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WWF-UK Policy Position Statement on: *International climate change adaptation*

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Contents

1. PURPOSE AND SCOPE

2. WWF-UK POSITION

3. BACKGROUND

4. KEY ISSUES

5. WHY WWF IS CONCERNED WITH ADAPTATION

6. WWF CASE STUDIES ON ADAPTATION

APPENDIX: Adaptation related terminology and definitions

1. Purpose and scope

Purpose: To provide an overview of the context and outline current WWF-UK policy positions on international climate change adaptation. As WWF-UK is a key player in the WWF global network on adaptation issues these positions are consistent with those of the wider WWF network.

Scope and focus of paper: This paper focuses on international adaptation policy, concentrating on the UN Framework Convention on Climate Change (UNFCCC) discussions. We also set out how climate change adaptation relates to the mission of WWF and provide some examples of how adaptation is being addressed in our conservation work. The paper does not discuss UK- or EU-level policy asks, nor adaptation tools or methods, nor does it cover in detail the process of mainstreaming adaptation within the organisation.

2. WWF-UK position

WWF's overall mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature. The adaptation¹ of ecosystems and human populations to a changing climate is crucial to achieve this mission. The Millennium Ecosystem Assessment states that climate change is one of the most important drivers of biodiversity loss. The Intergovernmental Panel on Climate Change estimates that if temperature increases exceed 2-3°C, 20-30% of plant and animal species assessed will be at risk of extinction.

Adaptation approaches need to be integrated, recognizing the links between ecosystems, biodiversity, livelihoods and climate change. Climate change impacts are played out through natural systems – undermining the planet's natural provisioning services which are fundamental to biodiversity and human wellbeing. Climate research shows increasing frequency and intensity of

¹ While acknowledging there are multiple definitions and approaches, WWF-UK for now will use the Intergovernmental Panel on Climate Change definition of adaptation as 'the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities'. See Appendix for further information.

natural disasters, such as tropical cyclones, drought and flooding, affecting both human and natural systems². Hundreds of thousands of people are being directly impacted by these kinds of disasters, as are the ecosystems upon which they rely. Where climate change impacts are felt most, for example in coastal communities and areas susceptible to flooding, people may increasingly fall back on natural resources as a safety net, increasing pressure on valuable biodiversity. This reduces the capacity for adaptation of both people and ecosystems.

It is of fundamental importance to recognise the role ecosystems play in sustainable development, disaster risk reduction and increasing resilience to climate change. Adaptation responses promoted by WWF must seek to reduce human actions which undermine ecosystem resilience, and build capacity of relevant stakeholders to adapt to current and future climate change, whilst respecting principles of ecosystem integrity and poverty reduction.

WWF-UK recognizes the importance of the UNFCCC process in creating a fair and effective global framework for climate change adaptation. We outline below our key recommendations for this process.

Top line recommendations for climate change adaptation in the context of the UNFCCC:

GENERAL APPROACH

Developing countries, in particular Least Developed Countries (LDCs) and Small Island Developing States (SIDS), are being disproportionately affected by climate change impacts, the severity of which is increasing decade by decade. Any new climate treaty must prioritise enabling vulnerable developing countries to adapt, where possible, to current and future consequences of climate change. Present commitments to deliver an agreement on adaptation under the UNFCCC process remain fragmented, focusing on scientific assessments and expert workshops, while lacking substance on implementation and financing. To work towards an effective global deal, all parties must better recognize the 'polluter pays principle', and that early emissions reductions greatly reduce adaptation costs. There needs to be greater recognition that a 'business as usual' emissions pathway, without a sharp peak and decline before 2020, may mean many vulnerable states, communities and ecosystems will reach the point where adaptation is no longer possible. For example, future climate scenarios predict some low lying coastal states such as Tuvalu will be lost due to sea level rise. Adaptation strategies developed at a national level alone may not be sufficient to deal with these impacts which have regional or international geopolitical ramifications. Massive flows of secure, substantial and predictable funding delivered through well-governed, transparent and effective funding mechanisms, plus regional climate risk insurance schemes will therefore be critical.

SPECIFIC POSITIONS

1. WWF-UK works collaboratively with the WWF network to develop consistent adaptation policy and also supports the key policy asks of the Climate Action Network³ (CAN). WWF focuses in particular on the role of ecosystems in adaptation: i.e. a) the role of ecosystems in adaptation should be fully recognised and integrated into the UNFCCC process, and b) ecosystem integrity should be viewed as a cross-cutting theme for mitigation and adaptation, and should be incorporated into national adaptation strategies and action plans, including the National Adaptation Programmes of Action (NAPAs).

² IPCC 4th Assessment Report, Working Group II, 'Impacts, Adaptation and Vulnerability', 2007

³ The Climate Action Network (CAN) is a worldwide network of over 450 Non-Governmental Organizations (NGOs) working to promote government and individual action to limit human-induced climate change to ecologically sustainable levels. www.climatenetwork.org

Adaptation financing and technology transfer

2. The developed world has a historical responsibility to support vulnerable communities in developing countries and to provide support for adaptation financing and transfer of technology. At least US\$ 63 billion per annum is needed for adaptation and insurance; immediate provision as a back payment of the US\$ 2 billion to Least Developed Country Fund (LDCF) to implement LDC National Adaptation Plans of Action (NAPAs), and additional resources to non-LDC vulnerable countries to develop and begin to implement National Adaptation Plans (NAPs), in order to address climate risks and integrate adaptation into national development planning processes.
3. Governments must make clear commitments to meet adaptation financing requirements under the UNFCCC framework. Working together within the EU and internationally governments should acknowledge their “fair share” of the costs of climate change and reinvigorate the process towards attainment of the Millennium Development Goals and the elimination of poverty.
4. WWF believes that the Kyoto Protocol Adaptation Fund should be fully operationalized with adequate financial and technical resources. It should form the main mechanism through which funds are channelled on adaptation, independently managed and accountable to the Conference of the Parties. The UNFCCC should receive direct contributions by developed countries and should invite non-Kyoto countries to contribute additional funds.
5. WWF believes that funding mechanisms for the Adaptation Fund should be expanded beyond the 2% Clean Development Mechanism (CDM) levy to include funding from instruments that tackle international aviation and shipping emissions. The aim should be to ensure adequate and sustainable financing for the adaptation fund by 2012.
6. WWF believes that any revised UNFCCC global deal on climate change should formulate the objectives necessary to provide full and fair financing and means of implementation for adaptation to the social, economic and environmental impacts of climate change, especially to vulnerable countries, in particular Small Island Developing States (SIDS) and Least Developed Countries (LDCs).
7. An international insurance scheme under the UNFCCC should be developed to support countries in coping with loss and damage caused by extreme events, to insure against local to regional climate emergency situations. This mechanism should consist of two pillars: 1) a climate insurance pool covering a defined share of high-level, climate-related risks of disaster losses, and; 2) a climate insurance assistance facility providing technical support to regional, local and public-private insurance schemes.
8. WWF supports the development of an international compensation and rehabilitation mechanism (CRM) to support those countries who suffer climate impacts above and beyond their adaptive capacity. The CRM should have the objective to adequately deal with loss and damage from adverse impacts of climate change that cannot be avoided through pro-active adaptation, cannot be covered by the climate risk insurance mechanism, but require extremes responses for affected communities such as resettlement and migration.
9. WWF supports mobilisation of both public and private finance and investment and the reform of policy frameworks and international financial institutions in order to provide new financial resources that should be sufficient, predictable and additional to Official Development Assistance and also readily accessible to vulnerable countries and communities.
10. Technology action plans should be developed to enhance the way that technology for adaptation is currently addressed within the UNFCCC.

Process and delivery

11. The preparation of National Adaptation Plans of Action should continue and be integrated with national planning policy processes.
12. A permanent UNFCCC adaptation body should be formed to coordinate and strengthen adaptation activities, as adaptation is currently covered under the UNFCCC Convention in a fragmented way.
13. Regional adaptation centres of excellence should be developed to promote knowledge, exchange and capacity building for adaptation.
14. WWF believes there should be effective scrutiny of projects invested in by bilateral and multilateral institutions to ensure they are climate SMART, thus reducing contributions to Green House Gases (GHGs), and also minimising risks from current and future climate impacts.
15. The use of EIA (Environmental Impact Assessments) and SEA (Strategic Environmental Assessment) should be integrated into the design of adaptation and mitigation projects to ensure they are environmentally and socially sustainable. Pro-poor, socially just, biodiversity-friendly adaptation and mitigation should be a prerequisite of any project or programme. .
16. WWF believes that adaptation must be mainstreamed into development policy and practice giving full recognition of the role that biodiversity and ecosystems can play in helping the most vulnerable people to adapt.

3. Background

CLIMATE CHANGE IMPACTS

The world's policy makers and scientists have reached consensus that humans are making a major contribution to climate change, but adequate and timely action is still not agreed or acted upon. The IPCC 4th Assessment report predicts that the global atmospheric temperature may rise by about 3°C by the end of the 21st Century (Defra suggest an increase of 3-6° C in the UK). This will have increasingly severe impacts on the earth's atmospheric systems, manifesting in sea level rise, high variation of precipitation levels, heat waves and other extreme weather events such as hurricanes and storm surges. However, as the science is updated and correlated with observed findings, new evidence is showing that the severity of impacts has been underestimated with the climate system is changing faster than earlier predicted and impacts are increasing. Scientists are increasingly highlighting the potential global impacts of a four degrees temperature change this century.

Average global temperature and sea level have risen since the late 19th century and at an increased rate over the past few decades. Warming of the global climate system is unequivocal, with global average temperatures having risen by nearly 0.8 °C since the late 19th century, and rising at about 0.2 °C/decade over the past 25 years. It is very likely (>90% probability, IPCC) that man-made greenhouse gas emissions have caused most of the observed temperature rise since the mid 20th century. Global sea-level rise has accelerated between the mid-19th century and mid-20th century, and is now about 3mm per year with the average global sea temperature having risen by 1°C on average. Uncertainties still surround some important aspects of climate science BUT the majority operate in one direction – towards more rapid and severe climate change and thus towards more dangerous and costly impacts.

The risk of continuing rapid climate change is focusing attention on the need to adapt and the recognition of the limits to adaptation. Climate change is not proceeding only as smooth curves in mean values of parameters such as temperature and precipitation. Climatic features such as extreme events, abrupt changes and the nonlinear behavior of climate system processes will drive impacts on people and ecosystems with a growing danger of crossing dangerous thresholds. Long term feedbacks in the climate system are developing now (e.g. with polar ice sheets, carbon sinks, permafrost etc). Once some thresholds in these systems are crossed, such processes cannot be stopped or reversed by human intervention, and will lead to more severe, runaway and irreversible climate change.

Environmental impacts: The IPCC estimate that if temperature increases exceed 2-3°C, 20-30% of plant and animal species assessed will be at risk of extinction. The IPCC also predicts shifts in ecosystem boundaries and a migration of habitats towards the poles. Increased extinction rates in disrupted ecosystems can lead to entire ecosystem collapse – the consequences of which are difficult to predict. The IPCC conclude ‘even with best-practise management it is inevitable that species will be lost, some ecosystems irreversibly modified and some environmental goods and services adversely affected’.

Human impacts: Globally, extreme weather events have resulted in huge loss of life and billions of dollars of economic damage (e.g. Hurricane Katrina etc). According to the recent Global Humanitarian Forum report, every year climate change leaves over 300,000 people dead, 325 million people seriously affected, and results in economic losses of US\$125 billion. Variations in temperature and rainfall patterns are also leading to serious knock-on effects including the rapid spread of diseases such as malaria and dengue fever, and the encroachment of invasive species. Four billion people are vulnerable, and 500 million people are at extreme risk. Governments around the world (including the UK) have identified climate change as one of the greatest threats to society and quality of life.

Two major and related responses are necessary:

1. **Mitigation:** We must rapidly reduce our emissions on a global scale to ensure that we do not exceed a 2°C global average temperature rise - the critical tipping point for ecosystems and people. This will reduce adaptation costs and give flora and fauna the most chance of being able to adapt. WWF-UK believes that collectively, all developed countries, including the United Kingdom, need to reduce greenhouse gas (GHG) emissions by at least 40% by 2020 for annex 1 countries and global emissions should be reduced by at least 80% by 2050 from 1990 levels.
2. **Adaptation:** Climate change impacts are happening now; we are already locked into further impacts and there is a serious risk of increasingly severe impacts within this century, and globally we are now committed to further impacts irrespective of any amount of mitigation, to which we must adapt. In order to survive and maintain and improve quality of life for those in poverty and to safeguard natural systems, we must adapt. There is real urgency to deliver climate adaptation because: there is a danger of infrastructural lock in to systems not designed to cope with a changing climate; the challenge across sectors and scales is severe; the timeframes required to develop adequate solutions are long; and there are limits to adaptation especially for the world’s most vulnerable people, places and ecosystems.

4. Key issues

RELATIONSHIP BETWEEN MITIGATION AND ADAPTATION

There are inherent linkages between mitigation pathways and adaptation costs and options. The higher the emissions the greater the climate change impacts and relative adaptation costs, and the lower the available options we have to adapt. Adaptation is therefore a fundamental necessity rather than an option. We can either undertake adaptation proactively or be forced to respond reactively and then risk being unable to adapt, potentially breaching the critical thresholds of adaptation. Urgent mitigation is a central and core component for adaptation as the greater the mitigation effort now, the less critical and costly the adaptation that will be required of future generations.

WWF-UK believes that we must reconnect adaptation and mitigation, recognising that we must mitigate in order to adapt and that some adaptation options have major impacts on mitigation options. For example, large-scale infrastructure for dam walls and flood defences is carbon-intensive, and some energy pathways are affected by sea level change and freshwater availability e.g. water cooling for power plants. Failure to mitigate adequately will also result in impacts to which we cannot adapt.

ECOSYSTEMS, BIODIVERSITY, LIVELIHOODS AND ADAPTATION

The natural environment is the mechanism by which climate change is regulated and through which it plays out. Ecosystems and biodiversity have a critical effect on the extent to which people can adapt to climate change and how effectively landscapes can absorb and store carbon. A healthy, functioning ecosystem is more resilient to the impacts of climate change. Likewise, a healthy, functioning human community is more resilient to the impacts of climate change and less likely to degrade the natural environment, resulting in the loss of biodiversity and ecosystem functionality. In essence it is not possible to think of one or the other in isolation: we live in an integrated and inter-dependant world and as such need systemic responses

The natural environment has always adapted. What is so different today is that it is already under intense pressure from human activities such as habitat destruction, over-exploitation, and pollution. The natural environment has become so fragmented that its resilience⁴ is now very low and therefore its ability to rebound from the added pressure of climatic impacts is greatly reduced.

The natural environment, ecosystems and biodiversity are acutely linked to the climate – so much so that changes to these systems affect the climate and cause change. All life including humans are utterly dependent upon ecosystems as they provide goods (such as products we directly use such as fish, forests and freshwater) and services (such as climate regulation) upon which we all depend.

The world's poorest communities are more directly dependent on ecosystem resources and less able to cope if they fail. Therefore, management of biodiversity and ecosystems is inextricably linked to poverty alleviation. Poverty alleviation is in turn a key component of adaptation. Conserving biodiversity, strengthening ecosystems and protecting the flow of environmental goods and services from these systems will make them more resilient when put under stress from a changing climate. By the end of the century climate change is likely to be the most significant

⁴ Resilience is the "degree to which a system rebounds, recoups or recovers from a stimulus" (Smit *et al.* 2000).

driver of biodiversity loss and ecosystems degradation as well as a major threat to the well being of people and societies.

RESPONSIBILITY FOR ACTION

The immediate climate change mitigation and adaptation support needs to come mainly from the developed world - those who are historically responsible for most of the world's emissions. However, developing countries also need to mitigate and shift to low carbon pathways and to start integrating adaptation into national development plans across all sectors and scales of society.

The Most Vulnerable Countries (MVCs) have contributed the least to global carbon emissions. The CO₂ emissions of over 100 MVCs (excluding South Africa) account for only 3.2% of the global total, compared to 23.3% for the US, 24.7% for the EU, 15.3% for China and 4.5% for India.⁵ MVCs will suffer most severe impacts of climate change and they have the lowest capacity to adapt in terms of technical and financial resources. This is compounded by endemic poverty and degraded natural environments, further weakening resilience to climate change.

The UNFCCC Bali Action Plan lays out clear recommendations for parties to meet their common but differentiated responsibilities and to make provision for adequate finance and resources for vulnerable countries. Some Annex 1 governments from rich countries have rhetorically accepted that they are responsible for assisting developing countries adapt to the impacts of climate change. However, most of them have failed to commit to providing adequate financing or technical resources. It is critical to recognise that adaptation financing is not a form of ODA but as compensation for climate damage caused by Annex 1 countries and inflicted upon those countries that historically have done so little to cause the problem.

COSTS OF ADAPTATION

Correctly estimating the costs of adaptation is very difficult, especially for ecosystems, as impacts and adaptation occur at the local level and are often difficult to translate into monetary values. How much adaptation is needed in the future depends on how successfully greenhouse gases are reduced. It is difficult to predict specific impacts for specific sectors, scales and localities given the diverse levels of resilience and vulnerability. However, it is clear from assessments to date that costs of adaptation will run into tens of billions of US dollars a year (\$50 to \$86 billion by 2030). However, the current adaptation cost estimates do not account for the loss and damage to ecosystems and their goods and services which if valued and incorporated would change the costs upwards by billions of dollars. Nor do costs include climate proofing the existing supply of natural and physical capital. This means in total the real costs could be significantly⁶ higher. Perversely, the current main threat to delivering adaptation is the inadequate provision of resources, especially financial ones. The main onus for provision of finance rests with Annex 1 parties and they have yet to meet their pledges or find new and additional sources of finance (e.g. auctioning of Assigned Amount Units (AAUs), or bunker levies). The size of the funds and their availability are not the only significant factors, but also how the funds themselves are governed and by which institutions, and the accessibility, transparency and democratic nature of the organisations responsible for their management.

⁵ IIED. Huq/Ayers (2007) Critical List: the 100 nations most vulnerable to climate change

⁶ Page 6 Actionaid Discussion Paper Compensating for Climate Change: Principles and Lessons for Equitable Adaptation Funding

5. Why is WWF concerned with adaptation?

Climate change is happening and impacts are already being felt with changing weather patterns globally and locally. Climate impacts affect all sectors from transport, housing, health to agriculture and freshwater, and across all scales, from local communities to international policy frameworks, across all global regions. There is nowhere on the planet that is not already being impacted or that will not feel further climate impacts in the future.

Given the level of current and future climate impacts, supporting climate change adaptation across all areas of our work is key to achieving our mission to stop the degradation of the natural environment and build a future in which people live in harmony with nature. WWF is in the business of increasing biodiversity, ecosystem functionality and human well being and is aiming to integrate climate change and adaptation into every part of our organisational DNA. Through WWF's adaptation mainstreaming work, the risks and vulnerabilities to projects and programmes associated with current and future climate change will be analyzed, and relevant adaptation measures identified (including policy recommendations and planning; ecological monitoring and resilience building; community based adaptation; technology, communications, and awareness raising and capacity building). The following section provides some examples of how WWF is currently integrating climate adaptation into conservation programmes.

6. WWF case studies on adaptation

MESOAMERICAN REEF

The Meso American reef in Belize is a sanctuary for numerous endangered species, including fish, turtles and coral. Local communities in the region depend on the health of the reef and the mangroves for their livelihood needs (fisheries and tourism in particular). The area is extremely sensitive to impacts such as coral bleaching, storm surges and hurricanes which are being exacerbated by climate change. The mangroves and the reefs not only support the wealth of marine life but also provide a buffer to protect the land from erosion, and reduce the impact of extreme climatic events such as hurricanes. WWF has been working on a climate change adaptation project, together with communities in the area, on adaptation initiatives such as mangrove restoration to improve the resilience of these habitats. This is coupled with strategies to reduce unsustainable fishing practices; promote sustainable tourism, monitor impacts of climate change and other related drivers on the reefs, and improve local coastline development plans to incorporate responses to climate risks.

INDIAN SUNDARBANS

The Sunderbans Delta is the largest mangrove ecosystem in the world, home to many endangered species of wildlife (including the iconic Bengal tiger) and poor communities who are reliant on the natural environment for their survival. This fragile ecosystem and the resident communities are suffering from increasing coastal erosion and salinity as a result of rising sea levels and tidal surges. WWF is working to improve the resilience of communities to climate related risks through on-the-ground responses, awareness raising and advocacy measures. Adaptation responses include testing saline-resilient paddy varieties; sustainable aquaculture practices; installing pond sand filters to ensure availability of drinking water, and pond excavation for irrigation. Disaster risk response measures are also being undertaken, for example a community based climate change centre has been inaugurated by WWF to enable villagers to better handle climate change by providing integral services such as an electronic early warning

system, disaster preparedness kits, knowledge, resources and skills for adapting to climate impacts and educational materials for students.

This coming year WWF-UK will be supporting the development of a 'Delta Vision' for the Sundarbans, to be developed jointly with key stakeholders and through engagement with governments, supranational and multilateral agencies. This will aim to break through long years of unsustainable development and exploitation of the Sundarbans and generate recognition of the importance of restoring the ecological integrity of the Delta. The Vision document will broadly identify the threats and inadequacies in sustaining the Delta's future and will recommend various policy and institutional changes that are critical to improve the ecological and human well being in Sundarbans.

Both of these projects include a 'Climate Witness' programme to relate the stories of local people, and their experiences of climate change, to local, regional, national and international decision-makers.

NEPAL

Communities in the Langtang National Park Buffer Zone in Nepal are increasingly facing hazards such as landslides, earthquakes and forest fires. Serious drought, temperature increases, and flashflooding are causing serious detrimental impacts on community livelihoods – causing food insecurity; lack of access to freshwater for irrigation and household needs; soil erosion; damage to infrastructure (including irrigation systems, land, property and roads); increase in pests and diseases, and changes to ecosystems and biodiversity. These hazards are in part as a result of non-climate drivers (such as land use changes, unsustainable use of natural resources, governance, tourism) but are exacerbated by climatic variability.

WWF-UK is funding a project in this area to support communities to increase their resilience to the threats of climate change and other drivers of degradation to ecosystem services on which they rely. Activities will include vulnerability assessments, awareness raising and sensitization on climate change issues; improved management of water resources (including rainwater harvesting); community forest fire management; disaster risk reduction in landslide hazard prone areas; improving agricultural techniques, and mainstreaming adaptation into local development plans.

Feedback

We are keen to receive your views and comments in response to this Policy Position Statement which we will be updating on a regular basis. We also need to be aware of any new piece of work/research/evidence that you have undertaken that may affect this Policy Position Statement. There may also be gaps within the current position which we may not be aware of and which you may wish to highlight for any future review. Please click [here](#) to email your feedback. Please ensure you state which Policy Position Statement you are referring to.

Appendix

Adaptation related terminology and definitions

The IPCC define **adaptation** as “the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.”⁷

Beyond this, however, explanation is vague and unsystematic and there are differing definitions between the UNFCCC and the IPCC. The IPCC note that “the array of potential adaptive responses available to human societies is very large, ranging from purely technological (e.g., sea defences), through behavioural (e.g., altered food and recreational choices), to managerial (e.g., altered farm practices) and to policy and institutional (e.g., planning regulations and organisational change).”

There is currently limited clarity regarding the extent to which adaptation is structural, technical, or socio-economic and it varies greatly in different geographical, political and economic contexts. Given the scale and range of activities which are labelled as ‘adaptation’, then put simplistically it means learning to cope where possible with the affects of climate change and its impacts. Importantly the definition for adaptation is now broadening to not just consider managing the direct climatic impacts but to also consider the management of other indirect climate impacts on other parts of the system and the way in which they synergistically antagonise other existing drivers of change e.g. climate impacts upon freshwater antagonising existing over use and abstraction or food; or energy shocks coupled with climate impacts. This understanding is increasingly being termed as “double exposure”.

“**Adaptive capacity** is 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.”⁸

Adaptation reduces the costs of climate change by reducing the damage from climate change impacts, adaptation activities may also have other advantages, for example increasing resilience to other disasters and reducing vulnerability.

The World Bank (2009)⁹ distinguishes different types of adaptation, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation. They also identify five categories of adaptation measures: (a) mobility, (b) storage, (c) diversification, (d) communal pooling, and (e) exchange. However, they do not explore the role that natural resource management (NRM) can have as an adaptation strategy.

Vulnerability is defined by the IPCC, 2007 as “the degree to which a system is susceptible to, and 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 change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.”

Assessing the vulnerability of a target system (including both human and ecological) is fundamental to any adaptation strategy and should be viewed as part of a continuous process as

⁷ IPCC (2007) *Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK <http://www.ipcc.ch/ipccreports/ar4-wg2.htm>

⁸ IPCC (2007) *Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK <http://www.ipcc.ch/ipccreports/ar4-wg2.htm>

⁹ World Bank (2009) *Climate Resilient Cities: A Primer on Reducing Vulnerabilities to Disasters*, The World Bank, Washington DC http://siteresources.worldbank.org/INTEAPREGTOPURBDEV/Resources/Primer_e_book.pdf

new vulnerabilities are likely to be exposed over time. Vulnerability assessments need to take a holistic approach, identifying assets exposed to climate impacts; the degree of a system's sensitivity to these impacts (which may be exacerbated by the pressures of other drivers, such as unsustainable development and natural resource extraction), and the ability of people to manage change (their adaptive capacity, including human, financial, social and technological). Vulnerability assessments should ideally take into account the best of available climate science; an analysis of policies and institutions at different levels; ecological hazard mapping, and livelihood vulnerability.

Responses are likely to need to include a wide range of measures depending on the vulnerabilities identified, adopting a multi-disciplinary approach. For example, livelihood responses may include Disaster Risk Reduction, aiming to make poor people less vulnerable to natural hazards and more resilient; livelihood diversification, as the poor often rely on a single source of income; social protection, including short term safety nets such as cash transfers or food aid, and longer term measures to combat poverty.

Resilience is the “degree to which a system rebounds, recoups or recovers from a stimulus” (Smit *et al.* 2000).

Strong institutions, strengthening education, health, infrastructure and a diversified economy all increase levels of resilience but in order to avoid maladaptation the importance of the role of ecosystems must be respected. Climate change will be felt through sectors that rely on natural resources, and which form the basis of people's livelihoods.

Interventions to build resilience need to be in part about reducing the impact of other drivers, such as addressing the causes of deforestation and forest degradation, but will also need to integrate planning for future climate impacts across different sectors, for example: in improving national capacity around water resource management as the quantity and quality of freshwater available changes; ensuring effective fisheries policies as climate change impacts on the health of fish stocks, and in agricultural policy-making, including livestock management as climatic variability alters the viability of crops and pasture land. As climate science is rapidly evolving, plans need to be flexible enough to respond to new threats (considering different potential scenarios), and stakeholders need to have sufficient capacity to access information, and understand the implications of impacts in order to respond to conditions of uncertainty.

Vulnerability assessments of environmental and social systems need to explicitly identify areas of resilience, for example corals which have survived past bleaching events, or communities which have rebounded quickly from an extreme climatic event. The conditions under which systems are less sensitive and more resilient to climate change need to be better understood so they can be replicated on larger scales.

Ecosystem Based Adaptation: WWF UK has been supporting the development of the ‘ecosystem based adaptation’ concept within the UNFCCC and developed a supporting CAN discussion paper on the subject. The role of biodiversity, ecosystems and natural resources should be taken into account when identifying appropriate adaptation strategies. “Ecosystem Based Adaptation” has emerged recently as a term to refer to “a range of local and landscape scale strategies for managing ecosystems to increase resilience and maintain essential ecosystem services and reduce the vulnerability of people, their livelihoods and nature in the face of climate change”. A concern with this terminology is that it may reinforce artificial distinctions between different ‘types’ of adaptation strategies, for example portraying ecosystem approaches as distinct from other strategies eg structural¹⁰ or community based, when a consideration of

¹⁰ Campbell A., Kapos V., Chenery A., Kahn, S.I., Rashid M., Scharlemann J.P.W. and B. Dickson (2008) The linkages between biodiversity and climate change adaptation. UNEP World Conservation Monitoring Centre, Cambridge. <http://www.cbd.int/doc/meetings/cc/ahteg-bdcc-02-02/other/ahteg-bdcc-02-02-unep-wcmc-en.pdf>

natural systems and their role in adaptation and resilience should be integrated into any adaptation strategy. Ecosystems 'for' adaptation or ecosystems 'in' adaptation may therefore be more appropriate terms.