World Resources Report

# Ecosystem Management: The Need to Adopt a Different Approach Under a Changing Climate

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**Question Four: Must we fundamentally change course to conserve ecosystems in a changing climate?** Do we need to adopt a fundamentally different approach to conserving ecosystems and their services in a changing climate?

*The authors argue the need for a fundamental shift in the way ecosystems are valued and managed due to the threats posed by intensifying multiple pressures from a changing climate and unsustainable demands for ecosystem services. They point out that complex political arenas make it hard to achieve consensus on viable solutions and that ecosystems are an undervalued commodity in the current economic model and political decision making process. Describing ecosystems as the "win-win-win" link between mitigation, adaptation and sustainability, they propose four strategies for prioritizing ecosystem protection.*

**Summary**

The purpose of this article is to set in context the essential roles that biodiversity and ecosystems have as the foundation for supporting human society. From this it is argued that there is a need for a fundamental shift in the way ecosystems are

valued and managed due to the threats posed to them by increasing multiple pressures from a changing climate and unsustainable demands for ecosystem services, whilst complex political arenas make it difficult to achieve consensus on viable solutions. In reality "˜ecosystems' exist as complex socio-ecological systems, due to the intervention by society through management, resource use and pollution. However, our current economic models have led to the worst form of market failure, where the resources underpinning human society are being degraded. Whilst there will be a continuing need for developing existing practices of incorporating ecosystems "˜thinking' into decision making, it is likely that the current level of urgency is insufficient to deal with the substantial threats posed. There is therefore a need for a more radical change where human society places the conservation and sustainable management of ecosystems and the services they provide at the heart of decision making. Ecosystems are an undervalued commodity in the current economic model and process of political decision making. In this article it is argued that ecosystem management must be given a primary priority to protect the vital ecosystem services we all depend on.

**Defining the problem**

Whilst human caused greenhouse gas emissions continue to rise, the global capacity to absorb them is declining due to ecosystem degradation. Continuation of this imbalance will lead to climate instability and reduce essential ecosystem services. Appropriate valuation, protection and management of the world's ecosystems will achieve two vital objectives:

1. Cost effective mitigation and adaptation for climate stabilisation through use of natural carbon sequestration processes.

2. Secured delivery of essential ecosystem services, such as clean air, food and water security.

Climate stabilisation can only be achieved by balancing emissions sources (human and natural) and the global ecosystems' sink capacity. The protection and management of the world's ecosystems offers a highly cost effective multiple "˜win' mechanism for mitigation by enhancing sink capacity and protects the essential life supporting ecosystem services that will enable societal adaptation to climate change. Even if there were no human activities on Earth, carbon would flow through the atmosphere because of natural biological and geological activity. Our planet is a dynamic geological and biological system. It produces and absorbs carbon and other greenhouse gases through a range of natural cycles and across a wide variety of ecosystems, which has resulted in past climate patterns in

conjunctions with planetary variations (i.e. the Milankovitch Cycles and solar activity).

Human activity has intervened in these natural carbon cycles in two main ways:

- By creating major new sources of carbon emissions from the use of fossil fuels;
- By degrading natural sinks of carbon by polluting or transforming natural ecosystems.

The combined result of these human interventions has been to change the planetary balance between the sources, sinks and storage pools of carbon. Put crudely, Earth is now emitting more carbon to the atmosphere than it can absorb. This changing imbalance is reflected in a progressive increase in $CO_2$ concentrations in the atmosphere which has led to climate change. Putting these things together, it can be seen that there are three main components to the global carbon cycle.

- Those emissions due to human activity.
- Those emissions from ecosystems.
- There is only one assured sink: the capacity of global ecosystems to absorb carbon.

This is shown in Figure 1.


Figure 1. **Imbalance of components for climate stabilisation** [1] [2]

*(Note proportions of size are not to scale and do not reflect actual values of fluxes)*

The key observation here is that global and regional ecosystems function as the main climate regulators, both in releasing greenhouse gases (sources) and sequestrating them (sinks) and in other direct and indirect interactions with the climate.

- Ecosystems currently absorb about half of anthropogenic $CO_2$ emissions (oceans about 24% and land about 30%). The remaining amount is the addition to the atmospheric pool.
- But ecosystem absorptive capacity is declining by about 1% per decade and is likely to decline more rapidly due to climate change and human impacts.

At the present time emissions due to human activity are increasing:

- Current estimates put the annual global emissions of $CO_2$ due to human activities at about 10 gigatons, of which about 1.5 Gt is from land use change

(mainly deforestation).

The net effect is an increasing imbalance between emissions and absorption capacity. *Therefore to achieve climate stabilisation there is need to manage all three components of the global carbon cycle, not just those resulting from fossil fuels and other human activities. The key problem is that only one component of the three-way balance is concentrated on as part of the post-2012 negotiations. The current policy is too focused on human based emissions. The risk of this situation is that regulating human based emissions will be insufficient to achieve climate stabilisation.*

**Climate stabilisation: the need for balance**

Examining the global carbon cycle suggests that whilst reducing emissions from human activity must form the basis of our stabilisation strategy it should not be the only part. Indeed there is no guarantee that significant reductions of anthropogenic emissions would on their own result in stabilisation.

As a simplified representation, a three way balance describes the global climate stabilisation problem:

Climate stability = Global ecosystems' capacity to absorb GHGs - (natural emissions from ecosystems + human induced emissions) [3]

The evolution of this will determine to a large extent the speed and magnitude of human induced climate change and the mitigation requirements to stabilise $CO_2$ (and other GHG) concentrations at any given level. [4] Currently the equation is set so as to lead towards climate instability (see Figure 1).

The dangerous paradox is that if emissions due to human activity increase as they are doing, emissions from ecosystems are likely to increase as well (due to positive feedback mechanisms), whilst the capacity of ecosystems to absorb emissions decreases. *Such an imbalance poses substantial risks of irreversible climate destabilisation.*

As can be seen from Figure 1, ecosystems function in two of the three components of the stabilisation balance. [5] Again, the danger of not fully recognising and accounting for the role ecosystems play in climate regulation, and looking solely at human based emissions risks addressing only one side of the three way balance. To achieve stabilisation (or climate resilience), there is need to balance the three components in ways that:

- Maximise the global ecosystem capacity to absorb GHGs,
- Minimise emissions from ecosystems (or at least be able to quantify what they are and understand how the processes work) and crucially,

- Reduce emissions due to human activity.

Therefore ecosystems play an unequivocal and increasingly important role in both ecosystem-based mitigation (carbon sequestration and storage) and ecosystem-based adaptation (i.e. foundation to societal adaptation to climate change impacts).

**Ecosystems: the "˜Win-Win-Win' link between mitigation, adaptation and sustainability**

An ecosystems approach can fulfil objectives for both mitigation of, and adaptation to, climate change as well as being the foundation for long term sustainability. Protecting ecosystems provides multiple benefits, both directly through sustainable management of biological resources and, indirectly through protection of ecosystem services [6]:

- Social - Secure livelihoods, particularly for the poor; public health benefits; cultural and aesthetic values; community support.
- Economic - Resilient ecosystems secure service provision to support all forms of economic activity.
- Climate regulation - ecosystems function as tools for mitigation, through appropriate management to reduce natural sources of emissions or increase absorption capacity.
- Environmental - Resilient healthy ecosystems have the capacity to support long-term sustainability.

These together provide countless streams of cost effective benefits and opportunities to human societies (economic, cultural, health and many more). Indeed, a fourth 'win' can be added in that profitable outcomes can be generated by utilising the benefits of healthy ecosystems. It is important to emphasise that the solutions are attainable. Some are relatively straightforward and could be developed immediately and at low cost [7], whilst others will need careful planning, development and larger investments.

**Ecosystems as a 'safety net'**

The adoption of an ecosystems management approach at a global scale will serve as a "˜safety net' against possible failures in the efforts to reduce emissions from human activity. *However, it must not be seen as an alternative to reducing human emissions, but rather as a complementary mitigation and adaptation approach.*

Whilst it is vital to achieve agreement on emissions reduction, there is no absolute guarantee that the targets set will be either correct for climate stabilisation or met. It therefore follows, using the precautionary principle, that ecosystems are protected and promoted as the primary mechanism for climate regulation, as well

as the foundation for supporting an adapting human society. The risk is that traditional approaches to combined economic and environmental issues (cost benefit analysis and risk assessments), are unable to deal with the inherent uncertainty in ecosystem responses to climate change, and additional pressures from a rapidly growing society. Without being able to define the resilience capabilities of ecosystems, the security of them acting as a safety net is unknown. Thus the argument goes that a considerably greater effort is needed to ensure the health of ecosystems and that we do not exceed the tolerance limits. Hence there is a much greater need for scientific understanding of biodiversity and ecosystem processes so as to identify their vulnerability and risk of exceeding resilience. There is a corresponding need to monitor the health of ecosystems and so better recognise emerging threats.

**People in the balance**

There is need to balance many opposing demands and trade-offs within the socio-ecological systems. Human population is expanding and the expectation of an increasing number of people is for living standard improvement and material gain, placing additional demands on resource use. To achieve a balance there needs to be a shift in human expectations, aspirations and behaviour and immediate resource use. *At the same time it must be recognised that poverty alleviation is a primary objective*. The aspirations of the poor need to be respected and support given to realise them, whilst on the other hand excessive resource consumption needs to be reduced in order to achieve suitable levels of equity and sustainability. Ecosystems provide the essential basics for livelihood provision, particularly for the poor, whilst excessive resource demands from the wealthy cause ecosystem degradation.

The key to many of the solutions in terms of practical application is through behavioural change. Fundamentally, people adopt new ways of doing things if:

a. There is an economic benefit; and

b. There is a clear rationale as to why change is needed.

Thus in making effective change there is need for new economic systems, societal level ethics and an ethos of collective responsibility, supported by an investment in education.

**The Economics of Ecosystems**

The publication of The Economics of Ecosystems and Biodiversity final report [9] at the Convention on Biological Diversity 10th Conference of the Parties meeting in

Nagoya, Japan, marks a turning point in the way ecosystems are valued and therefore how they can be utilised. It sets out the basis on which there is a need for valuation, and ways in which this can be achieved. The challenge is in making these approaches part of the mainstream methods within economics. A key question is also unanswered: "˜how long will it take to make the approaches mainstream?' and therefore effective enough to halt the decline in ecosystem health under the uncertainties of climate change and ecosystem resilience. A key factor in determining this will be how much resistance there is from entrenched existing economic thinking and vested interests in the current economic models.

The emphasis in this article is to support the aims of placing ecosystem protection and valuation at the heart of economic and political decision making. To facilitate the uptake of these aims, it is necessary to foster a society wide understanding and appreciation of the importance biodiversity and ecosystems have in providing the essential '˜life support systems' we depend on. Once this is achieved, new policies and economic models will become easier to develop and introduce. Providing evidence of the economic benefit of ecosystems is a vital part in this process, but may be insufficient by itself. Without a fundamental acceptance by all sections of society of the essential role biodiversity and ecosystem have, there is a risk that market driven mechanisms aimed at protecting them will only partially succeed. At worst, the market failures seen in the past that have resulted in ecosystem degradation may be repeated. Engagement with politicians and business leaders is thus essential in order to find the balance between ecosystem protection and continued use of natural capital. So are integrated moves towards low carbon economies, such as the Green Economy Initiative.

In order to provide a secure foundation for the transformational change needed to develop sustainable resource use, using the precautionary principle, there is need for a given level of predetermined essential conservation and protection of ecosystems which economic activity cannot degrade. This would maintain a fundamental level of ecosystem health and resilience in case of market failures and uncertainty in climate change impacts.

**Four complementary strategies**

**1.** ***Political commitment.*** There must be a sense of urgency to raise the profile of ecosystems in climate change and sustainability policy settings at local, national and international levels.

**2.** ***Investment.*** There must be explicit inclusion of investments related to ecosystem management and ecosystem protection, especially as part of a Global Climate

Change Fund. The scale of investment must be commensurate with the value of the ecosystems services.

3. ***Incentives.*** There must be a deliberate focus on introducing incentives to reduce emissions, ease existing pressures on ecosystems and support changes that increase environmental resilience and resource sustainability, including incentives for increased land and water protection.

4. ***Information.*** There must be a solid commitment to establish comprehensive information, and foster closer links, between ecosystem management, climate-change adaptation and disaster risk reduction communities, as well as between science, economics, politics and policy. In addition, there must be increased information sharing between countries, including North-South and South-South exchanges. Monitoring of crucial environmental variables and processes related to ecosystem-based climate change mitigation and adaptation must be expanded and supported over the long term.

***The following are recommended to policy makers:***

- Ensure ecosystem-based adaptation is an integral component of climate change at international, national and regional scales.
- Governments recognize, acknowledge and fully value the role of healthy ecosystems in climate change mitigation and adaptation and long term sustainability.
- Emissions from ecosystems and the GHG stocks they store are included in the sectors reported by the UNFCCC (adding to the human induced sectors).
- Existing stocks of carbon in ecosystems (such as soils and vegetation) must be protected and prevented where possible from causing further emissions.
- Enhance ecosystem sink potential and avoid source risk (i.e. reduce deforestation).
- Recognise the global "˜public good' of ecosystem interactions and ecosystem services which transcend national boundaries.
- Align climate change policies with other relevant conventions, including habitat, water and biodiversity conventions (such as the Convention on Biological Diversity).
- Incorporate ecosystem-based mitigation within Nationally Appropriate Mitigation Actions (NAMAs) and ecosystem-based adaptation into National Adaptation Plans of Action (NAPAs).
- Encourage funding for national and local level projects that strengthen ecosystem resilience and help build adaptation capacity in human systems.
- Develop education, training and communication capabilities.

- Emphasize strategies that promote: a) Legally-designated and effectively managed protected areas, and b) Integrated sustainable resource use from ecosystems.
- Support research and action on: a) Climate-ecosystems interactions and feedbacks. b) Ecosystem processes and functions. c) Increasing our understanding of the complex inter-relationships between society and ecosystems, and d) Development of climate modelling that includes ecosystem feedbacks.

**Conclusions**

Developing policies and economic strategies that place ecosystems and the services they provide at the centre of future economic development and climate change mitigation and adaptation efforts will result in positive benefits to all people of the world. An ecosystems approach is an essential, cost effective part of the '˜tool kit' to tackle climate change and progress towards long-term sustainability. Multiple cost-effective benefits include:

- Enhanced climate regulation through re-balancing of the carbon cycle.
- Protection of essential ecosystem services including enhanced food and water security, public health and societal wellbeing.
- Reduction of risks of further ecosystem degradation and subsequent societal disruption.

Fundamentally, the Ecosystems Approach ensures that the essential systems for life support on Earth are correctly valued, protected and managed.

Given the vital role ecosystems play in sustaining human society, their current rate of degradation and the emerging threats due to climate change, it is doubtful that existing approaches to integrating environmental concerns with economic policy development will be sufficient by themselves to tackle the problems we face. The threats posed by climate change and other sources of environmental degradation place a high premium on the precautionary principle. Whilst command and control, incentives, voluntary actions and other policy instruments, if properly developed and resourced, can achieve substantial desirable changes, there is a substantial risk that reliance on existing forms of intervention alone will be too little and too slow. Therefore we need a wider societal level change towards appreciating and valuing ecosystems and the services they provide. There is a need both to combine the best mix of approaches currently available and for a fundamental change in individual and societal level attitudes and methods of evaluation of ecosystems so as to centralise their role and place them at the heart of our economic models. Such a coupling of emerging interventions with a wholesale

shift in the role ecosystems thinking has in all aspects of societal attitudes, policies and economics can serve to form the foundations of a secure and sustainable balance between society and our environment.

**Notes/References:**

[1] Canadell et al 2007 PNAS. See: https://www.pnas.org/content/104/47/18866.full.pdf+html

[2] Global Carbon Budget. See: https://www.globalcarbonproject.org/carbonbudget/07/index.htm

[3]Includes all emissions as a direct result of human activity, including fossil fuel burning, cement production, land use and land use change.

[4] Canadell et al 2007 PNAS. See: https://www.pnas.org/content/104/47/18866.full.pdf+html

[5] It can be argued that ecosystems exist in all three components due to their role in underpinning all forms of economic activity, some of which result in human GHG emissions.

[6] World Bank 2009: Convenient solutions to an inconvenient truth: ecosystem-based approaches to climate change. See: https://climate-l.org/2009/07/06/world-bank-publishes-report-on-ecosystem-based-approaches-to-climate-change/

[7] Illustrated by marginal abatement cost curves, i.e. Kammen 2007. The benefits of decarbonising the economy. In Richardson et al 2007. See: https://climatecongress.ku.dk/

[8] TEEB (2010) The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB.

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