avoided the need to add another layer of analytical complexity (and by extension capacity) in the form of a standardization procedure.

The following general caveats apply to the use of vulnerability indicators in this study:

1. Representation of vulnerability. While every effort was made to use indicators of vulnerability that are appropriate to the hazards and risks faced by countries, these indicators are necessarily crude in their representation of the factors driving vulnerability, which are complex, operate to a large extent at local scales, and are context specific. There will be elements of vulnerability that are not captured in this analysis, and these may be of crucial importance in certain contexts. In particular, while the HDI is viewed as a reasonable proxy for adaptive capacity, this is a subjective judgment, and its ability to capture the

capacity of populations to adapt, and the constraints on this capacity, is unproven.

2. Data quality. Inevitably, there are issues relating to the reliability of some of the data from which the indicators are constructed. As indicated in the report, some of the indicator data representing small islands appear to be unreliable. Figures for numbers of people killed or affected by climate-related disasters may be over- or under-estimated, and reporting will not be even across countries, leading to a skewed representation of vulnerability or risk for some groups of countries.
3. Scale and representativeness. National-level indicators aggregate data at the country scale, and consequently cannot represent sub-national scale variability. As a result, sub-national "hot-spots" of vulnerability/risk may not be detected. This is especially problematic for large countries, within which certain highly vulnerable populations may be missed due to the averaging associated with aggregation. These populations may exceed those of smaller countries.

Details of indicators used in the EG study

EXPOSURE TO COASTAL HAZARDS

Percentage of national population in low-elevation coastal zone (LECZ)
Certain regions and country groups were selected on the basis of their high exposure to sea-level rise and associated coastal hazards. For this type hazard, some indicator of the degree of exposure of each country was required. The percentage of national population in the low-elevation coastal zone, from the CIESIN Global Rural-Urban Mapping Project (GRUMP) was chosen for this purpose. This is based on data gridded at a resolution of 1km x 1km, with the LECZ defined as the area below 10 m elevation above mean sea level (amsl) and within 100 km of the shoreline. This is a rather crude definition, but gives and indication of the population potentially at risk from sea-level rise, tropical storms, and other types of coastal climate hazards/extremes, as well as those potentially at risk from the economic impacts of these hazards and changes in coastal and marine ecosystems (e.g. via impacts on livelihoods).

The low spatial resolution of this dataset makes it problematic for use in small islands with variable topography, resulting in severe underestimation of population in the LECZ in many Caribbean Islands, as indicated by the low estimates of coastal populations in the Caribbean, a problem identified by experts on this region within the EG. This is a problem identified in the methodological notes of the dataset, which state that "The spatial detail of census data varied greatly between countries and 1km resolution was considered the highest resolution that could be supported globally. The SRTM data utilized was at a resolution of 1km to facilitate a 1 to 1 spatial match with the population data. By degrading the resolution of the SRTM data to 1km, the estimates shown likely underestimate the population counts in the zone. A 10 meter elevation ceiling was chosen in part because of the error documented in SRTM data precision globally."

For the above reason, this dataset was used to assess exposure to coastal hazards in South Asia, Southeast Asia, and the Pacific (where the low-lying nature of many islands means that problems associated with spatial resolution combined with high topographic variation are avoided), but not the Caribbean, where a greater emphasis was placed on expert judgment.

Further information on this dataset is available in McGranahan et al. (2006, 2007).

Environmental vulnerability index (EVI)

The Environmental Vulnerability Index (EVI) was used in place of the LECZ indicator for the Pacific region, in which the LECZ indicator is unreliable for the reasons outlined above. The EVI is an integrated index of country-level vulnerability constructed from individual indicators representing exposure to disasters, status of the natural environment and society at large, and the capacity of society to adapt to external stimuli including climate change. The EVI uses from 4 to 100 or more indicators according to its purpose. The EVI used in the analysis of small island countries in the Pacific was jointly developed by SOPAC and UNEP to reflect specific situation of small island countries. Further information on the EVI is available at: http://www.vulnerabilityindex.net/EVI_2005.htm.

VULNERABILITY TO WATER SCARCITY

One of the major, and most problematic, impacts of climate change will be on the availability of water resources, with a number of regions (e.g. North Africa and the Maghreb, southern Africa, Central Asia) projected to experience severe water scarcity as a result of a combination of reductions in rainfall and enhanced evaporation due to higher temperatures. Other regions (e.g. the Andean region and parts of South Asia) will experience reduced water availability due to the loss of glaciers that provide significant water resources, particularly in the spring. Exposure to water scarcity and climatic desiccation at the regional was assessed on a semi-quantitative basis using IPCC projections and expert judgment. Within these regions, vulnerability to water scarcity was assessed using the following two complementary indicators.

Population with access to an improved water source (IWS)
This variable, values for which were extracted from Table 7 of the 2007 Human Development Report (representing percent of national population with access to an improved water source in 2004), was used as a proxy for vulnerability to increased water stress in regions where principle hazard is climatic desiccation or reduced water availability. The rationale behind this choice was that people without access to an improved water source are more likely to rely on sources of water that are strongly coupled to climatic change and variability, such as rivers and wells whose productivity is dependent on fluctuating groundwater levels. In the event that these sources fail due to drought or desiccation, alternative sources may not be readily available, particularly in isolated rural areas with not water distribution infrastructure. Populations not supplied by mains water sources are also likely to be a lower priority for governments than those dependent on centralised distribution, for example in urban areas. See UNDP (2007) for further information and data.

Climate Vulnerability Index (CVI)
The CVI is a composite index developed at the University of Oxford which captures local/national contextual information, focusing on vulnerability to climate change associated with water availability, quality and access. This dataset was used as an additional indicator of vulnerability for regions facing climatic desiccation and other hazards linked with water availability (e.g. transient droughts, flooding which might result in water contamination, etc), on the basis that it captures a wider range of factors contributing to vulnerability to water stress (and other potential climate change hazards) than the IWS indicator. The use of regionally relevant contextual information also makes this indicator more representative of conditions at the national level than many other “universal” vulnerability indicators. Further information on this dataset is available in Sullivan and Meigh (2005).

VULNERABILITY TO FOOD INSECURITY

Population undernourished (FI)
The percentage of national population undernourished in the period 2002/2004, from Table 7 of the 2007 Human Development Report, was used as a proxy for vulnerability to increased food insecurity likely to be associated with hazards such as climatic desiccation and a general reduction in water resources, which will have impacts on domestic food production (both commercial and subsistence). The rationale behind the choice of this indicator is that those who are already food insecure are likely to be hardest hit by any further reduction in food availability, arising from reduced domestic production, reduced food imports, or increases in food prices, all of which are potential consequences of regional changes in climate such as those on which the selection of climate change "hot-spots" is based. Food insecurity is a common outcome associated with other hazards such as flooding, so this indicator is a wide relevance.

ADAPTIVE CAPACITY

Human Development Index (HDI)
The capacity of societies, communities and individuals to respond and adapt to climate variability and change (generally referred to as "adaptive capacity") is an important component of vulnerability to long-term climate change hazards such as those on which this analysis is based. There is still much debate about how adaptive capacity can be assessed, but it is generally agreed that access to resources and information, and the ability and willingness to make adaptation decisions and take necessary adaptation actions, are key factors determining adaptive capacity. Countries' HDI rankings are used as a crude proxy for adaptive capacity, as the HDI captures information about education, economic wealth, and human health, all of which are important in mediating people's and countries' ability to understand and respond to climate change risks. The HDI rankings are taken from Table 1 of the 2007 Human Development Report. Countries with high HDI rankings were not selected in order to ensure that focus remained on countries in which adaptive capacity needs to be improved.
Elements of adaptive capacity are also captured by the dataset of Brooks et al. (2005), which is discussed below (see CDVI).

GENERALISED VULNERABILITY TO CLIMATE-RELATED DISASTERS

Climate Disaster Vulnerability Index (CDV)
A study by Brooks et al (2005) identified 11 development-related variables that were significantly correlated with mortality from climate-related disaster outcomes (represented by data from the EM-DAT) in a global analysis of national-level data representing decadal periods (1980s and 1990s). These 11 variables were combined into a composite vulnerability index, based on 13 different sets of weightings of the constituent indicators. The frequency of occurrence of countries in the upper quintile of these 13 different versions of the index was then calculated, and countries that occurred in the upper quintile one or more times were listed, along with the frequency of occurrence, yielding a "score" of 1-13 for a subset of 60 "highly to moderately" vulnerable countries. The presence of a country in this subset, and its score from 1-13, were used as supplementary indicators of vulnerability for all regions, with 13 indicating extreme vulnerability.

The CDVI score is not a ranking, but rather represents the consistency with which a country is classified as among the most vulnerable countries across different versions of the same indicator set, which emphasise different components of vulnerability.
This index combines indicators which represent vulnerability to sudden-onset transient extremes such as floods and storms (e.g. population with access to sanitation) with

indicators likely to be representative of a country's capacity to adapt in the longer term (e.g. education and governance indicators).

CLIMATE DISASTER RISK

Climate Disaster Risk Index (a): Cumulative numbers affected
This dataset was constructed by dividing the total numbers of people affected by climate-related disasters between 1978 and 2007 by the national population in 2007. Both of these variables were provided by the World Bank. Data on numbers affected by disasters were extracted from the CRED Emergency Events Dataset (EM-DAT : http://www.emdat.be). This dataset was used as a proxy for overall risk associated with historical climate variability and extremes over a 30-year period, as represented by disaster outcomes, aggregating considerations of large-scale exposure and underlying vulnerability. It was used on the basis that countries experiencing large adverse outcomes from recent historical climatic variability already experience high exposure and/or vulnerability to climate hazards, meaning that they are likely to be at high risk from climate change as a result of existing vulnerabilities and the potential for climate change to exacerbate existing hazards. It is likely that records of numbers affected are unreliable for some countries, due to under-reporting or (less likely) over-reporting.

Climate Disaster Risk Index (b): average score across five risk indices
Adger et al (2004) developed five indices of risk associated with historical climate-related disasters represented in the EM-DAT, based on absolute numbers killed, percentage of population killed, percentage of population killed or otherwise affected, and the ratio of killed to affected calculate using two different methodologies. For each index, countries were assigned a score of 1-5 based on their quintile position, with 5 representing high risk. An overall Climate Risk Index was constructed by averaging these quintile rankings for the 1990s and assigning a score of 1-5 to countries based on their position in a ranking by average score. This index was used as a further proxy for historical climate risk, augmenting the above cumulative risk index which was derived from the same EM-DAT data, but which was processed differently and which represents a much longer period.

COUNTRY PREPAREDNESS

Resource Allocation Index (RAI)
There are no direct quantifiable measures for country preparedness for absorbing significant resources and success in implementing adaptation initiatives as part of a PPCR pilot.

However, the EG concluded that the Resource Allocation Index (RAI) of IDA countries would be the closest and reasonably transparent proxy from amongst a very limited set of such indicators. The IDA RAI ranks recipient countries on a scale of 1 to 6, based upon 16 criteria grouped into four equally weighted clusters: (i) economic management; (ii) structural policies; (iii) policies for social inclusion and equity; and (iv) public sector management and institutions. To ensure consistency in performance within and across regions: (i) detailed questions and definitions are provided to country teams for each of the 16 criteria; and (ii) a World Bank wide process for rating and vetting a dozen benchmark countries is carried out to anchor the ratings in all IDA regions.

The IDA RAI is a six point scale from 1 to 6, with better performance reflected in higher values of the indicator. The EG, however, did not have access to RAI values for all IDA countries, and there were gaps in data for most of the regions that were examined by the EG for country selection. Therefore, it was not possible to use RAI as a comprehensive screen. However, available RAI values were considered as part of the expert judgment to assess country preparedness.

Recommendations for future indicator-based assessments

Development of a hazard index

The initial screening process to select regions (or countries) with high exposure to climate change hazards might be placed on a more formal and rigorous footing by developing a global database that assesses exposure to climate change related hazards at the national (or sub-national) level. This would involve the identification of a number of "key hazards" for individual countries, and the representation of the "intensity" of each of these hazards for each country using appropriate indicators. Such a database might include indicators of projected changes in temperature, evaporative moisture losses, relative sea-level rise, estimates of potential changes in the frequency of climatic extremes based on modelling or expert judgment, an index relating to the potential for a country or region to be affected by abrupt non-linear changes in climatic or environmental conditions, and indicators representing existing or baseline exposure to climate-related hazards (e.g. frequency of tropical cyclones and/or other extremes). The resulting hazard index might assign scores to countries for a number of hazard categories, which would provide a indication of which hazards were of greatest importance for which countries or regions.

The construction of such a database would be a significant undertaking, but might be feasible without the commissioning of new modelling studies (e.g. to assess potential changes in the behaviour of extremes in a quantitative manner) if it was based on a combination of simple climate variables (e.g. projected changes in temperature and precipitation) and expert judgment regarding the impact of climate change on extreme events and other hazards. Any such index would also need to consider uncertainty, and the timescales associated with the evolution of climate hazards. A hazard index would enable screening for exposure to climate change hazards at the national (or sub-national) level to be carried out on a more systematic, quantitative basis, while still incorporating a significant amount of expert judgment.

Refining of vulnerability indicators

The vulnerability indicators employed in this study were selected to provide a balance between (i) the need for readily available data that were easily interpretable and which could be used with minimal additional processing in a rapid assessment within severe time constraints, and (ii) the need to consider the contextual nature of climate change risks and the fact that vulnerability and exposure vary geographically and depending on the nature of the hazards being examined. The indicators employed here, and the way in which they were used, went some way towards acknowledging the complex and context-specific nature of climate change risks. Nonetheless, there are a number of ways in which this element of the analysis could be improved, given sufficient time and resources, particularly with respect to the use of indicators.

There is considerable scope for tailoring vulnerability indicators to both national developmental and hazard contexts. A set of indicators might be developed for each type of hazard (for example as represented in a hazard index), and these might be applied to the countries affected by that hazard. The result would be a more detailed national-level risk assessment tailored to the most important hazard(s) for each country in the analysis.

Further refinement might involve the use of a subset of hazard-specific indicators to account for different national development contexts. For example, a set of indicators representing vulnerability to drought or long-term desiccation might include different variables depending on whether the main impacts are likely to be on agriculture, pastoralism, or water resources for domestic and industrial consumption. These impacts would depend on livelihoods and the structure of the national economy. A highly agrarian nation whose economy depends heavily on agricultural exports may be concerned principally with agricultural impacts, whereas a country with a large population whose livelihoods are based on pastoralism might be more concerned with the impacts of drought on rangelands. A country dependent on industry or services, with a small agricultural base in which pastoralism is absent or negligible, might be more concerned about the impacts of drought and desiccation on domestic and industrial water supplies. In practice the relative importance of impacts on different sectors will vary across countries, meaning that different indicators might be given different weights in different national contexts.

Tailored indicators representing hazard and development contexts at the national level might be developed to reflect different aspects of vulnerability, specifically exposure at the sub-national level, factors driving the vulnerability of exposed populations, and the adaptive capacity of the exposed populations. Some of the indicators used in this study might be refined, providing a starting point for such an exercise. For example, the LECZ dataset might be refined to give a better picture of exposure to hazards associated with sea-level rise by using higher-resolution data representing coastal areas lying under specific elevations associated with risks from specific, plausible magnitudes of sea-level rise (e.g. 0.5m, 1m, 2m, etc). This might be complemented by a vulnerability index tailored specifically to the coastal zone, which represents the quality of infrastructure, coastal governance, the regulatory environment and the presence, coverage and efficacy of early warning systems.

Vulnerability to climatic desiccation might be assessed in terms of the marginality of existing water resources and/or agriculture, for example based on areas under rain-fed agriculture where rainfall is below a certain threshold, and the potential for irrigation based on existing groundwater resources. A high vulnerability score in this respect, coupled with a high score in a hazard index representing projected desiccation or increased drought incidence, would indicate high risk to agriculture. Alternatively, a specific agricultural risk index might be constructed that represents the proportion of agriculture (measured in terms of value, areal extent or dependent population) in areas where projected changes in precipitation encompass values that would reduce rainfall below the limit for rain-fed agriculture. Similarly, tailored risk indices could be developed for other contexts, which provided more detailed, quantitative information on area, value or population at risk than the combined hazard and vulnerability indices.

General considerations

The above measures would result in a set of hazard and vulnerability (and perhaps composite risk) indicators that varied across countries, either in their nature or in their relative importance expressed through weightings. These indicators might be normalized so that countries could be compared, for example by expressing each indicator in terms of a score from 1 to 5 for each country. However, the development of a single index for comparisons between countries is not recommended, as even improved indicators are unlikely to be able to capture all aspects of risk, making comparisons between individual countries on this basis unreliable. Rather, it is recommended that countries be grouped into categories representing hazard, vulnerability and/or risk as “extreme”, “high”, “moderate”, etc. Examination of individual indicators rather than of an aggregate index would also allow different aspects of hazard, vulnerability and risk to be assessed, making any risk assessment more transparent and nuanced.

The tailoring of indicators to hazard and development contexts would require an extensive study of the factors driving vulnerability in many different countries and contexts, in addition to a study to determine the nature of climate change hazards at the national level. Issues of weighting may also be contentious. Such an undertaking therefore presents considerable challenges in terms of resources, time and expertise required, and also in terms of methodology. However, such an undertaking would be worthwhile to establish a better foundation for climate change risk assessments, and might be piloted in one particular region initially. Initially, the indicators used in this study might be refined, providing a basis for the further development of indicators tailored to specific contexts.

Annex 2: Projects, Programmes, and Strategies: three modes of adaptation.

Box 1: Projects, Programmes, and Strategies: three modes of adaptation.

At the national level adaptation to climate change can be addressed in terms of projects, programmes and strategies. Initially the preferred approach was to gain experience primarily through projects. For example under the GEF SCCF (Special Climate Change Fund) and SPA (Special Priority for Adaptation) a series of specific adaptation projects have been funded. Also the NAPAs (National Adaptation Plans of Action) were similarly funded through LDCF (Least Developed Countries Fund) for the purpose of identifying priority adaptation projects. More recently other sources of funds for adaptation projects have come into the picture including multilateral and bilateral donors and in some cases NGOs.

There is now a need to integrate adaptation into development programme activities such as programmes for particular sectors (agriculture, water, health, and so on); for particular hazards, (floods, droughts, storms); and for particularly hazardous or vulnerable places and people such as coastal zones, or the urban and rural poor. The PPCR is primarily directed towards the incorporation of climate change risks into such programmatic approaches, often involving single sectors.

It is further recognised that at the national level a broad strategic approach to climate change is also required in which multiple risks can be examined in multiple sectors and allocations made among them. Over time programmatic approaches can contribute to the development of more integrated national planning and policy such as might be formulated in a national climate strategy which includes both adaptation and mitigation and their co-benefits.

The PPCR is designed to help countries move beyond the project stage to the programmatic level and so indirectly to contribute towards broader more strategic policies at the national level. In some cases programmatic level adaptation may be already in progress or can be initiated immediately. In other cases capacity building is required to enable a larger set of countries to access adaptation funding in the future.

The three modalities are not mutually exclusive but complementary. All three need to happen simultaneously and the amount of activity of each kind depends on both the availability of support and on the capacity of the national government.

Annex 3: TORs for the Expert Group to the PPCR

Background and Introduction

1. Recognizing that UNFCCC deliberations on the future of the climate change regime are underway, including discussions on a future financial architecture and funding strategy for climate change, multilateral development banks (MDBs) have developed an interim measure to scale-up assistance to developing countries and build the necessary knowledge base in the development community. The Climate Investment Funds (CIF) are to build on progress made by many of the developing countries, with the objectives of scaling up investments in low-carbon technologies (Clean Technology Fund), and supporting various programs to test innovative approaches to climate action (Strategic Climate Fund). Designed as an interim instrument, the CIF include specific sunset clauses linked to agreement on the future of the climate change regime.

2. The SCF will provide financing to pilot new development approaches or to scale-up activities aimed at a specific climate change challenge or sectoral response through targeted programs. The first program to be included in the SCF, the Pilot Program for Climate Resilience (PPCR), will pilot national level actions for climate resilience in 5 to 10 highly vulnerable countries.

PPCR Goals and Objectives

3. The Pilot Program for Climate Resilience (PPCR) is designed to:

   (a) deliver programmatic funding at scale in 5 to 10 highly vulnerable countries to help transform country-led national development planning to make it more climate resilient;
   (b) be country-led and build on National Adaptation Programs of Action (NAPAs) and other relevant country studies, plans and strategies;
   (c) be complementary to existing sources of adaptation funding and supportive of the evolving operation of the Adaptation Fund;
   (d) provide crucial lessons on how to invest in climate resilience through national development planning consistent with poverty reduction and sustainable development goals.

Mandate of the Expert Group

4. An Expert Group is to be established by the Sub-Committee of the PPCR and provided with appropriate guidance by the Sub-Committee to make recommendations on country selection for the pilot program based on:

   (a) transparent vulnerability criteria;
   (b) country preparedness and ability to move towards climate resilient development plans taking into account efforts to date and willingness to move to a strategic approach to integrating climate resilience into development; and
   (c) country distribution across regions and types of hazards (as appropriate to a pilot program).

5. The guidance provided in this note is to help the Expert Group in selecting 5 to 10 highly vulnerable countries to be recommended for inclusion in the PPCR.

Country Selection Core Questions

6. It is recommended that the Expert Group take into account the eight core questions outlined below when formulating its recommendation on the countries[6] to be included in the pilot program:

First order selection criteria

I. Country Vulnerability

7. Extent to which recommended country can be considered vulnerable to one or multiple climate risks (in terms of droughts, floods, storms, coastal 1 meter zone, coastal 5 meter zone, etc); extent to which recommended country has relevant special needs as guided by agreed international processes and Conventions, for example the IPCC, and relevant principles and articles of the United Nations Framework Convention on Climate Change (UNFCCC). In looking at country vulnerability, the Expert Group is expected to not only take into account the strength of the physical climate impact signal, but also consider country exposure, sensitivity (as a function of dependence of GDP on climate sensitive sectors), and adaptive capacity (being partly a combination of human development index (HDI) and governance).

II. Country Eligibility

8. Is recommended country (a) ODA-eligible (as per OECD/DAC guidelines); (b) does recommended country have an active MDB country program (i.e., an MDB lending program and/or an on-going policy dialogue with the country), and (c) is the recommended country a highly vulnerable Least Developed Country eligible for MDB concessional funds, including the Small Island Developing States among them?

Second order selection criteria

III. Country Preparedness and Rapid Results

9. Extent to which (a) country selection will maximize opportunities for quickly moving towards strategic climate resilient development planning that provides rapid results and replicable experiences and lessons over the next few years while ensuring coherent demand-driven support to national PPCR partners; (b) country is already receiving external funding for adaptation; (c) country can absorb additional external support through PPCR; and (d) PPCR can build needed adaptive capacity by supporting national adaptation programs, plans, or policies.

IV. Country Distribution

10. Extent to which the list of recommended pilot countries is regionally representative as befitting a pilot program. Within this context and sample-size permitting, the Expert Group is encouraged to consider other dimensions of 'spread' such as but not limited to: governance indices, various dimensions of vulnerability, a mix of developmental stages for selected countries. And it is important to re-emphasize that in line with the design of the PPCR, a group of countries may propose to the PPCR-SC a regional or sub-regional program that brings together a number of country programs.

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[6] In accordance with the design of the PPCR, a group of countries may propose to the PPCR-SC a regional or sub-regional program that brings together a number of country programs. A regional or sub-regional program will be considered as one pilot in the program.

In such a case, a regional or sub-regional program will be considered as one pilot in the program.

V. Hazard Types

11. Extent to which the group of recommended countries reflects the range of representative climate hazards (i.e., in terms of droughts, floods, tropical storms, storm surges, typhoons, river floodplains, etc) as appropriate to a pilot program.

Third order selection criteria

VI. Coherence and Value-Addition

12. Extent to which PPCR-financed activities would be complementary to existing sources of adaptation funding and supportive of evolving national, regional or global activities. This includes specific consideration to fully exploiting synergies and potential to include climate change adaptation and disaster risk reduction activities in country programs.

VII. Replicability and Sustainability

13. Extent and likelihood that program benefits, results and lessons will be applied widely and maintained during and beyond PPCR-financed activities.

VIII. Scalability and Development Impact

14. Extent and likelihood that PPCR resources and activities are of sufficient size to help transform national development planning to make it more climate-resilient.

Selection Methodology

15. The selection will be undertaken in conformity with the above guidance and any other material that the expert group finds useful.

Outputs

16. In reporting to the PPCR Sub-Committee, the Expert Group should include information on:

(a) specific description of objectives;
(b) methodology and justification used to arrive at the proposed pilot country listing;
(c) responses to each of the 8 core selection questions;
(d) comprehensive findings from their deliberations providing an assessment/review of key issues (e.g., specific threats/programs that should be addressed by each country).
(e) conclusions and recommended list of countries for inclusion in the PPCR. The proposed list should include 5 to 10 countries (with an alternate choice for each slot).

Consultation

17. To promote broad acceptance and subsequent replication of the PPCR experience and lessons, the Expert Group should undertake consultations with key stakeholders prior to submission of their final report to the PPCR-SC.

Reporting

18. The outputs from the Expert Group will be submitted to the PPCR Sub-Committee for consideration in advance of its meeting in January 2009 in both hard copy and electronic formats. Given the tight schedule of the PPCR, it is fully expected that even before the Expert Group finalizes the report, the PPCR-SC will be appropriately updated on the on-going deliberations of the Expert Group.

Resources

19. The CIF Administrative Unit will submit to the PPCR Sub-Committee a proposed budget for the costs of the Expert Group for review and approval.

Proposed Time Frame and Schedule of Milestones

20. It is expected that a proposed list of pilot countries will be reviewed and approved by the PPCR-SC at its meeting in mid-January 2009. The proposed schedule for the major tasks is as follows:

- (a) November 19, 2008: PPCR-SC appoints Expert Group members.
- (b) November 26, 2008: Administrative Unit enters into contract with the experts.
- (c) December 1-7, 2008: Consultations with stakeholders during the fourteenth session of the UNFCCC Conference of the Parties, Poznan, Poland.
- (d) December 19, 2008: Interim update to the PPCR-SC.
- (e) January 5-9, 2009: Expert Group Meeting and Report writing, Washington D.C.
- (f) January 14, 2009: Report of Expert Group submitted to the Administrative Unit.
- (g) January 20, 2009: Submission of report of Expert Group to the PPCR-SC

21. The PPCR-SC is invited to approve the schedule. Change may be necessary in light of the tight time constraints.

Roles and Responsibilities

22. The PPCR-SC is responsible for selection of the experts to serve on the Expert Group, for providing general guidance to the group and for approving the necessary budgetary support. The PPCR-SC is also responsible for determining the countries to participate in the pilot program. The expert group is responsible for preparing a report to the PPCR-SC on the selection of pilot countries, including a recommended list of countries to participate in the program. The CIF Administrative Unit will service and coordinate the PPCR Expert Group process.

Annex 4: Consultations by the Expert Group to the PPCR undertaken between Monday 24th November – Monday 5th January

Since its establishment in late November 2008 the EG has been engaged in consultations with Parties to the UNFCCC, and a variety of other experts and interested groups and individuals. The EG has operated largely in "listening mode" gathering ideas and suggestions, and clarifying its own role and work as required. Informal and formal consultations have been held by members of the Expert Group (EG) regarding its mandate and the selection of countries. A list of organisations and individuals consulted so far is presented at the end of this document.

Formal consultations took place through an Expert Group Consultation Meeting held at the UNFCCC COP (COP14) in Poznan on Saturday 6th December. The meeting was chaired by three of the 8 EG members: Ian Burton, Balgis Osman-Elasha, and Saleemul Huq. Enos Esikuri, Senior Environmental Specialist of the World Bank, was also present to help answer questions relating to the role of the World Bank and the PPCR-SC. A number of issues arose from the consultation, which clustered around five key themes:

1. The number of countries in pilot programme;
2. The issue of funding made available through loans versus through grants;
3. The process of application to the PPCR, and criteria of country selection
4. The potential for particular groups or types of countries to be selected such as regional groupings of countries, and post-conflict countries.
5. The relationship between the PPCR and UNFCCC processes

Participants in the consultation felt that a greater number of pilot countries would allow for more generalisable results, and increase the chances of demonstrable programme successes. Representatives of the World Bank justified the initial proposal for a limited number of countries (5-10) on the grounds of the need to ensure that limited funds were not spread too thinly in each case. This is a function of rough estimates of how much money is available under the PPCR, coupled with the need to have a demonstrable impact on adaptive capacity, the costs of which have been estimated at US$50-100 Million. The EG working group acknowledged both points and said the number of pilot countries was something that would be given consideration.

On the question of grants versus loans, many countries expressed dissatisfaction at the fact that some of the funding under the PPCR was to be made available through loans, going against the 'polluter pays' principals of adaptation finance. It was explained that the majority of donors (four out of five) contributing to the PPCR had in fact made funds available through grants, with the exception of the UK, which was making funds available through highly concessional loans. It was noted that countries would have the option of not accepting the concessional loans and accepting only a grant.

Country representatives asked questions about the process for country selection, and how to apply and actively promote their countries for consideration by the EG. It was clarified that there was no application process, only a selection process, in which the role of the EG was to evaluate countries according to the criteria outlined and make recommendations to the PPCR-SC. These recommendations would be made public before the final decision of the PPCR-SC set for January 29th 2009. Comments on recommendations of the EG should be addressed directly to the PPCR-SC who would make the final decision on countries to be included in the PPCR, based on the recommendations of the EG and the feedback they received. Then the selected countries receive an invitation and the process continues from there.

Questions on criteria included whether selection was confined to LDCs that have produced NAPAs. It was clarified that where there is a NAPA this would be built on, but this is not a condition; where there has not been a NAPA, other national processes that demonstrate similar capacity for cross-sector and scale working and mainstreaming, undertaken in a participatory manner, as well as demonstrable interest in and ownership of actions on adaptation and vulnerability reduction, would also be relevant. Other questions around criteria clustered around how the '3 orders' of criteria would be applied and how information against these could be collected. It was noted that while the EG has yet to formally decide on this, it was likely that this would be a cascading process - some criteria are absolute such as the need for an existing relationship with a regional development bank. After this there will be a mixture of quantitative assessments based on data and information drawn from existing national and international databases, coupled with qualitative data gleaned from discussions and interviews with regional, national and international experts. Suggestions for sources of information were welcomed.

Concerns were raised over the eligibility of certain countries to be part of the PPCR, for example small countries that might not be able to demonstrate the 'absorptive capacity' to receive the scale of funding and type of programmatic approach offered by the PPCR; and post-conflict countries that may have difficulty competing on grounds of institutional capacity. It was agreed that the EG would discuss the possibility of countries being grouped. It was clarified that post-conflict states would not be excluded on these grounds; it is also necessary to understand what can be done to address climate resilient development in weak capacity environments, and useful to have a range of 'starting points' in terms of institutional readiness and capacity.

Finally, there were discussions around the role of the PPCR in relation to UNFCCC processes, particularly the Nairobi Work Programme (NWP) and the Adaptation Fund. It was clarified that the NWP will provide information that will be useful to countries participating in the PPCR, although there is no direct connection. It was noted that there should be more clarity about how this all fits together, and a dialogue should be initiated with the NWP. There are close synergies with the Adaptation Fund, with the developing country chair or vice-chair of the Adaptation Fund Board being a member of the PPCR – SC that will decide which countries to include.

List of stakeholders consulted by the EG

Achala Abesekara, Sri Lanka (delegation)
Peter C.Acquah, Secretary, Regional Office for Africa - UNEP
Mohammad Alam, Jordan (delegation)
Mozaharul Alam, BCAS, Bangladesh
Mathbar Adhikary, Nepal delegation
Al Binger, Caribbean Community Climate Change Centre
Fahmi A. Binshbrak, Yemen (delegation)
Maria Brockhaus, CIFOR
Tom Downing, SEI
Kristie l.Ebi, international consultant
Monteils Fabien, Madagascar (delegation)
Suchma Geva, Foreign Affairs, Canada
Anne Hammil, IISD
Saadeldin Ibrahim Izzeldin, Sudan Higher Council for Natural Resources
Bubu Jallow, Gambia (delegation)
Pa Ousman Jarju, The Gambia (delegation)
Richard Klein, SEI
Bo Lim, UNDP
Rahari Mani Zara Lydie, Madagascar (delegation)
Juan Mancebo, Dominican Republic (delegation)
Dr. Elsayed Mansour, Head of Climate Change Unit, Egypt (delegation)
Ajay Mathur, Ministry of Power, India
Dr. Awa Khalifa Musa, Director of Food Security Disaster Management and Refugees Studies, Sudan
Hasan Nagmeldin, Sudan delegation
Anwar Noaman, Yemen (delegation)
Anthony Nyong, African Development Bank
Steven Were Omamo, United Nations Food Programme
Denis Sombi Lansana, Sierra Leone (delegation)
Hawa Sow, WWF Senegal
David Lesolle, Botswana (delegation)
Holger Lipton, GTZ
Jo-Ellen Parry, IISD
Anand Patwardhan, Indian Institute of Technology, India
Atiq Rahman, BCAS, Bangladesh
Mohammad Reazuddin, Bangladesh (delegation)
Jay Roop, Asian Development Bank
Erika Rosenthal, Attorney, International Program, Earth Justice
Ousmam Fall Sarr, Senegal (delegation)
Louis Seck, Senegal (delegation)
Lisa Schipper, Stokholm Environment Institute (SEI)
Seid Abdu Salih, Eritrea (delegation)
Youba Sokona, Director, Sahel and Sahara Observatory
Samir Tautawi, Vulnerability and Adaptation Manager, Egypt (delegation)
Jordi Renart i Vila, United Nations Food Programme