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PAPER

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Climate Information and Capacity Needs
for ecosystem management,
under a changing climate



Copenhagen Discussion Series



The UNEP Copenhagen Discussion Series are working papers produced by UNEP and its partners in the lead up to the UNFCCC Climate Talks in Copenhagen in December 2009. They aim to contribute to the discussions on climate change issues, including those under consideration in the UNFCCC Climate Talks.

The UNEP Copenhagen Series do not aim in any way to prejudge the climate negotiations but rather contribute analysis and knowledge to those negotiations. Comments and feedback on the contents are very welcome and should be sent to climate.coordinator@unep.org

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SUMMARY

This Paper demonstrates the need to integrate across information types (i.e. weather, climate, socio-economic, policy and ecology) to better inform those involved in decision-making for ecosystem management¹. The provision of climate information and an understanding of ecosystem responses to climate change and variability must underpin planning for the future. There will be increasing need for climatic information to be integrated into risk assessment frameworks and adaptation planning. This is essential to enable better informed decision making in planning to ensure the adequate provision of ecosystem services (water, food, air quality, shelter etc) and appropriate adaptation and mitigation strategies for the well being of both people and nature.

There is a need for a substantial mindset shift to fully recognize the fundamental role of ecosystems as life-supporting systems. The value given to ecosystems and the magnitude of effort to manage them has to be based on this mere fact and indeed, it should be an integral part of the post 2012 climate change agreement to be made at COP15 of the UNFCCC.

1. WHY THIS PAPER:

The aim of this Paper is to set the foundations for a framework to provide appropriate climate information to decision makers. The Paper will serve as a precursor to the UNFCCC Conference of the Parties (COP 15) to be held in Copenhagen (7-18th December 2009)² with the aim of providing support for the negotiation process. Further, the paper will benefit the development of the Global Climate Change Adaptation Network³. The purpose is to help build climate resilience of vulnerable human systems, ecosystems and economies through increased understanding of ecosystems and the mobilisation of knowledge and technologies to support adaptation policy setting, planning and practices. To adequately do so requires adequate climate information to understand how ecosystem management through interactions of natural resource management, biodiversity and ecosystem services, will respond to climate change and other multiple stressors.

Fundamentally, the provision and consideration of climate information needs to underpin planning for the future, and must be integrated with those other factors considered in the decision making process. This approach is necessary to enable better informed decision making in planning to ensure the adequate provision of ecosystem services (water, food, air quality, shelter etc) and appropriate climate change adaptation and mitigation strategies for the well being of both people and biodiversity.

Alongside the aims for achieving sustainable natural resource management, biodiversity conservation, and protection of ecosystem services, a further aim is to ensure that climate information needs are considered in supporting the Millennium Development Goals⁴ and disaster risk reduction⁵.

¹Ecosystem management is defined in this paper as "an integrated process to conserve and improve ecosystem health that sustains ecosystem services for human well-being," encompassing land and marine based natural and semi-natural systems, and associated land uses including conservation, sustainable livelihoods, pastoralism, agriculture and forestry.

²See <http://en.cop15.dk/> and <http://unfccc.int/2860.php>

³See <http://www.unep.org/bh/Newsroom/pdf/CC%2017%20GAN%20Strategy%20Jan09.pdf> for the draft strategy and <http://www.unep.org/bh/Newsroom/pdf/CC%2017%20GAN%20Strategy%20Jan09.pdf> for an overview of objectives.

⁴See <http://www.un.org/millenniumgoals/>

⁵See <http://www.unisdr.org/>

2. BASIS FOR ECOSYSTEM APPROACH:

The interaction between climate change and ecosystem management is key to secure adequate ecosystem services to human well-being. The process is multi-faceted through water and energy cycling. Climate change at regional to global scale can be amplified or modified through responses of different ecosystems, hence impacts on to biodiversity and other ecosystem processes.

- Ecosystems form the fundamental unit of life support for humans and all other forms of life. Their functions are primarily driven by the climate.
- Healthy ecosystems support human well being through the provision of ecosystem services. These include the supply of food, fresh water, clean air, fertile soil, biological diversity, and the ability to regulate the climate through energy transfer and the global biogeochemical cycles, including the carbon cycle, but also the nitrogen and phosphorous cycles.
- The ability of ecosystems to function and provide these services is determined by many factors including their biological diversity, ecological and evolutionary processes, climatic inputs of energy and water, anthropogenic impacts related to economic activities, and their interactions.
- Depending on the nature of change and the condition of the system due to human perturbation, climate variability and change can pose substantial risks to ecosystem health, the provision of ecosystem services and therefore human and biodiversity well being.
- Greater value to support ecosystem-based management decision making can be gained through the integration of multiple information types with climate and ecosystem information forming the basis for establishing the boundaries for a sustainable human society.

Decision makers and land stewards have a wide range of considerations - including economics, policy and law, ethics, self interest - in which climate information forms only part of the decision making process. Therefore we aim to raise the profile of both ecosystem management and the associated climate information needed within societal processes and systems (political, economic, and legal) so that climate information exists at the heart of the decision making process.

3. CHALLENGES

The key challenge is to make it as easy as possible for decision makers to use climate information and to facilitate change in the way that natural resources and ecosystems are valued and managed. However, this is complicated as many decision makers are non-professionals who serve the vulnerable communities and groups whose subsistence livelihoods depend on traditional land use activities in remote areas with poor communication infrastructure. Furthermore, direct manipulation of ecosystem components over extensive areas is expensive and generally unfeasible even for wealthy countries. Generally, human use of ecosystem services is managed indirectly through policy incentives and innovations in management interventions, or indirectly through changes in demand for provisional ecosystem services such as food products. The latter is influenced by consumer choices, people's attitudes, and community values. Therefore, it is important to recognize the complexity of societal factors that influence ecosystem management in different bioregions, economies and cultures around the world.

A major challenge thus becomes how to engage with stakeholders as to what information (climate and other types) they need and how best to provide it. Currently, decision-maker at various levels make only minimal use of existing climatic information. Maintaining credibility between information providers and stakeholders, given the natural vagaries of climate and the range of uncertainty associated with projections of future climate change and variability will be an essential challenge to address.

The specific challenge of climate change and variability requires that climatic information be seamlessly integrated into risk assessment frameworks and strategic planning for adaptation.

4. CURRENT USES OF CLIMATIC INFORMATION

There is a wealth of climate information available that is employed in a wide range of uses, including storm prediction, flood risk and drought warning, storm driven sea level surges, pest outbreak risks etc. There are however substantial variations globally in climate information quality and the degree to which it is available and used for ecosystem management and policy development. There is a growing trend within many countries to incorporate climate information into decision criteria, but the capacity to do so using the best available science, information and dissemination methods is more limited in developing countries. From an ecological perspective, ecosystem processes operate at all temporal scales. In land dominated by natural and semi-natural ecosystems there is a gradient of human activity. In areas with little modern human land use activity, there has been less use of formalised climatic information.

5. WHAT IS THE CURRENT CAPACITY TO MEET THE NEEDS?

There is considerable variability in the quality and availability of observed climate (weather) data on which to form a baseline against which we can compare potential future changes. Similarly the ability of information providers to meet the needs of decision makers for the immediate future (short range forecasts), seasonal (long range forecasts) and future projections varies considerably around the world. Some developed countries are able to deliver state of the art weather forecasts

and modelled future projections of the climate at a national scale whilst many less developed countries lack the capacity for the provision of weather and climate information, often relying on external assistance based on global scale projections that lack sufficient spatial detail for appropriate decision making.

Secondly, there is a range of capacity in the dissemination and communication of climate information to relevant people. This capacity follows the same pattern as above for forecasting and climate modelling. The provision of climate information needs to feed into existing steps to establish the capacity for adaptation, for example the 'stocktaking' exercises currently being undertaken by UNEP (i.e. UNEP 2009) and the development of National Adaptation Programmes of Action (NAPAs¹). This disparate capacity to meet the needs of decision makers needs to be addressed.

6. INFRASTRUCTURAL AND INSTITUTIONAL GAPS

In many developing countries there is also a legacy of gaps in infrastructural and institutional capabilities. There has been a lack of institutional coordination to facilitate the systematic integration of relevant climate information with other pertinent information in a form that planning and operational agencies can use. Climate information is not systematically integrated into longer-term planning and investment decision making, with a tendency for Governments and other institutions to focus on short-term objectives rather than long term goals. Generally there is a lack of understanding by many policy makers of how climate variability and change might impact achievement of the Millennium Development Goals, and lack of understanding by policy makers of the utility of climate information for reducing the negative impacts of climate variability and climate change (GCOS/WMO 2006).

7. KEY RECOMMENDATIONS

a: Improve data-gathering networks and information management systems for both climate and ecosystem sectors. Given the geographic gaps in meteorological instrumentation, it will be necessary in many regions to prioritize ecosystems for targeting investments for improving climatic information. Therefore, effective use of climate information for ecosystem management by regional and

national decision-makers begins with an inventory of major ecosystems that potentially will be most impacted (the Millennium Ecosystem Assessment² provides a basis for this). There is need to identify gaps in ecosystem and socio-economic data for documenting and understanding ecosystem degradation and restoration. Future efforts should seek to maximize the value of existing data from different sources through data integration mechanisms that seek to synchronize disparate data types. Strategies should be developed to document recent trends in climate variables, environmental indicators, and relevant socio-economic indicators. There is need to ensure collection of data for monitoring the effects of climate variability and change, including extremes, with appropriate spatial and temporal resolution. High intensity monitoring of selected ecosystems or watersheds may provide "early warning" signals of climate disruption, threats to species, and ecosystem thresholds (NCSE, 2008). Environmental observing and reporting systems must be strengthened at the local-to-regional level where many adaptation decisions will be made. National mechanisms should be established to ensure that critical measurements of high quality will continue to be taken long into the future.

In Brief: inventories of major ecosystems are needed and priority ecosystems identified; observed local and regional responses to past climatic stresses should be catalogued; critical gaps in ecosystem and socio-economic data should be noted; recent trends in climate variables, environmental and socio-economic indicators should be documented; and observing and reporting systems strengthened.

b: Improve integration of regional and national infrastructure for the effective delivery through appropriate communication of climate information and predictions to national governments, agencies and the private sector. Given that many ecosystem processes (e.g. water flows, migrating animals) transcend political and administrative borders, and that many nations and land stewards share the same or similar ecosystem types, there is need to promote agreements that ensure international sharing of relevant ecosystem data and climate data to promote regional approaches to problems spanning national boundaries. This is achieved by building effective partnerships between relevant climate service providers and the public and private sectors, and non-governmental organizations having interests in ecosystems. Strategies that have demonstrated success in other regions, nations, or sectors should be considered for wider adoption. Partnerships between developed and developing countries can provide critical access to advanced technologies (e.g., satellite data) and infrastructure. National or regional climate services should function as an "integrated threat center," as a one-stop source of science, data, information and modelling from all branches of government and provide oversight and management to coordinate among agencies (NCSE 2008). National climate change risk assessments and associated adaptation planning can provide a framework for coordinating the integration of climatic and socio-economic information both across sectors and national borders.

In Brief: international data-sharing agreements be established; strategies having success elsewhere be adopted; technology sharing between developed and developing countries be practiced; national and regional climate services centres function as "integrated threat centres"; and risk assessment and adaptation planning provide the necessary coordinating framework.

¹ See http://unfccc.int/national_reports/napa/items/2719.php

² See <http://www.millenniumassessment.org/en/Index.aspx> for details.

c: Strengthen scientific and technical capabilities to provide more credible and user-oriented climate information and predictions by reinforcing international, national and regional scientific mechanisms. Best-available science must be employed to project changes in climate, including trends in means, extremes, inter-annual variability, and inter-decadal variability. Climate-ecosystem interactions and feedbacks are of particular importance for advancing models. Consideration should be given to changes and variability over the next 20 to 50 years and changes to 2100, and other possible time scales of high relevance to particular ecosystems. This also helps identify priority areas. International partnerships will facilitate access to best-available global climate information, regional climate downscaling (regional climate models and statistical downscaling), and ecosystem modelling tools. Climate scientists, in close collaboration with impacts modellers, should identify regional "hot-spot" analyses to help decision-makers and stakeholders to prioritize adaptation needs and opportunities. Decision-makers must be actively providing input to the development of climate products to ensure that decision-support tools benefit from effective flow of climate information. Consideration of the above factors will provide the basis for developing requirements for infrastructure, communication systems, education, and other forms of capacity-building.

In Brief: international partnerships be established to ensure use of best available science; relevant time horizons for projecting changes be established; adaptation needs and opportunities be prioritized; and decision-makers should be engaged in development of climate products.

d: Enhance the ability of governments, societies and institutions to access and use climate prediction and information. Access to and effective use of climate change information requires considerable advance planning jointly by climate scientists, stakeholders, and representatives of societal groups highly impacted by ecosystem degradation. There is need to identify socio-economic drivers for and impediments to effective decision-making and to integrate information for planning, preparedness, disaster risk reduction and coping with climate variability, including extremes. Information and technology needs for facilitating adaptation to climate change at local and regional scales and over time scales of inter-annual to inter-decadal should be a basis for prioritizing strategies. Effective decision-making requires dissemination and communication of climate information in forms readily usable by stakeholders. Mechanisms built into the information flow should allow for

identification of gaps between information available and services needed, rapid adoption of new information, rapid response to emergent climate product needs, and adaptive management strategies that are flexible to meet changing situations.

It also should be noted that climate information cannot be considered in isolation. Successful ecosystem management decisions in response to climate change call for a wider range of information across a broad spectrum of disciplines. These include socioeconomics, ecology, conservation management, hydrology and many others. Hence an interdisciplinary approach is required. Such data and the processes to evaluate the links between them become vital to identifying the cause, effects and roles of different drivers of change. Policy analyses and informed decisions can only be made if there is an understanding of the relationships between the climate, human society and the environment.

Climate information in conjunction with other information types needs to form the basis for the establishment of the conservation and sustainable resource use of the world's ecosystems. The utilisation of climate information to determine environmental constraints and ecological requirements will enable the human society to live within those constraints and to develop lifestyles that are sustainable.

In Brief: advanced planning be carried out jointly by climate scientists, stakeholders, and appropriate impacted groups; identify and use effective dissemination and communication forms readily accepted by stakeholders; and engage a wide range of disciplines.

8. CONCLUSIONS

The consequences of not using climate information and not valuing properly the services provided by ecosystems, is that there is a greater risk of further environmental degradation, reduction in ecosystem services and increased species extinction. Subsequently there would be increased human suffering and a higher probability of not achieving mitigation objectives. As such, the imperative is to ensure that climate and other information types are integrated into, inter alia, risk assessment frameworks and adaptation planning, to maximise the support given in decision making. **What is needed is a substantial cultural shift to better recognize the importance of ecosystems as the fundamental units of life support, and the functional role of biodiversity in these systems. Properly funded research and monitoring, and support for decision making, will help ensure that these risks are minimised.** Climate information for ecosystem management needs to underpin the decision-making process for policy makers, with an adequate recognition from policy makers of the role of ecosystems in life support provision. **Hence there is need to place the provision of climate information and capacity needs for ecosystem management at the heart of the climate change debate leading up to the Copenhagen negotiations (COP15).**

The provision of climate information is a vital component to ensure that ecosystems are managed appropriately within the boundaries of environmental limits. It is imperative that human social systems (particularly resource use economics and policies) adapt to develop within the constraints of environmental limits to establish a sustainable global society. For this to occur, planning and decision making needs to be better informed about how ecosystems function now and will change in the future due to an altered climate. Therefore the climate information, when coupled with other information types such as ecology and socio-economics, should be centralized within policy formulation and practical ecosystem management decision making process. Ecosystem management

should form the basis for ensuring a sustainable provision of ecosystem services. For these reasons, human management of ecosystems under climate change and variability is both essential and urgent.

9. REFERENCES

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A protest sign is placed in a desolate, arid landscape. The ground is parched and cracked, with sparse, dry vegetation. The sign is tilted and features the following text:

UN Climate Change Conference 2009
C O P E N H A G E N
SEAL THE DEAL!
Power Green Growth, Protect the Planet