Executive Summary

Adaptation has become an important issue in international and domestic discussions on climate change. Numerous terms and concepts have come into common usage as a result of IPCC reports, discussions in the context of the UNFCCC and dialogs by the climate community at large. This paper examines the key adaptation terms and concepts used by the climate change community and other institutions. Conflicts and contradictions are noted with the aim of sensitizing different bodies to the differences, but particularly the Parties to the Convention and experts participating in the IPCC. Given the need to promote a common understanding among various stakeholders and the potential financial implications of various definitions, it appears important for the IPCC and the UNFCCC to work toward common definitions, at least for a core set of terms and concepts.

1. Introduction

At its meeting on 23 March 2005, the Annex I Expert Group requested the Secretariat to prepare a paper on key adaptation concepts and terms that have entered the UNFCCC lexicon such as 'adaptation', 'vulnerability', 'adverse effect', 'adaptive capacity', and others. The aim of the task is to collect various definitions (found in literature) of the same terms and to clarify these key adaptation concepts and policy issues that are widely used within the UNFCCC context and negotiations.

In the last several years, the issue of adaptation to climate change has moved high on the UNFCCC negotiating agenda. Since COP 7, when three specific funds were created to support implementation of various measures that facilitate vulnerability assessment and adaptation, adaptation has become an increasingly important component of the international climate change dialogue. The Buenos Aires programme of work adopted at COP 10 emphasizes further implementation of specific activities that would enhance countries' understanding of climate change impacts, their specific vulnerabilities, and ability to cope with and adapt to climate change. COP 11 adopted a detailed five-year programme of work on impacts, vulnerability and adaptation to climate change that will assist Parties to the UNFCCC to make informed decisions on implementation of adaptation measures.

Various workshops and expert meetings facilitated by the UNFCCC Secretariat were held to enhance knowledge about adaptation to climate change. There are also numerous events outside the official UNFCCC process that stimulate informal discussions and development of analytical papers aimed at advancing the understanding on adaptation. As these various processes move forward, an important step will be the development of a common understanding of the terms and concepts that are widely used to define the scope of work and funding expectations.

Adaptation itself and many related terms are not defined in either the UNFCCC or the Kyoto Protocol. Many key adaptation terms and concepts are defined by the IPCC in its Third Assessment Report (TAR) and earlier reports[1]. Various other scientific/policy communities use slightly different definitions or freely use terms that have meaning in a common usage, such as, for example, vulnerability, resilience, adaptability but may take on greater significance in a negotiation setting. In addition, UN bodies and national climate programmes have their own definitions of the same terms. It was observed that interpretation of some of key adaptation terms by scientific groups or policy makers can be quite different, which may lead to varied or false expectations and responses.

There is a body of literature that has been created in the last 5-10 years that is devoted to the discussion of vulnerability and adaptation to climate change. As in other fields, scholars and policy makers have invented and used terms to explain their ideas and positions. However, the issue of adaptation is much less mature than mitigation and hence it has not been the subject for rigorous policy analysis, particularly

[1] The use of the reference IPCC TAR implies "Climate Change 2001 Impacts, Adaptation, and Vulnerability. IPCC Third Assessment Report, Cambridge University Press"

economic analysis. This may change as both national and international policy options are given more serious consideration. If this is to occur, scholars and policy-makers may be well served to agree on the usage of some of the key terms and concepts. Examples of such terms are adaptation, vulnerability, impacts, and adaptive capacity. Some other terms, less crucial for defining the concept of adaptation, might be freely used as common words that do not require strict definitions. Examples could be: coping, sensitivity, and adaptability.

This paper provides a list of key concepts and terms for consideration by delegates. The goal of the paper is to illustrate a range of existing definitions of key terms and to facilitate consensus on their use, while noting that some of these terms may not need to be strictly defined, at least until more data and/or understanding is developed.

2. Key Adaptation Concepts and Terms

The following concepts and terms have been identified from reports and documents of the IPCC, the UNFCCC[2], other UN agencies (e.g., UNDP, UNEP, ISDR), and national reports of Annex-I and non-Annex I Parties. Some scientific literature, for example, *Science* and *Nature*, and several academic publications have also been reviewed.

The key terms are presented in alphabetical order. For each term/concept the paper presents various definitions that are found in literature, with the source of a specific definition stated at the end of the definition[3]. The definitions are taken without editing from the original sources. After all definitions of a particular term/concept are listed, the paper presents a short discussion on different possible interpretations of the same term, if such differences have been detected.

This section includes definitions that seem most important in the international discussion on adaptation to climate change. These terms are: adaptation, adaptation assessment, adaptation baseline, adaptation benefits, adaptation costs, adaptive capacity, adaptation deficit, adaptation measure, adaptation method, adaptation technology, climate change, coping capacity, coping range, critical threshold, disaster, extreme weather event, mainstreaming, resilience, sensitivity, and vulnerability. Other relevant definitions are presented in section 3, but the paper does not analyse them.

2.1 Adaptation to climate change

Adaptation *- Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation* (IPCC TAR, 2001 a)

Adaptation *- Practical steps to protect countries and communities from the likely disruption and damage that will result from effects of climate change. For example, flood walls should be built and in numerous cases it is probably advisable to move human settlements out of flood plains and other low-lying areas…"* (Website of the UNFCCC Secretariat)[4]

[2] An earlier version of this paper included definitions from the UNFCCC website glossary. These definitions were subsequently removed from the UNFCCC website in the period between draft publication (March 7, 2006) and the final version of this paper (May 5, 2006).

[3] The history of and process for arriving at various definitions have not been reviewed.

[4] http://unfccc.int/essential_background/feeling_the_heat/items/2911.php This definition is not from the Convention, and can be regarded as a working definition.

Adaptation *- Is a process by which strategies to moderate, cope with and take advantage of the consequences of climatic events are enhanced, developed, and implemented*. (UNDP, 2005)

Adaptation *- The process or outcome of a process that leads to a reduction in harm or risk of harm, or realisation of benefits associated with climate variability and climate change.* (UK Climate Impact Programme (UKCIP, 2003)

All four definitions differ from one another in several ways. First, they all use different words to describe what adaptation is. The first key words in the definition that express adaptation as 'adjustment', 'practical steps', 'process' and 'outcome' can be interpreted differently by various stakeholders. 'Process' seems to be a very broad and open ended term that does not include any particular time or subject references and can easily incorporate 'steps' and 'adjustments'. 'Adjustment' seems to imply a process that leads toward some standard or goal. The UKCIP offers additional interpretation of adaptation as an outcome. Expectations from adaptation as an outcome might be much higher than expectations from it as a process. Funding aspirations and evaluation of achieved results would also vary accordingly.

These seemingly small differences might create different expectations from different stakeholders, depending on the meaning of the term that they decide to use. The IPCC provides a broad definition by distinguishing various types of adaptation (e.g., anticipatory, reactive, public, planned adaptation, etc.) and focuses not only on technical adaptation measures but also on institutional responses. The IPCC definition also includes adaptation of natural systems not just human. One can already see that some stakeholders (e.g., community-based adaptation practitioners) use a more technical interpretation of the term (the one closer to the definition from the UNFCCC Secretariat website), while others (e.g., adaptation policy-makers) use a broader definition and emphasize the institutional/policy side of adaptation. These varied interpretations could have serious financial implications.

Variations in defining adaptation are probably rooted in the fundamental difference between definitions of climate change provided by the UNFCCC and the IPCC (see page 12 for definitions of climate change).

2.2 Adaptation assessment

Adaptation Assessment *- The practice of identifying options to adapt to climate change and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency, and feasibility*.(IPCC TAR, 2001 a)

The term 'Adaptation Assessment' while appearing to be clear on paper can be difficult in some cases to apply in practice.[5] Currently, there is no set of criteria or metrics that allow us to assess adaptation options objectively across locations and situations.[6] When analysing adaptation, one can focus on a number of lives that can be saved, or a value of economic losses that might be avoided, or the cost effectiveness of the adaptation project itself. Each particular case and every particular situation is different. Adaptation assessment across countries and regions is fraught with difficulties.

Each criterion that is suggested in the definition as a basis for assessing adaptation represents a complex set of metrics. For example, feasibility can be interpreted in several ways, i.e., political and technical. Some might also wish to add social or economic feasibility. The 'benefits' of adaptation can be expressed as a value of avoided climate change damages. Since damages can be quite different: reversible and irreversible, short and long term, benefits of adaptation would have to be evaluated with different sets of assumptions in mind. Costs of adaptation also incorporates a wide range of possible meanings: cost of

[5] Note that the definition uses "such as" and is opened.

[6] Criteria for evaluating mitigation options have been discussed in the literature and applied much more extensively. Terms such as economic efficiency, environmental effectiveness, political feasibility and equity are among the broad terms used to evaluate such options.

scientific projections, cost of modelling, administrative cost of policy development, cost of technical adaptation measures, and the opportunity cost to the society from application of adaptation measures.

Efficiency of adaptation measures is also hard to measure, since efficiency usually implies resources spent per unit of output, and there is no single unit in the adaptation output. Effectiveness of adaptation measures in many cases can be measured only hypothetically, assuming a specific magnitude of climate change or alternatively only after the fact. While some regions are already experiencing changes from some past state and can potentially measure the effectiveness of chosen adaptation measures (e.g., the effectiveness and direct benefits from early warning systems), most adaptation measures will initially be implemented in areas where significant changes are expected in the future and might not be tested for several years, decades or centuries.

While in some cases a single adaptation measure can be evaluated, for example, building electric pumping wells in drought prone areas or building a dam in flood prone areas, adaptation should usually consist of a package of measures, and evaluation of a single measure in a package might not be effective. Current definition does not distinguish between evaluation of a single measure and a package of measures. For example, better climate predictions and forecasts is the key information piece instrumental for effective adaptation, however, if improved projections and forecasts are available only to scientists and are not translated for policy-makers, the value and effectiveness of this important component of adaptation might be significantly diminished. Thus, improved scientific capacity should be assessed in a package with other measures such as information dissemination, and the dialogue between scientists and policy-makers.

2.3 Adaptation baseline

Baseline/Reference *– The baseline (or reference) is any datum against which change is measured. It might be a "current baseline," in which case it represents observable, present-day conditions. It might also be a "future baseline," which is a projected future set of conditions excluding the driving factor of interest. Alternative interpretations of the reference conditions can give rise to multiple baselines.* (IPCC TAR, 2001 a)

Adaptation baseline *– Also referred to as an adaptation policy baseline, this includes a description of adaptations to current climate that are already in place (e.g., existing risk mitigation policies and programmes).* (UNDP, 2005)

Baselines *– Used in two distinct ways in the UNDP Adaptation Policy Frameworks for Climate Change, the term "baseline" can refer to either a project baseline or a future baseline or reference scenario. The project baseline describes where the project is starting from while the reference scenario provides a plausible picture of a future in the priority system without adaptation, to allow for comparison of different adaptation strategies, policies, measures.* (UNDP, 2005)

There are at least four types of baselines that need to be considered. The IPCC definition appears to allow for consideration of a climate baseline, a baseline associated with the current state of physical and ecological systems, and a baseline associated with the current state of socio-economic systems. The UNDP definition appears to be focused on a policy baseline. All four can be complicated to define in detail, but at a minimum care may be needed to ensure using them in a proper context.[7]

2.4 Adaptation benefits

Adaptation Benefits *– The avoided damage costs or the accrued benefits following the adoption and implementation of adaptation measures.* (IPCC TAR, 2001 a)

[7] When used in conjunction with the term "adaptive capacity", a baseline may also be associated with other social and economic variables.

Methods to assess accrued benefits or avoided damages of adaptation measures are still very much under development.[8] Several studies have been conducted to evaluate costs and benefits of specific adaptation measures in particular locations and conditions (e.g., the decision to construct the Thames river barrier in London, improvements of drainage systems in the US). Some other research focuses on cost-benefit evaluation methods, for example UKCIP report on "Costing the impacts of climate change in the UK", OECD publication "The Benefits of Climate Change Policies". However, given the methodological complexity and data limitations, estimating benefits is currently a research subject.

2.5 Adaptation costs

Adaptation Costs *- Costs of planning, preparing for, facilitating, and implementing adaptation measures, including transition costs.* (IPCC TAR, 2001 a)

This definition is important as it describes the types of actions related to adaptation that can be evaluated in terms of their contribution to the overall cost of adaptation. It is also very open ended as it is not clear what the term 'transition cost' means in this definition. Consider for example the possibility of moving to one set of climate conditions over a period of the next 20-30 years and subsequently to a different set of climate conditions 20-30 years later. The term 'measures' may or may not include policies.

2.6 Adaptive capacity

Adaptive Capacity *– The ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.* (IPCC TAR, 2001 a)

Adaptive capacity *– Is the property of a system to adjust its characteristics or behaviour, in order to expand its coping range under existing climate variability, or future climate conditions. The expression of adaptive capacity as actions that lead to adaptation can serve to enhance a system's coping capacity and increase its coping range thereby reducing its vulnerability to climate hazards. The adaptive capacity inherent in a system represents the set of resources available for adaptation, as well as the ability or capacity of that system to use these resources effectively in the pursuit of adaptation. It is possible to differentiate between adaptive potential, a theoretical upper boundary of responses based on global expertise and anticipated developments within the planning horizon of the assessment, and adaptive capacity that is constrained by existing information, technology and resources of the system under consideration.* (UNDP, 2005)

Adaptive capacity *– The ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. Adaptation can be spontaneous or planned, and can be carried out in response to or in anticipation of changes in climatic conditions.* (UKCIP, 2003)

Capacity *– A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. (Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management. Capacity may also be described as capability.)* (UN/ISDR **,** 2004)

Does adaptation lead to increased adaptive capacity? Or does increased adaptive capacity increase your ability to adapt? Or does adaptive capacity indicate the possible extent/limit of adaptation?

[8] This term should not be confused with the benefits of mitigation policies which are a function of the avoided damages associated with reducing emissions.

It seems that most authors and practitioners use the term 'adaptive capacity' as simply a characteristic of a system and its ability to adjust to climate change on its own.[9] Adaptation will increase this ability. However, a discussion on different interpretations of the term 'vulnerability' (see below) might be an indication that some scholars see adaptive capacity as a limit beyond which adaptation is no longer possible.

When applying the term to social systems, policy makers view adaptive capacity as ability of the society to develop adaptation. That is why, in addition to interpreting adaptive capacity as a characteristic of a system, UNDP also defines it as actions that lead to adaptation. However, some confusion might arise if actions are not clearly defined. Actions could aim at increasing adaptive capacity or could mean adaptation itself.

UKCIP definition of adaptive capacity does not make it clear either. Although the first part of the definition copies exactly the IPCC definition of adaptive capacity, the second part of the definition brings up various types of adaptation which makes it unclear what relationships between adaptive capacity and adaptation UKCIP definition implies.

UN/ISDR definition is different from the definitions of adaptive capacity used by the climate change community in that it refers exclusively to human systems: community, society, organization, while IPCC, UNDP and UKCIP definitions imply (although do not state that explicitly) natural systems, and also it does not distinguish 'adaptive capacity', it uses either the definition of capacity or coping capacity.

One important aspect that is not widely discussed in the literature is how to 'measure' adaptive capacity. How do we know you have it or what will it take for you to get it? Yohe (2001) suggested the following determinants for adaptive capacity:

- The range of available technological options for adaptation;
- The availability of resources and their distribution across the population;
- The structure of critical institutions, the derivative allocation of decision-making authority, and the decision criteria that would be employed;
- The stock of human capital, including education and personal security;
- The stock of social capital, including the definition of property rights;
- The system's access to risk-spreading processes, e.g., insurance;
- The ability of decision makers to manage information, the processes by which these decision-makers determine which information is credible and the credibility of the decision-makers, themselves, and
- The public's perceived attribution of the source of stress and the significance of exposure to its local manifestations.

Gathering data on these determinants is of course highly problematic except for the most developed countries. Nevertheless, Yohe's approach identifies serious issues that need to be considered if this term is going to be widely used in the future, particularly in the context of the UNFCCC.

2.7 Adaptation measure

Policies and measures *– Usually addressed together, respond to the need for climate adaptation in distinct, but sometimes overlapping ways. Policies, generally speaking, refer to objectives, together with*

[9] Note that the IPCC includes the terms climate variability and extremes

the means of implementation. In an adaptation context, a policy objective might be drawn from the overall policy goals of the country – for instance, the maintenance or strengthening of food security. Ways to achieve this objective might include, e.g., farmer advice and information services, seasonal climate forecasting and incentives for development of irrigation systems. Measures can be individual interventions or they consist of packages of related measures. Specific measures might include actions that promote the chosen policy direction, such as implementing an irrigation project, or setting up a farmer information, advice and early warning programme. Both of these measures would contribute to the national goal of food security. (UNDP, 2005)

There are two interesting observations in this definition. First is that 'policies', according to this definition, refer to objectives, and adaptation objectives might be drawn from the overall policy objectives of the country. In this context the recommendation to countries might be to set specific country objectives with changing climate in mind (e.g., improved efficiency of water consumption, protection of wetlands, enhanced food security, improved public health, etc.), and then adaptation can be evaluated in terms of its contribution to achieving these overall objectives. Conceptually, specific adaptation objectives should be incorporated into national goals.

A second observation relates to the description of 'measures'. Since the definitions of adaptation do not include the term 'adaptation measures', it is important to note that 'measures' in the context of this definition imply actions.

2.8 Adaptation method

Method *– A set and sequence of steps or tasks that should be followed to accomplish the task that represents a part of large framework. Method can be implemented through using a number of tools. Examples include: methods for development and use of scenario data in the vulnerability and adaptation assessment, e.g. those presented in the UNEP Handbook (1998) and IPCC – TGCIA Guidelines on the Use of Scenario Data for Climate Impact and Adaptation Assessment (1999)* (website of the UNFCCC Secretariat)[10]

This term often causes confusion as it is sometimes used to mean "method to evaluate impacts, or adaptation policy options and/or actual projects". As defined by the UNFCCC, it encompasses 'impacts, vulnerability and adaptation to climate change" and all forms of tasks and tools.

2.9 Adaptation technology

A report by the UNFCCC Secretariat on a seminar on the development and transfer of technologies for adaptation to climate change (FCCC/SBSTA/2005/8) states that defining adaptation technologies is difficult. It suggests that an operational definition might be used *"the application of technology in order to reduce the vulnerability, or enhance the resilience, of a natural or human system to the impacts of climate change". Technological approaches to adaptation include both "hard" technologies such as capital goods and hardware, as well as "soft" technologies such as knowledge of methods and techniques which enable "hard" technologies to be applied.*

This definition notes that technologies may be 'hard and soft'. It is, however, linked to other terms, such as, vulnerability and resilience. The workshop report also states that "adaptation involves more than merely the application of a particular technology. Adaptation is an ongoing and reiterative process that includes information development, awareness raising, planning, design, implementation and monitoring.

[10]http://unfccc.int/files/adaptation/methodologies_for/vulnerability_and_adaptation/application/pdf/definitions.pdf

Reducing vulnerability requires not only having access to technology, but also having the mechanisms, expertise and other resources that are needed to make the technology useable and sustainable."

It seems that the workshop report uses the terms 'adaptation measure' and 'adaptation technology' interchangeably. Various reports and policy papers, for example German Federal Ministry for Economic Cooperation and Development[11], and Mace (2003) distinguish "hard" adaptation measures when they imply the use of specific technologies and actions that involve capital goods, and "soft" adaptation measures that focus on information, policy and strategy development, and institutional arrangements. The IPCC also distinguishes "soft" and "hard" protection measures in the context of adaptation (IPCC TAR 2001 a, Chapter 6).

2.10 Climate change

Climate Change *– Refers to any change in climate over time, whether due to natural variability or as a result of human activity.* (IPCC TAR, 2001 a)

Climate change *– Refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land-use.* (IPCC TAR, 2001 b)[12]

Climate change *– A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. See also climate variability.* (UNFCCC Article 1)

Climate Change *– The climate of a place or region is changed if over an extended period (typically decades or longer) there is a statistically significant change in measurements of either the mean state or variability of the climate for that place or region. (Changes in climate may be due to natural processes or to persistent anthropogenic changes in atmosphere or in land use. Note that the definition of climate change used in the United Nations Framework Convention on Climate Change is more restricted, as it includes only those changes which are attributable directly or indirectly to human activity.)* (UN/ISDR, 2004)

The UNFCCC makes a distinction between 'climate change' that is attributable to human activities altering the atmospheric composition of the globe and 'climate variability' attributable to natural causes. By contrast, the IPCC takes a broader view on 'climate change' and states that climate change can occur as a result of natural variability and human activity.

These different definitions have implications for defining 'adaptation' as a policy response to climate change. As Pielke (2004) notes in his publication "What Is Climate Change", "Under the FCCC definition, 'adaptation' refers only to new actions in response to climate changes that are attributed to greenhouse gas emissions….Under the logic of the FCCC definition of climate change, adaptation represents a cost of climate change, and other benefits of these adaptive measures are not counted….From the restricted perspective of the FCCC, it makes sense to look at adaptation and mitigation as opposing strategies…" He also states that "From the broader IPCC perspective on climate change, adaptation policies also have benefits to the extent that they lead to greater resilience of communities and ecosystems to climate change, variability, and particular weather phenomena."

[11] http://www.gtz.de/de/dokumente/en-climate-adapt-brosch-e.pdf.

[12]This definition is also used in *Climate Change 2001: Mitigation*. IPCC Third Assessment report, Cambridge University Press.