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RIO+20 POLICY BRIEF #4

Biodiversity and ecosystems for a planet under pressure

Transition to sustainability: interconnected challenges and solutions

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We share this planet with millions of other species and varieties of life, and depend on ecosystems for all our basic needs. While current trends in biodiversity and ecosystem services are sharply and dangerously negative, the right actions, developed and implemented promptly, can restore a biologically rich and ecologically viable planet. This policy brief sets out the main challenges facing the world as we seek to protect and enhance our vital biodiversity and its human benefits. In addition, we suggest pathways that will lead us towards a more sustainable future.

Rio+20 Policy Briefs

One of nine policy briefs produced by the scientific community to inform the United Nations Conference on Sustainable Development (Rio+20). These briefs were commissioned by the international conference *Planet Under Pressure: New Knowledge Towards Solutions* (www.planetunderpressure2012.net).

GLOBAL CHANGE IGBP International Geosphere-Biosphere Programme · IHDP · DIVERSITAS an international programme of biodiversity science · WCRP World Climate Research Programme · Earth System Science Partnership · ICSU International Council for Science

Summary of key points and policy recommendations

- Incorporate the multiple values of biodiversity and ecosystem services into policy and management decisions.
- Create green economies based on 'inclusive wealth', which includes all forms of capital – natural, social and human as well as financial and manufactured – and in which intergenerational wellbeing increases over time.
- Incorporate biodiversity and ecosystem services into water- and land-use planning at all scales from local to global, including both protected areas and production landscapes and seascapes.
- Implement policies and practices that reduce inequities in access to the benefits derived from biodiversity and ecosystem services, and ensure that those who bear the cost of their provision are fairly compensated.
- Restructure ecosystem governance and management to recognize that ecosystems transcend political boundaries.
- Develop global governance institutions that work in partnership with national institutions, local organizations and the private sector, to address global-scale drivers of biodiversity change.
- Implement the Strategic Plan for Biodiversity 2011–2020 and the Aichi Targets at all scales.

RIO+20
United Nations Conference on Sustainable Development

THE BIODIVERSITY CHALLENGE

"Biodiversity underpins and mediates many benefits that people obtain from ecosystems – protecting, restoring and sustainably managing ecosystems is thus crucial to a better future"

The benefits provided by ecosystems, which include the myriad of functions carried out by water, air and soil, are essential for human lives and livelihoods. Biodiversity – the variety of characteristics in plants, animals and other organisms, their abundance and their interactions in the world's terrestrial and aquatic ecosystems – underpins and mediates the sustained delivery of these ecosystem benefits. For these reasons, ecosystems must be protected, restored where damaged, and managed sustainably.

Human pressure on biodiversity today is unprecedented. Despite global commitments to reduce the impacts of human activities on the planet's ecosystems, the loss of biodiversity and ecosystem services continues and, in some cases, is accelerating. This rapid deterioration, experienced at all scales from local to global, represents a significant and irreversible loss of our heritage and curtails options for future generations. Accelerated loss of biodiversity is likely to continue unless the main drivers of change, which include climate change, land use change as well as increasing demands on ecosystems, are mitigated substantially.

Towards a sustainable development pathway

Recent attempts to reduce the rate of loss of biodiversity and ecosystem services indicate that, while many actions and interventions can reverse the trend, most have so far failed to stem this loss. Two themes proposed by the Rio+20 Summit are critical to defining a sustainable development pathway that secures a reasonable standard of living for the global population while preserving our ecosystems and resources:

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1. The need to move to an economic model that reflects the three pillars of sustainability: social, environmental and economic. This approach, known as the **green economy** model, values ecosystem services – both monetary and non-monetary – appropriately and recognizes natural resource constraints by allocating the costs of 'externalities' (i.e. the costs of actions currently not transmitted through prices, such as pollution) correctly. The green economy represents much more than just a focus on less harmful technologies; it represents a comprehensive approach towards a viable and desirable future for all.
2. The need for **institutions and governance systems** that can guide and support the protection and sustainable management of biodiversity and ecosystems, and the equitable flows of the benefits they provide to people everywhere. These institutions must be able to cope with changes in ecosystems, steer away from abrupt change in ecosystem function, and provide a buffer from the most detrimental consequences of unavoidable changes.

ISSUES OF MAJOR CONCERN

Global extinctions

The target set by world leaders at the World Summit on Sustainable Development in 2002 to halt the decline of biodiversity by the end of 2010 has not been achieved. About one third of the more than 50,000 species on the International Union for Conservation of Nature (IUCN) Red List remain threatened to some degree (see Figure 1). Traditional varieties of crops, vegetables and domestic animals are also disappearing fast.

Homogenization of biota and landscapes

In addition to a reduction in the total number of species and genetic varieties on the planet, the remaining living systems are increasingly becoming dominated by a few very successful species. Diverse and locally adapted species and ecological communities are being replaced by much less diverse managed croplands and plantations as well as by depleted, simplified and often polluted aquatic ecosystems. Such 'biotic homogenization' is at least as important as global extinctions in reducing the security of the benefits people derive from ecosystems, from the provision of food to cultural values.

Loss of resilience

Increasing evidence suggests that changes to ecosystems limit their ability to regulate environmental fluctuations and change. Extreme events such as floods, fires, disease outbreaks and storm surges are less buffered as a result, increasing the vulnerability of ecosystems and people to disasters and delaying their recovery from disturbances.

Exceeding critical thresholds

Declines in biodiversity and ecosystem services tend to be unexpected, abrupt collapses that are more likely to occur once a tipping point has been passed. Examples of such 'regime shifts' include bush encroachment and desertification in Africa, coral bleaching in Asia and salinized rangelands in Australia.

Furthermore, coastal areas worldwide are becoming affected by excessive nutrient loads originating most frequently from agriculture, sewage and industrial waste (Figure 2). These cause vast algal blooms and create oxygen-depleted zones where fish and other marine organisms can no longer survive. Future risks include forest dieback in the Amazon basin and widespread collapse of coral reefs because of ocean acidification. Reversing changes like these is at best, very slow and expensive and at worst, impossible. There is an urgent need to act now before such thresholds are reached.

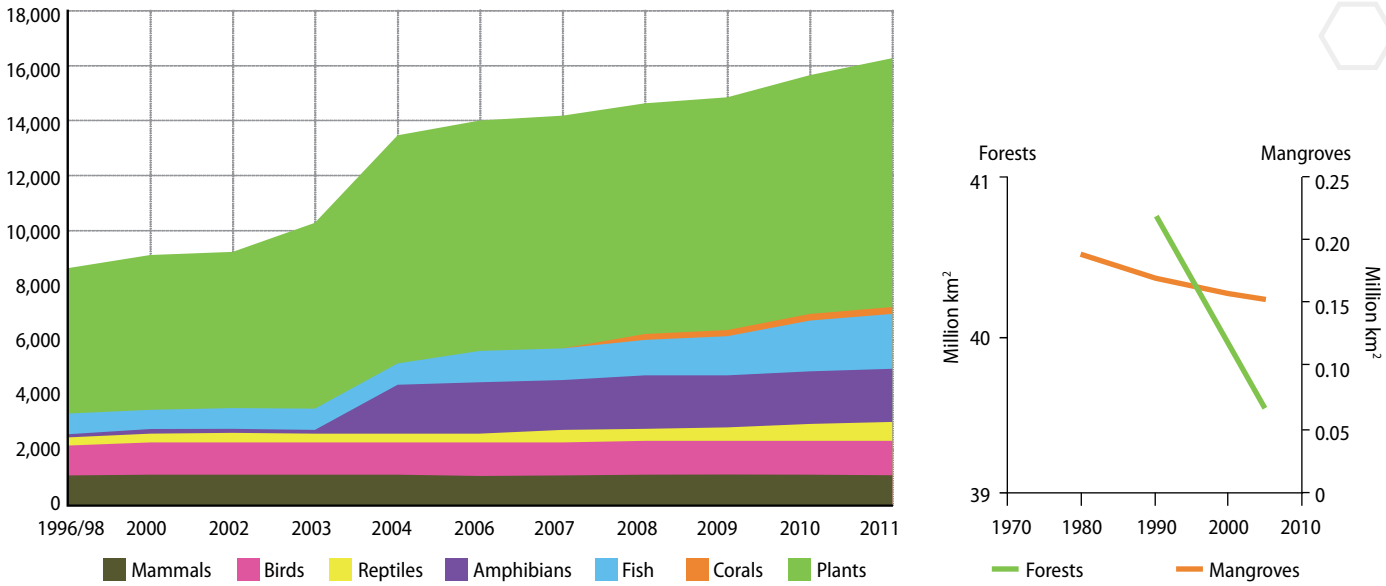

Figure 1. Species and ecosystems are declining fast. Recent trends in the number of threatened species in different animal and plant groups (left) and in the area occupied by two key ecosystems (right). Sources: Butchart et al. (2010) and IUCN Red List (2011); see also Secretariat of the Convention on Biological Diversity (2010).

Figure 2. Beyond the tipping point? Oxygen depletion in coastal marine ecosystems. Documented hypoxic (oxygen-depleted) zones, now more than 500 in the world, are doubling every year, causing fish mortality. Although it can occur naturally, hypoxia is most frequently caused by eutrophication, i.e., the overloading of waters with nutrients, especially nitrogen, phosphorous and silicon and/or organic matter. Major sources of this nutrient pollution are agriculture and livestock production, sewage and industrial waste, plus additional complex temperature and water exchange impacts from climate change. Nutrient effects on water oxygen levels are exacerbated when local water bodies become stratified and mixing of layers is prevented. The map shows the location of systems that remain hypoxic (red circles), systems that are eutrophic and therefore at risk of becoming hypoxic (yellow circles), and systems that have recovered from hypoxia (green circles), primarily through reduction of nutrient loads. Sources: Rabalais et al. (2010), Diaz and Selman (2010), STAP (2011a); Map from www.wri.org/project/eutrophication/gallery/maps.

ADDRESSING ROOT CAUSES OF BIODIVERSTY LOSS

Biodiversity conservation must be expanded to tackle the root causes of loss, while at the same time meeting societal needs. This has been recognized explicitly in the new Strategic Plan for Biodiversity 2011–2020 agreed upon at the 10th Conference of the Parties to the Convention on Biological Diversity (CBD) in Nagoya in 2010 (see www.cbd.int/sp). These root causes are complex and include social, economic and institutional factors. Within the framework of the economic and institutional reforms proposed by the Rio +20 Summit (see box on page 3), we recommend four priority areas to stem biodiversity loss while supporting sustainable and fair development.

PRIORITY AREA 1 – Incorporate the multiple values of biodiversity and ecosystem services into policy and management decisions

Global economic systems, markets and policy decisions do not currently reflect actual costs and benefits. Conventional macroeconomic models consider ecosystems and biodiversity as inexhaustible resources with which to create wealth; they fail to reflect fully any changes in their capacity to do so. In contrast, the greener economies of the future will need to be based on the concept of 'inclusive wealth'. This includes all forms of capital – natural (land, water, soil, biodiversity and ecosystem services), social (institutions and social networks) and human (education, health and skills), as well as financial and manufactured capital – and aims to improve human wellbeing by building, maintaining and valuing them all. Because many of the ecological processes that underpin the provision of goods

essential for human existence are poorly understood, or simply not amenable to economic valuation, their value is underestimated by policymakers, practitioners and the general public, and not considered in policy and decision-making analyses. Taking them into account in more inclusive metrics of human progress is a major challenge.

In a truly green economy, intergenerational wellbeing, as measured by inclusive wealth, would increase over time. Some countries are experimenting with adjusted systems of national accounts, in which decreases in natural resource stocks and increases in pollution are subtracted from, rather than added to, the wealth of the nation. Recent moves to replace traditional indices of progress (e.g., gross domestic product or GDP) with measures of societies' overall wellbeing (such as inclusive wealth) appear promising.

PRIORITY AREA 2 – Incorporate biodiversity and ecosystem services into land-use planning

Industrial, high-input agriculture, forestry, aquaculture and fishing are radically transforming ecosystems at the expense of such ecosystem services as freshwater supply, soil quality and climate regulation. Intensive commercial production reduces the diversity of cultivated or domesticated species and varieties, narrowing future choices and decreasing food security. At the same time, destructive fishing and aquaculture practices are severely damaging ocean ecosystems.

More effective and integrated land- and ocean-use planning is essential for sustainability, but reconciling local and global needs and values poses technical, socioeconomic and moral difficulties. Planning tools must include multiple criteria and targets. For this to be possible, we need improved information on the spatial distribution of biodiversity and ecosystem benefits, and better understanding of the ecological consequences of various land and ocean uses.

Integrated planning approaches at global scale must be accompanied by the promotion of behavioural changes that lead to a shift in consumption patterns and a reduction in the total amount of land and water needed for the production of food, fuel and fibre (e.g., lifestyles based on lower energy consumption and diets based less on meat in affluent societies or sectors). Biodiversity and ecosystem considerations must be incorporated into production systems at the local scale, an adequate system of protected areas must be established regionally, and the underlying drivers of biodiversity loss must be targeted globally.

PRIORITY AREA 3 – Implement policies and practices that reduce inequities in access to the benefits derived from biodiversity and ecosystem services, and ensure that those who bear the cost of their provision are fairly compensated

More affluent nations or social groups place larger demands on biodiversity and ecosystem services. These demands are often met from distant sources, or by exceeding local sustainable supply. As a result, ecosystems are impoverished or altered in ways that reduce the long-term supply of benefits. While all people suffer from biodiversity and ecosystem service declines, the most affected groups – in most cases the poor – are not necessarily those that drive the demand. Economic and institutional frameworks that fail to take into account the equitable distribution of benefits, including those of future generations, will only perpetuate these inequities and therefore cannot be sustainable.

A more just distribution of benefits requires good policies based on sufficient and openly available information about where, when and to whom ecosystems provide benefits, and how changes in ecosystems affect these benefit flows. Approaches that compensate those providing services to remote users show some promise, especially in the case of water and carbon payments. For example, payment for watershed services and water-quality trading programmes already involve some 3.24 billion hectares globally. Similarly, creating resource governance institutions that give groups that are dependent on particular benefits a say in how those benefits are managed will provide incentives for better stewardship.

Two conditions are critical for the success of payments for ecosystem services and similar schemes. Firstly, they must be carefully designed to produce net positive environmental impacts (e.g. to reduce deforestation). Secondly, fair and equitable compensation needs to be ensured. Achieving both will require innovative institutional frameworks.

PRIORITY AREA 4 – Find new and better ways to govern ecosystems

There is often a mismatch between ecosystems and governance structures. Species, water, nutrients and pollutants move, and ecosystem processes take place irrespective of national boundaries. Yet the governance arrangements that

affect biodiversity and ecosystems typically have political jurisdictions. Many drivers of biodiversity change operate at the international scale, and therefore fall outside the full control of the affected areas, making integrated management difficult. Marine systems are a good example, since there is a lack of governance for areas outside national exclusive economic zones, and fish stocks can straddle countries' jurisdictions.

These governance challenges are further complicated by the accelerated and increasingly far-reaching exchange of materials, organisms and information among distant locations. One sobering example of this is the accumulation of plastics and their chemical toxins in the world's oceans.

In many parts of the world, biodiversity conservation is being embedded more comprehensively in and across management sectors. In some cases administrative boundaries have been reconfigured to match biophysical ones. Examples include aligning water management areas with the hydrological systems that provide the water, aligning ecosystem processes with administrative realities, and identifying biodiversity priority areas. Cooperation between countries in the management of shared ecosystems is more challenging. Nevertheless, transboundary conservation areas have shown promise in Africa, the Americas and Europe.

Global governance institutions, working in partnership with national institutions, local organizations and the private sector, are essential to address the international-scale phenomena that are among the largest drivers of biodiversity loss. For instance, mechanisms such as Reducing Emissions from Deforestation and Forest Degradation (REDD+, a United Nations collaborative scheme) and the International Seafood Sustainability Foundation (a coalition of fish canning companies, conservation groups and scientists) appear promising, although numerous uncertainties must be overcome.

CONCLUSIONS

"...if the global community continues on its current path, the declines in biodiversity and ecosystem benefits will impede future efforts towards sustainable development and poverty reduction."

PHOTO: SHUTTERSTOCK/P BOROWKA

The Millennium Ecosystem Assessment emphasized that if the global community continues on its current path, the declines in biodiversity and ecosystem benefits will impede future efforts towards sustainable development and poverty reduction. The recent Global Biodiversity Outlook 3 shows that if we do not stem these declines we risk passing tipping points that could seriously compromise human wellbeing. However, both sources highlight the fact that different, more sustainable development paths are possible. The concepts of a green economy and a global environmental governance system aligns well with these positive scenarios. Against this background, the 193 Parties to the CBD recently adopted a Strategic Plan for Biodiversity 2011–2020 for implementation by the entire United Nations system (not only biodiversity-related conventions), which includes targets that address many of the challenges outlined here.

It is imperative that we focus our efforts on the key priority areas outlined above and integrate biodiversity and ecosystem services into economic measures as well as policy and development planning. We must also restructure the way that ecosystems are managed, to account for their existence beyond national and international borders. If this can be achieved, we will be much better positioned to develop an equitable economy embedded within sustainable social and ecological systems, and to create the global institutions that make this possible.

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Authors: Sandra Díaz, Belinda Reyers, Thomas Bergendorff, Lijbert Brussaard, David Cooper, Wolfgang Cramer, Anantha Duraiappah, Thomas Elmqvist, Daniel P. Faith, Gustavo Fonseca, Thomas Hammond, Louise E. Jackson, Cornelia Krug, Anne Larigauderie, Paul W. Leadley, Philippe Le Prestre, Mark Lonsdale, Thomas E. Lovejoy, Georgina M. Mace, Hiroyuki Matsuda, Harold A. Mooney, Anne-Hélène Prieur-Richard, Mirjam Pulleman, Eugene A. Rosa, Robert J. Scholes, Eva Spehn, Billie L. Turner II, Meryl J. Williams, Tetsukazu Yahara.

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