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ADAPTATION TO CLIMATE CHANGE: KEY TERMS

Ellina Levina and Dennis Tirpak, OECD
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FOREWORD

This document was prepared by the OECD and IEA Secretariats in March-May 2006 in response to the Annex I Expert Group on the United Nations Framework Convention on Climate Change (UNFCCC). The Annex I Expert Group oversees development of analytical papers for the purpose of providing useful and timely input to the climate change negotiations. These papers may also be useful to national policy-makers and other decision-makers. In a collaborative effort, authors work with the Annex I Expert Group to develop these papers. However, the papers do not necessarily represent the views of the OECD or the IEA, nor are they intended to prejudge the views of countries participating in the Annex I Expert Group. Rather, they are Secretariat information papers intended to inform Member countries, as well as the UNFCCC audience.

The Annex I Parties or countries referred to in this document are those listed in Annex I of the UNFCCC (as amended at the 3rd Conference of the Parties in December 1997): Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America. Korea and Mexico, as OECD member countries, also participate in the Annex I Expert Group. Where this document refers to “countries” or “governments”, it is also intended to include “regional economic organisations”, if appropriate.

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OECD and IEA information papers for the Annex I Expert Group on the UNFCCC can be downloaded from: <http://www.oecd.org/env/cc/>

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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 dialogues 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 reports¹. 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 UNFCCC², 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 definition³. 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 – TG CIA 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.

¹⁰http://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 Development¹¹, 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>.

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

2.11 Coping capacity

Coping Capacity – *The means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster. (In general, this involves managing resources, both in normal times as well as during crises or adverse conditions. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and human-induced hazards.)* (UN/ISDR, 2004)

Coping capacity – *Capacity refers to the manner in which people and organisations use existing resources to achieve various beneficial ends during unusual, abnormal, and adverse conditions of a disaster event or process. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and other hazards* (European Spatial Planning Observation Network)

Although the term ‘coping capacity’ is widely used in the context of the UNFCCC, it is not officially defined.

UN/ISDR definition applies the term only to social systems, i.e. people and organizations as it does in its definition of ‘capacity’.

Coping and adaptive capacity can mean the same thing if both concepts imply natural ability of a system to adjust to climate change. In this interpretation, adaptation measures and adaptation in general will increase this ability. However, if adaptive capacity implies the extent to which the system is capable of adapting, these two concepts are different. Coping capacity can be increased with adaptation measures while adaptive capacity already includes coping capacity plus possible adaptation measures and cannot be increased beyond a certain point.

The way most literature uses these two terms suggest that ‘coping capacity’ and ‘adaptive capacity’ mean essentially the same thing.

Peltonen (2005) makes a subtle distinction between coping and adaptive capacities, he states that “successful adaptation to climate change and sea-level rise depends greatly on coping capacity or adaptive capacity, that is, the ability of an affected (human or natural) system, region, or community to cope with or adapt to the impacts and risks of climate change induced sea-level rise. While the concept of coping capacity is more directly related to an extreme event (e.g. a flood or a winter storm), the concept of adaptive capacity refers to a longer time frame and implies that some learning either before or after an extreme event is happening”.

2.12 Coping range

Coping range – *The variation in climatic stimuli that a system can absorb without producing significant impacts.* (IPCC TAR, 2001 a)

Coping range – *Is the range of climate where the outcomes are beneficial or negative but tolerable; beyond the coping range, the damages or loss are no longer tolerable and a society (or a system) is said to be vulnerable.* (UNDP, 2005)

Coping range – *The range of variability described by a climate variable, climate-related variable or proxy climate variable whose consequences or outputs can be measured in terms of tolerable levels of harm or risk. The exceedence of the coping range is expected to result in harm.* (UKCIP, 2003)

The emphasis of this definition is on the range of climate that can be coped with.

2.13 Critical threshold

Critical threshold – *The point at which an activity faces an unacceptable level of harm, such as a change from profit to loss on a farm due to decreased water availability, or coastal flooding exceeding present planning limits. It occurs when a threshold q.v. is reached at which ecological or socioeconomic change is damaging and requires a policy response.* (Australian Greenhouse Office. 2003)

Threshold – *Any level of a property of a natural or socioeconomic system beyond which a defined or marked change occurs. Gradual climate change may force a system beyond such a threshold. Biophysical thresholds represent a distinct change in conditions, such as the drying of a wetland, floods, breeding events. Climatic thresholds include frost, snow and monsoon onset. Ecological thresholds include breeding events, local to global extinction or the removal of specific conditions for survival. Socioeconomic thresholds are set by benchmarking a level of performance. Exceeding a socioeconomic threshold results in a change of legal, regulatory, economic or cultural behaviour. Examples of agricultural thresholds include the yield per unit area of a crop in weight, volume or gross income.* (Australian Greenhouse Office. 2003)

Threshold – *A property of a system or a response function, where the relationship between the input variable and an output or other variable changes suddenly. It can be important to identify thresholds, and other non-linear relationships, as these may indicate rapid changes in risk.* (UKCIP Technical Report. 2003. Climate Adaptation: Risk, uncertainty and decision-making.)

Thresholds apparently define the boundaries of coping ranges. Some other literature (e.g., Nicholls, 2006) also uses the term ‘tipping points’ that imply physically-based thresholds such as the amount of sea-level rise or intensity and frequency of storms or length of a drought, etc. which will necessitate a major response decision or action. An important area for future research would be the role of adaptive capacity in defining and moving thresholds.

There is one important difference between the Australian and UK definitions: the latter stresses a “sudden” change in the system’s balance, while the former does not include any time-related determinants. The example, provided in the Australian definition of ‘critical threshold’, of a farm that experiences a change from profit to loss due to decreased water availability may or may not imply a sudden change.

2.14 Disaster

A Disaster – *Is a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.* (UN/ISDR, 2004)

It is interesting to note that the definition incorporates the notion of external assistance. This suggests that recovery from a dramatic event (e.g., flood, heat wave) with only internal resources is not a disaster.

2.15 Extreme weather event

Extreme weather event – *An event that is rare within its statistical reference distribution at a particular place. Definitions of "rare" vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile. By definition, the characteristics of what is called "extreme weather" may vary from place to place. An "extreme climate event" is an average of a number of weather events over a certain period of time, an average which is itself extreme (e.g., rainfall over a season).* (IPCC, TAR, 2001 a)

Extreme event – *An extreme weather event refers to meteorological conditions that are rare for a particular place and/or time, such as an intense storm or heat wave. An extreme climate event is an*

unusual average over time of a number of weather events, for example heavy rainfall over a season. (Australian Greenhouse Office. 2003)

2.16 Mainstreaming

A definition of ‘mainstreaming’ does not yet exist, although the term is widely used. It seems that ‘mainstreaming’ is used interchangeably with ‘integration’. Mainstreaming refers to the integration of adaptation objectives, strategies, policies, measures or operations such that they become part of the national and regional development policies, processes and budgets at all levels and stages (UNDP, 2005). The term is also used to describe the process of integrating adaptation to climate change into development assistance (e.g., Agrawala (2005), Klein (2002)). Although some broader or narrower interpretations are possible, the term is often associated with the process of taking into consideration potential climate change impacts when making investment or development assistance decisions.

2.17 Resilience

Resilience – *Amount of change a system can undergo without changing state.* (IPCC, TAR, 2001)

Resilience – *Resilience is a tendency to maintain integrity when subject to disturbance.* (UNDP, 2005)

Resilience – *The ability of a system to recover from the effect of an extreme load that may have caused harm.* (UKCIP, 2003)

Resilience – *The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.* (UN/ISDR, 2004)

Resilience – *Refers to three conditions that enable social or ecological systems to bounce back after a shock. The conditions are: ability to self-organize, ability to buffer disturbance and capacity for learning and adapting* (Tompkins E. et al. 2005)

There is an important difference in the definitions of resilience provided by the IPCC, UNDP and UN/ISDR on the one hand and the UKCIP on the other. The former institutions define resilience as the capacity of a system to tolerate disturbance without changing state; the UKCIP defines resilience as the ability to recover from the effect. These interpretations are different because in the first case resilience implies the ability not to sustain damage while in the latter interpretation resilience implies that the damage can occur and the system will be able to recover from it.

For example, there are two distinct ways to characterise resilience of a hypothetical village in the coastal zone by applying two different interpretations of ‘resilience’. If we use the first interpretation to tell that the village is resilient to storms we probably imply that there is a protection system in place and/or no construction in a sensitive zone to be damaged. If we use the second interpretation, we might imply that there is some construction in the sensitive zone that can be damaged but it is not significant for the functioning of this village, so even if it is damaged, the village can recover from it, thus it is resilient.

The importance of this distinction is in the application of the term ‘resilience’ and attempts to measure it or measure approaches that increase resilience. Are we talking about adaptation that increases the system’s resilience in a sense that no damage or very insignificant damage can occur? Or are we talking about adaptation that increases our ability to recover from the damage?

Klein et. al. (2004) reviewed the literature relating to the concept of resilience. They concluded that resilience is best used to define two specific system attributes:

- The amount of disturbance a system can absorb and still remain within the same state or domain of attraction;
- The degree to which the system is capable of self-organisation.

It is also important to clearly define the relationship between ‘resilience’, ‘vulnerability’, ‘adaptive capacity’, ‘coping capacity’ and ‘coping range’ to make these terms practically applicable. In the IPCC definition of resilience, this term seems to be closely related to “coping range”, since the emphasis of the definition is on the amount of change that the system can tolerate. Other definitions emphasise the ‘ability’ of a system, so its “coping and/or adaptive capacity” to tolerate change. Some scholars have analysed the applicability of the concept of resilience on practice and proposed to use “adaptive capacity as the umbrella concept that includes the ability to prepare and plan for hazards, as well as to implement technical measures before, during and after a hard event... the resilience be regarded as one property that influences adaptive capacity.”(Klein et. al, 2004) ‘Vulnerability’ seems largely to imply an inability to cope and ‘resilience’ seems to broadly imply an ability to cope. They may be viewed as two ends of a spectrum.

2.18 Sensitivity

Sensitivity – *Is the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise) (IPCC TAR, 2001)*

Sensitivity – *The degree to which a system is affected, either adversely or beneficially, by climate related stimuli, including mean (i.e., average) climate characteristics, climate variability and the frequency and magnitude of extremes (Australian Greenhouse Office. 2003)*

Sensitivity – *Affects the magnitude and/or rate of a climate related perturbation or stress (while vulnerability is the degree to which a system is susceptible to harm from that perturbation or stress). (UNDP, 2005)*

The UKCIP uses the IPCC definition and adds: **Sensitivity** *refers to the change that results (in a system or variable) from a specific perturbation in an input value, parameter value, or other assumption.*

2.19 Vulnerability

Vulnerability – *The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity. (IPCC TAR, 2001)¹³*

UNDP distinguishes **Socio-economic vulnerability** – *Is an aggregate measure of human welfare that integrates environmental, social, economic and political exposure to a range of harmful perturbations. And **Vulnerability** – the degree to which the exposure unit is susceptible to harm due to exposure to a perturbation or stress, and the ability (or lack thereof) of the exposure unit to cope, recover, or fundamentally adapt (become a new system or become extinct) (Kasperson et al., 2000) It can also be considered as the underlying exposure to damaging shocks, perturbation or stress, rather than the probability or projected incidence of those shocks themselves. (UNDP, 2005)*

¹³ This definition contains a minor error: instead of “...susceptible to, or unable to cope with...” it should say “...susceptible to, and unable to cope with...”

Vulnerability – *The extent to which a natural system or human society is unable to cope with the negative impacts of climate change, variability and extremes. It depends on changes in climate as well as the sensitivity and adaptive capacity of the system or society.* (Australian Greenhouse Office, 2003)

Vulnerability – *Refers to the magnitude of harm that would result from a particular hazardous event. The concept recognises, for example, that different sub-types of a receptor may differ in their sensitivity to a particular level of hazard. Therefore climate vulnerability defines the extent to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. It depends not only on a system's sensitivity but also on its adaptive capacity. Hence arctic alpine flora or the elderly may be more vulnerable to climate change than other components of our flora or population.* (UKCIP, 2003)

Vulnerability – *The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. (For positive factors, which increase the ability of people to cope with hazards, see definition of capacity.)* (UN/ISDR, 2004)

Vulnerability – *The degree to which an individual, group or system is susceptible to harm due to exposure to a hazard or stress, and the (in)ability to cope, recover, or fundamentally adapt (become a new system or become extinct).* (Tompkins, E., 2005)

The term ‘vulnerability’ is one of the key concepts in the adaptation research. It is widely used and also widely evaluated in terms of its applicability, use and interpretations. Some scholars (O’Brien, K. et al., 2004) discuss two competing interpretations of vulnerability in the climate change literature. This discussion claims that one interpretation views vulnerability as a residual of climate change impacts minus adaptation, and that the second interpretation views vulnerability as a general characteristic or state generated by multiple factors and processes, but exacerbated by climate change.

The definitions of vulnerability collected in this paper have some common features. All of the definitions listed above define vulnerability as the degree, extent or magnitude to which the system is susceptible to harm/adverse effects of climate change. All these definitions also state that vulnerability depends on a system's sensitivity and its adaptive capacity.

The first interpretation of vulnerability as residual (‘end point’) can be explained by an alternative interpretation of ‘adaptive capacity’ as the extent of adaptation. If adaptive capacity is viewed as the limit of adaptation; then vulnerability can be viewed as a residual from climate impact minus adaptation, since beyond the limit of adaptive capacity nothing else can be done – true vulnerability. However, in most cases vulnerability is interpreted as a starting point that can be reduced by adaptation. It probably means that most scholars and policy makers interpret adaptive capacity as ability to adapt that is not constant in time and not as a limit of adaptation. So, adaptation can enhance/increase adaptive capacity and reduce vulnerability. “Successful adaptation reduces vulnerability to an extent that depends greatly on adaptive capacity - the ability of an affected system, region, or community to cope with the impacts and risks of climate change. Enhancement of adaptive capacity can reduce vulnerability”. (IPCC TAR, 2001)

2.20 Vulnerability assessment

Vulnerability assessment *identifies who and what is exposed and sensitive to change. A vulnerability assessment starts by considering the factors that make people or the environment susceptible to harm, i.e. access to natural and financial resources; ability to self-protect; support networks and so on.* (Tompkins, E. et al., 2005)

3. Other Adaptation-related Terms

This section presents other terms and definitions that are listed in IPCC reports, UNFCCC documents and other literature. They are either less controversial or do not have a wide range of definitions and were considered to be of less importance for this paper. The paper does not analyse these terms and presents them here for completeness. The paper does not attempt to collect all terms that are used in the adaptation context.

3.1 Adaptation policy framework

Adaptation Policy Framework – *Is a structural process for developing adaptation strategies, policies, and measures to enhance and ensure human development in the face of climate change, including climate variability. The APF is designed to link climate change adaptation to sustainable development and other global environmental issues. It consists of five basic Components: scoping and designing an adaptation project, assessing current vulnerability, characterizing future climate risks, developing an adaptation strategy, and continuing the adaptation process. (UNDP, 2005)*

3.2 Types of Adaptation

The IPCC distinguishes several types of adaptation (IPCC TAR, 2001):

- **Anticipatory Adaptation**—*Adaptation that takes place before impacts of climate change are observed. Also referred to as proactive adaptation.*
- **Autonomous Adaptation**—*Adaptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems. Also referred to as spontaneous adaptation.*
- **Planned Adaptation**—*Adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.*
- **Private Adaptation**—*Adaptation that is initiated and implemented by individuals, households or private companies. Private adaptation is usually in the actor's rational self-interest.*
- **Public Adaptation**—*Adaptation that is initiated and implemented by governments at all levels. Public adaptation is usually directed at collective needs.*
- **Reactive Adaptation**—*Adaptation that takes place after impacts of climate change have been observed.*

3.3 Adaptation deficit

Definition was offered by Ian Burton at the In-session workshop on adaptation (May 21, 2005, Bonn): *Failure to adapt adequately to existing climate risks largely accounts for the adaptation deficit.*

3.4 Adverse effects

The UNFCCC Convention defines “**adverse effects of climate change**” as “*changes in the physical environment or biota resulting from climate change which have significant deleterious effects on the*

composition, resilience or productivity of natural and managed ecosystems or on the operation of a socio-economic systems or on human health and welfare.” (UNFCCC, 1992)

This definition recognizes that ecosystems, socio-economic systems, health and welfare are all areas that may be impacted and anticipated to suffer adverse effects.

3.5 Catastrophic event

Catastrophic event - *A climate-related event having sudden onset and widely distributed and large magnitude impacts on human or natural systems, such as historically rapid sea level rise or sudden shifts (over a decade or less) in atmospheric or oceanic circulation patterns. Such events have occurred in the past due to natural causes (Australian Greenhouse Office. 2003)*

3.6 Climate feedback

Climate feedback - *The influence of a climate-related process on another that in turn influences the original process. For example, a positive climate feedback is an increase in temperature leading to a decrease in ice cover, which in turn leads to a decrease of reflected radiation (resulting in an increase in temperature). An example of a negative climate feedback is an increase in the Earth’s surface temperature, which may locally increase cloud cover, which may reduce the temperature of the surface. (IPCC TAR, 2001)*

3.7 Climate Change Scenario

Climate Change Scenario - *A coherent and internally-consistent description of the change in climate by a certain time in the future, using a specific modelling technique and under specific assumptions about the growth of greenhouse gas and other emissions and about other factors that may influence climate in the future. (UKCIP, 2003)*

3.8 Climate impacts

(Climate) Impacts - *Consequences of climate change on natural and human systems. Depending on the consideration of adaptation, one can distinguish between potential impacts and residual impacts. (IPCC TAR, 2001)*

- ***Potential Impacts***--*All impacts that may occur given a projected change in climate, without considering adaptation.*
- ***Residual Impacts***--*The impacts of climate change that would occur after adaptation.*

See also aggregate impacts, market impacts, and non-market impacts.

- ***Aggregate Impacts*** - *Total impacts summed up across sectors and/or regions. The aggregation of impacts requires knowledge of (or assumptions about) the relative importance of impacts in different sectors and regions. Measures of aggregate impacts include, for example, the total number of people affected, change in net primary productivity, number of systems undergoing change, or total economic costs.*
- ***Market Impacts*** - *Impacts that are linked to market transactions and directly affect gross domestic product (GDP, a country's national accounts)--for example, changes in the supply and price of agricultural goods.*

- **Non-Market Impacts** - Impacts that affect ecosystems or human welfare, but that are not directly linked to market transactions--for example, an increased risk of premature death.

3.9 Climate variability

Climate Variability - Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability). See also climate change. (IPCC TAR, 2001)

3.10 Impact assessment

(Climate) Impact Assessment – The practice of identifying and evaluating the detrimental and beneficial consequences of climate change on natural and human systems. (IPCC, TAR, 2001)

Impact assessment – The analysis of positive and negative consequences of climate changes on natural systems and human societies, both with and without adaptation to such changes. (Australian Greenhouse Office. 2003)

See also *Adaptation assessment*.

3.11 Integrated Assessment

Integrated Assessment - A method of analysis that combines results and models from the physical, biological, economic, and social sciences, and the interactions between these components, in a consistent framework to evaluate the status and the consequences of environmental change and the policy responses to it. (IPCC TAR, 2001)

Integrated assessment - A consistent framework to analyse models that simulate climate (including physical and biological conditions) and socioeconomic conditions (including policy and behaviour) and the interactions and feedbacks between them. This integration can be performed over a range of spatial scales, increasing in complexity from farms or cities, to regions, to countries to global (Australian Greenhouse Office. 2003)

3.12 Maladaptation

Maladaptation – Any changes in natural or human systems that inadvertently increase vulnerability to climatic stimuli; an adaptation that does not succeed in reducing vulnerability but increases it instead. (IPCC TAR, 2001)

3.13 National adaptation programme of action (NAPA)

National adaptation programmes of action (NAPAs) – Documents prepared by least developed countries (LDCs) identifying urgent and immediate activities useful for coping with climate change. The NAPAs are then presented to the international donor community for support. (UNFCCC Secretariat website)¹⁴.

¹⁴ <http://unfccc.int/adaptation/napas/items/2679.php>

3.14 Reinsurance

Reinsurance – *The transfer of a portion of primary insurance risks to a secondary tier of insurers (reinsurers); essentially "insurance for insurers."* (IPCC, TAR, 2001)

Reinsurance – *Insurance for insurers. As with insurance, the basic function of reinsurance is to spread risks; that is, part of the liability accepted by an insurer is transferred to the reinsurance company.* (Australian Greenhouse Office. 2003)

3.15 Risk

Risk - *Is the probability that a situation will produce harm under specified conditions. It is a combination of two factors: the probability that an adverse event will occur; and the consequences of the adverse event. Risk encompasses impacts on human and natural systems, and arises from exposure and hazard. Hazard is determined by whether a particular situation or event has the potential to cause harmful effects.* (Australian Greenhouse Office. 2003)

Risk (climate-related) – *Is the result of interaction of physically defined hazards with the properties of the exposed systems – i.e., their sensitivity or (social) vulnerability. Risk can also be considered as the combination of an event, its likelihood, and its consequences – i.e., risk equals the probability of climate hazard multiplied by a given system's vulnerability* (UNDP, 2005)

The term 'risk' is often used in the context of climate change. However, it has not yet been defined, either by the UNFCCC or by the IPCC.

3.16 Risk management

Risk management - *The implementation of strategies to avoid unacceptable consequences. In the context of climate change adaptation and mitigation are the two broad categories of action that might be taken to avoid unacceptable consequences.* (Australian Greenhouse Office. 2003)

Integrated Risk Assessment - *An approach to the management of risk that includes all sources of hazard, pathways and receptors, and considers a wide combination of risk management options.* (UKCIP, 2003)

3.17 Robustness

Robustness – *The ability of a system to continue to perform satisfactorily under load.* (UKCIP, 2003)

3.18 Stimuli (climate-related)

Stimuli - *All the elements of climate change, including mean climate characteristics, climate variability, and the frequency and magnitude of extremes.* (IPCC TAR, 2001)

3.19 Strategy

Strategy – *Refers to a broad plan of action that is implemented through policies and measures. A **climate change adaptation strategy** for a country refers to a general plan of action for addressing the impacts of climate change, including climate variability and extremes. It may include a mix of policies and measures, selected to meet the overarching objective of reducing the country's vulnerability.* (UNDP, 2005)

4. Conclusions

The analysis of various definitions of the key adaptation terms and concepts demonstrates that definitions vary across institutions and different groups of stakeholders. The lack of precision is a reflection of a highly dynamic discussion of the adaptation issue where the lexicon is still evolving and the relatively young age of these discussions. Once adaptation enters wider circles of policy makers and analytical community it may need to be handled with more care and accuracy.

As work on adaptation to climate change progresses, a need for greater precision is likely to become more apparent, as will the implications of various terms. Terms that have policy implications may warrant special attention in the review of the Fourth Assessment report (AR4) of the IPCC.

Some terms and concepts are not defined either by the IPCC or the UNFCCC. If deemed necessary a cooperative effort between the UNFCCC and IPCC could aim to clarify such terms and concepts. For example, the following terms are not yet defined by the IPCC: adaptation policies and measures, adaptation goals and/or objectives, adaptation technologies, coping capacity, adverse effect, disaster, risk, and mainstreaming.

Some existing definitions are very loose, and inevitably generate different interpretations. While creative ambiguity may be appropriate for some, others may have policy implications in the future. For example, such terms as ‘adaptation’, ‘adaptation assessment’, and ‘resilience’ might benefit from further clarification. Also, in some cases precise definitions may not be desirable until more information is available, for example, the definition of ‘adaptation baseline’.

In the interim, it would be helpful if the adaptation community used either the existing definitions provided by the IPCC or, in some cases, those provided by the UNFCCC, rather than invent new definitions.

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