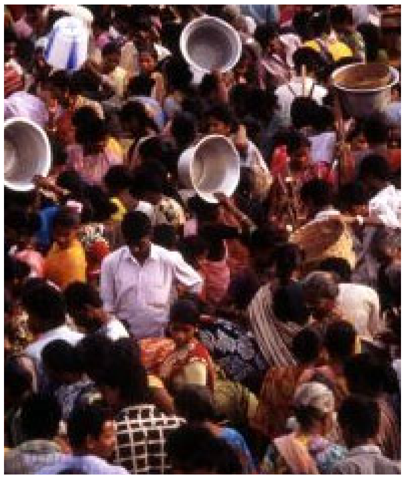

A Guide to:

Securing Protected Areas

in the Face of Global Change

--Options & Guidelines--

World Commission on Protected Areas

Securing Protected Areas
in the Face of Global Change
—options & guidelines—

CALL FOR COMMENT AND INPUT

Dear Participants at the
5th World Parks Congress:

IUCN's World Commission on Protected Areas (WCPA) is implementing a special project: *Ecosystems, Protected Areas, and People*. During this first phase, the aim is to help protected area managers, policy makers, and stakeholders learn to deal with factors of global change that will have growing impacts on their areas in the coming decades.

The project will include a report on "options and guidelines" for use by area managers and protected area leaders. At this moment the draft *Guide* to the report is ready for peer review. The full report will be available in late 2003.

The draft full report together with this summary will be provided to the Convention on Biological Diversity as a contribution from WCPA and this Congress to the development of the CBD's program of work on protected areas, which is likely to be agreed upon at the 7th Convention of the Parties (COP 7), next year. Subsequently, these reports will be uploaded onto IUCN/WCPA's new *Protected Areas Learning Network* (PALNet).

This is a particularly important opportunity for you to have input and influence on this issue. Please provide your revisions and comments on this document to the WCPA team in the dedicated Room at the Congress.

Warm regards,

Kenton Miller, Chair, IUCN World Commission on Protected Areas,
and Vice President for International Development
and Conservation, World Resources Institute

APPEL A VOS COMMENTAIRES

Chers Participants au
5ème Congrès mondial sur les parcs :

La Commission mondiale des aires protégées (CMAP) de l'UICN est en train de mettre en place un projet spécial : *Ecosystèmes, Aires Protégées et Populations*. Durant cette première phase, le but est d'aider les gestionnaires d'aires protégées, les décideurs et les autres parties prenantes à apprendre à gérer les facteurs de changement climatique qui auront des impacts grandissants sur ces aires dans les décennies à venir.

Le projet inclura un rapport sur « les options et les directives » qui sera utile aux gestionnaires et aux experts d'aires protégées. L'ébauche du *guide* du rapport est maintenant prête pour commentaire. Le rapport complet sera disponible fin 2003.

L'ébauche du rapport complet, ainsi que ce résumé, seront présentés à la Convention sur la Diversité Biologique en tant que contribution de la CMAP et du Congrès au développement du programme de travail sur les aires protégées de la Convention, qui sera probablement adopté à la 7ème Convention des Partis (COP 7) l'année prochaine. Ensuite, ces rapports seront installés sur le réseau d'apprentissage des aires protégées (*Protected Areas Learning Network* /PALNet) de l'UICN/CMAP.

Ceci est une opportunité particulièrement importante pour vous de donner votre opinion et d'exercer votre influence sur ce sujet. Veuillez donner vos révisions et commentaires sur ce document à l'équipe de la CMAP dans le bureau qui leur sera assigné au Congrès.

Je vous prie d'agréer mes salutations les meilleures.

Kenton Miller, Président
La Commission mondiale des aires protégées de l'UICN

PETICIÓN PARA COMENTARIOS

Estimados Participantes en la
V Congreso Mundial de Parques:

La Comisión Mundial de Áreas Protegidas de la UICN (CMAP) esta implementando un proyecto especial: Ecosistemas, Áreas Protegidas, y Gente (EPP). Durante esta primera fase, el objectivo es ayudar los administradores de las áreas protegidas, tomadores de decisiones y actores interesados aprender a trabajar con factores de cambio global que tendran impactos crecientes en sus áreas en las proximas décadas.

El proyecto incluirá un reporte de "opciones y lineamientos" para ser usadas por administradores y líderes de áreas protegidas. En este momento el borrador *Guía* para el reporte esta listo para ser revisado por colegas. El reporte completo estará disponible a finales del 2003.

El borrador completo del reporte junto con este resumen sera proporcionado en la Convenio Sobre la Diversidad Biológica (CBD) como una contribución de CMAP y este Congreso para el desarrollo del programa de trabajo del CBD en áreas protegidas, que probablamente se pondra de acuerdo en la 7th Conferencia de las Partes el proximo año. Posteriormente, este reportes sera puesto en la nueva *Red de Aprendizaje de Áreas Protegidas* (PALNet) de la UICN/CMAP.

Esta oportunidad es sumamente importante para que pueda dar sus comentarios y pueda influenciar en este producto. Por favor provea con su revisiones y comentarios de este documento al grupo de CMAP en la sala dedicada para esto en el Congreso.

Saludos cordiales,
Kenton Miller, Presidente,
Comisión Mundial de Áreas Protegidas de la UICN

A Guide to:

Securing Protected Areas in the Face of Global Change

--Options & Guidelines--

A Draft Report by the Ecosystems,
Protected Areas, and People Project
IUCN - World Commission on Protected Areas
August 2003

IUCN
The World Conservation Union

This guide summarizes the full volume: *Securing Protected Areas in the Face of Global Change, Options & Guidelines*, which will be published in late 2003. The Ecosystems, Protected Areas, and People project is a collaboration led by the IUCN – World Commission on Protected Areas.

IUCN
The World Conservation Union

WCPA
WORLD COMMISSION
ON PROTECTED AREAS

Compiled by: Melissa Boness, Bret Bergst, and Kenton Miller

Based upon chapters:

Understanding Global Change,
Rob Wolcott, Bret Bergst, Anthony Janetos, Sara Scherr, Amanda Sauer, Marta Miranda, Janis Alcorn, Andres Luque, and Sandra Valenzuela

Building the Global System,
Mohamed Bakarr and Gustavo Fonseca

Local Communities, Protected Areas and Equity,
Grazia Borrini-Feyerabend

Developing Capacity for the 21st Century,
Julia Carabias, Javier De la Maza, and Rosaura Cadena

Evaluating Management Effectiveness,
Fiona Leverington and Marc Hockings

Partners: IUCN- World Conservation Union, UNESCO's World Heritage Centre and Man and the Biosphere Programme, The Nature Conservancy, Conservation International, and the World Resources Institute

Financial support for the project has been received from the Swedish International Development Authority (SIDA), the Netherlands Ministry of Foreign Affairs, the Norwegian Ministry of Foreign Affairs (NMFA), the World Resources Institute, The Nature Conservancy, Conservation International, World Wildlife Fund, IUCN, and the United Nations Environment Programme (UNEP) as an Implementing Agency of the Global Environment Facility (GEF).

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Page 28	Terracing: G. Borrini-Feyerabend

Forward

The IUCN World Commission on Protected Areas (WCPA) is a worldwide network of protected area experts, managers, scientists, and conservation leaders. Among its activities, the *Ecosystems, Protected Areas, and People* (EPP) project aims to strengthen the capacity of this community to manage protected areas in a world of rapid global change.

As an output of the EPP project, the Commission and its partners are developing guidelines to help managers adapt their policies, strategies, and practices to the forces of global change. Climate change, sea level rise, fragmentation of habitats, and invasive alien species are among the challenges facing protected area managers. Growing human population and shifting settlement patterns, along with changing demands for food and fiber will alter the use of land and waters. And, evolving government policies to promote decentralization, devolution of power, and democratization are all changing the way in which we confront conservation goals and provide the full range of material and non-material values and benefits from biological resources.

This draft guide summarizes initial options and guidelines proposed by our partners. It will be submitted to the world's leading protected area managers and interested parties at the 5th World Parks Congress in September 2003 for comment and improvement. Subsequently, the guide will be offered to the Parties to the Convention on Biological Diversity as they develop their programme of work on Protected Areas.

Other outputs of the EPP project include establishing a network of field learning sites to demonstrate innovative approaches for dealing with the impacts and opportunities created by global change. A web-based, interactive *Protected Areas Learning Network* (PALNet) is being developed to enable managers and policy makers to share their experience, and together, to build knowledge on ways and means to secure protected areas in the face of change. Published briefs will be disseminated to aid managers and policy makers with limited access to web-based communication.

The full volume: *Securing Protected Areas in the Face of Global Change, Options & Guidelines* will be available on PALNet, and in hard copy, in late 2003.

This is a draft. We very much welcome your observations to help make our contribution to the security of protected areas as useful as possible.

Kenton Miller, Project Director
Vice President for International Development and Conservation, World Resources Institute, and Chair, IUCN World Commission on Protected Areas

Kishore Rao, Project Manager
Head, Asia Regional Protected Areas Program, IUCN - World Conservation Union

Thaba-Tseka, Lesotho. The crops here in the rugged mountains of Lesotho are failing because the rain came much too early. And much too late. There were hailstorms and tornadoes, too. Then an early frost killed most of the maize sprouts that had survived the earlier bizarre weather.

Now this tiny kingdom of subsistence farmers tucked into southeastern South Africa is in the midst of a famine; the World Food Program estimates that nearly one-third of Lesotho's 2.1 million residents will need emergency handouts this year. And village elders like Mkhabasha Ntaote, the 70-year-old matriarch of a huge and hungry extended family, believe something has gone haywire in the cosmos. The weather patterns, they say, no longer form patterns.

"Frost in the summertime!" Ntaote marveled. "We never used to see weather like this. We don't know what to expect anymore from the skies. I think God is angry at us, but I don't know why."

Many scientists say that Ntaote, along with nearly 40 million other Africans at risk of starvation, may be among the first human victims of global climate change….

Bizarre Weather Ravages Africans' Crops
Some See Link To Worldwide Warming Trend
Michael Grunwald Washington Post Staff Writer
January 7, 2003; Page A1

VISION

We are increasingly presented with compelling evidence of ecological crises brought on by biological, social, and institutional change. Such evidence, and the headlines it provokes, is likely to become both more prevalent and reliable.

Now more than ever, it is important that we come to terms with the fact that change is the rule, not the exception, for life on Earth. Acknowledging change and its role in our life processes does not mean, however, that we passively submit to the drastic impacts it can impose on our living resources. Rather, we must replace our idea of static beauty and perfection in biological nature with an appreciation of the dynamics of ecological systems.[1] And learn how to work within existing and emerging forces of change to manage and preserve biological diversity.

Human societies have been preserving areas for their biological, cultural, religious, and aesthetic importance for millennia. Frequently, however, their efforts have been reactive—responding to crises of the moment, while giving little thought or action to long-term concerns that may threaten their very existence.

Merely footsteps over the threshold of a new Millennium, we are faced with a decision that will shape conservation for decades to come: Will our next steps follow in the path of those that have come before us, or will we boldly forge a new course, striving for summits on a distant horizon? *Will we continue to look back, fighting in vain to maintain our land- and sea-scapes as a reflection of their former glory? Or will we seize the opportunities to look ahead and wrestle from our imaginations a more vivid picture of what they can be?*

Introduction

The 20th Century legacy of more than 100,000 protected areas covering more than 11% of Earth's terrestrial surface[2] provides us an extraordinary base from which to pursue conservation goals such as species preservation, watershed protection, and habitat restoration. In these early years of a new Century, however, we as a global community, must move beyond our recognition of individual place-based achievements, to acknowledge that our social, economic, and ecological well-being depends upon the continued ability of our protected area estate to provide their collective ecosystem goods and services for the benefit of people.

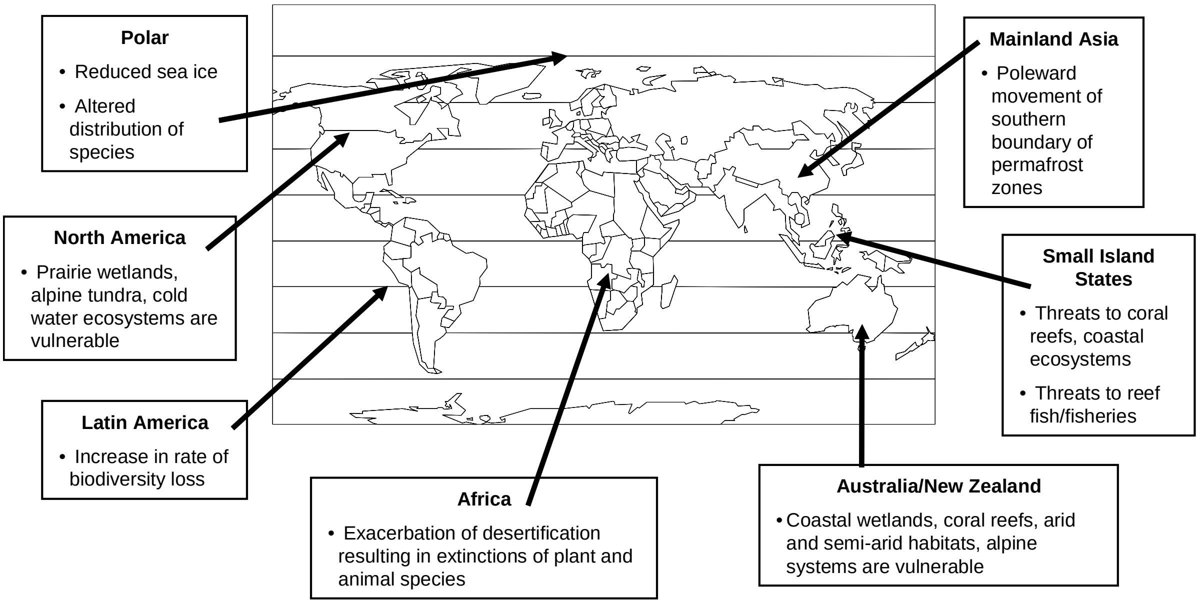
However, the ability of our ecosystems to maintain these services is being severely threatened by factors of global change. Expanding population, growing resource consumption, climate change, and globalization are among the forces altering the context within which we operate. What do these emerging challenges and opportunities mean for protected areas? And how best can we adapt our strategies, policies, and actions to ensure the long-term conservation of biodiversity in the face of global change? This report attempts to answer these questions, focusing on options and guidelines offered to protected area stakeholders to increase understanding and inform decisions.

Goals of the Report

Securing Protected Areas in the Face of Global Change has two goals. The first is to identify and characterize selected "factors" of global change that are impacting the viability of protected areas worldwide. While not a comprehensive list of global change, each of the factors discussed in this review demonstrates the depth, breadth, and complexity of issues faced by protected area managers and stakeholders. These factors are highlighted as having the most significant and immediate implications for the pace and pattern of protected area establishment, management, viability in achieving biodiversity conservation and the full range of ecosystem services, as well as long-term institutional sustainability.

The second, and perhaps even more important goal is to move beyond understanding the impacts of global change, to motivate protected area managers and policy-makers to transform the ways in which they operate. Frequently, the challenges of global change loom so large as to seem insurmountable, and

Figure 1: Examples of Vulnerable Ecosystems



Source: IPCC 2001

thus are often ignored. Faced with issues such as changing climate and rising sea level, managers can often become overwhelmed by the task of meeting their conservation objectives. This report aims to empower managers and policy-makers to think and act adaptively. Armed with the tools and knowledge to identify and address threats and opportunities of change, protected area stakeholders can act to maintain, and even restore our systems necessary for biodiversity conservation.

WHAT IS GLOBAL CHANGE?

Global change is a broad term that refers to the myriad of factors, primarily human driven, that alter our biological, social, and institutional environment. They are emerging trends that can be physical or biological, such as increased variability of climate or rising sea level; they can be driven by social and economic forces such as growing human populations and increasing demand for food and fiber; or they can arise from new government policies such as decentralization and cooperative management arrangements. Above all, these emerging trends shift the context and increase the uncertainty of how we best manage our Earth's most valuable places (Figure 1).

BIOPHYSICAL CHANGE

Climate Change

As we have noted, ecological systems are not static, however, over time human activities have begun to alter the rate and intensity at which natural phenomena occur. For example, climate change[3], a well-known biological factor of global change, is caused by a natural phenomenon called the greenhouse effect.[4] Historically, a very strong correlation has been exhibited between atmospheric concentration of greenhouse gasses and temperature averages, often through slow paralleled trends (Petit *et al.* 1999). However, in the last 100 years, human activities such as increased emissions from fossil fuels and land clearing for agriculture and forestry, have dramatically increased the concentrations of greenhouse gasses in the atmosphere, most notably carbon dioxide. In the longest running continuous monitoring record of atmospheric CO_2 concentrations in the world, researchers in Mauna Loa, Hawaii have documented an 18% increase in the mean annual concentration of carbon dioxide since 1959 (Keeling and Whorf 2003). Over a slightly longer period, average surface temperature has increased 0.6 degrees Celsius (since 1900) and is expected to increase another 1.4 to 5.8 degrees C by the year 2100 (IPCC 2001). Thus far, the distribution of this change has varied across latitudes, and temperatures in Siberia and Alaska have risen significantly faster than the global average—at a rate of 1 degree Celsius per decade.

In addition to serious biological impacts of increasing atmospheric temperature, there are social impacts resulting from the disparity in emissions and land use change. Industrialized countries, home to only 20% of the world's population, are responsible for nearly 63% of net carbon emissions from fossil fuel burning and land use changes since 1900. North America and Europe contributed 25 and 21 percent respectively, compared to a combined contribution of 37 percent by 140 developing countries. China and India, the two most populous countries, together home to 40% of the world's population, have contributed only 7 and 2 percent, respectively, to atmospheric carbon accumulation since 1900 (Baumert and Kete 2001). By most forecasts, however, this trend is expected to change significantly in the next two decades, with China surpassing industrialized nations as the largest emitter by 2020 (IPCC 2000, Panayotou *et al.* 2002).

Sea Level Rise

A further manifestation of climate change and atmospheric warming is a rise in sea level. Simplified down to its most basic component parts, warmer global temperatures lead to reduced snow and ice cover, increased melting of the polar ice caps, thermal expansion, and increased precipitation. These factors, in turn, increase the volume of water in the Earth's oceans and seas, causing their levels to rise.

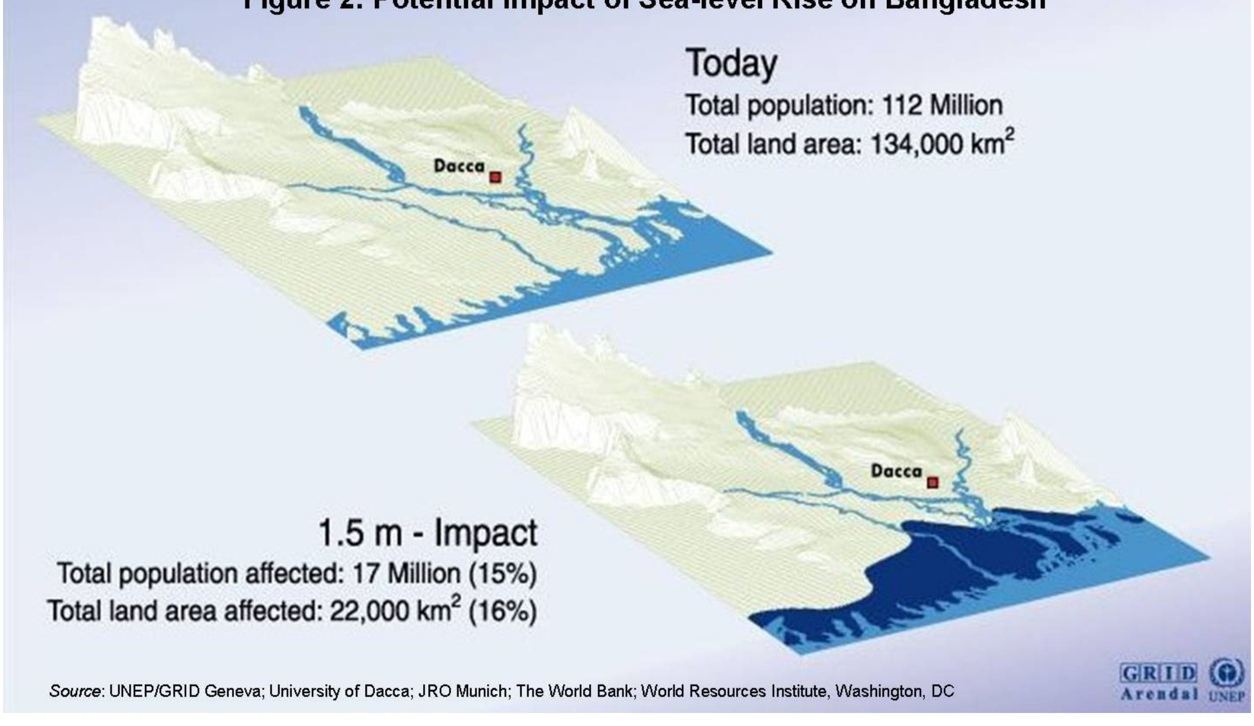
During the past 3,000 years, sea level rose at an average annual rate of approximately 0.1 to 0.2 mm (IPCC 2001).[5] As mentioned earlier, global temperatures have risen approximately 0.6° C in the past century, corresponding to an average eustatic sea level rise[6] from 1 to 2 mm annually. This translates into the Century's aggregate rise reaching between 0.1 and 0.2 meters, a ten-fold increase over the previous three millennia.

Future sea level is difficult to predict. Sea level rise of 0.09 to 0.88 meters is projected for the period 1990 to 2100, primarily from thermal expansion. The mid-range of such projections, 0.48 m, corresponds with an average rate of sea level rise about two to four times the rate over the 20th century (IPCC 2001). Such a rise could have significant impacts worldwide, with potentially devastating affects on low-lying deltas (see, for example, Figure 2).

Habitat Loss and Fragmentation

Of the human activities that have led to climate change, clearing land for various uses has also led to another factor of global change: habitat loss and

Figure 2: Potential Impact of Sea-level Rise on Bangladesh



Source: UNEP/GRID Geneva; University of Dacca; JRO Munich; The World Bank; World Resources Institute, Washington, DC fragmentation. Habitat fragmentation is the subdivision of larger habitat segments into smaller, scattered, unsustainable segments as a result of agricultural expansion, forestry, resource extraction, urban development, transportation infrastructure and other forms of land-use change. Fragmentation of native habitat is a primary cause of species extinction and loss of biological diversity.

A single road bisecting a habitat can effectively reduce an individual species population by half. Road building and infrastructure are directly responsible for threats to 40% of the world's remaining "frontier forests" (Bryant *et al.* 1997; Box 1). Transport also figures prominently as an indirect threat to forests, to the extent that it facilitates logging, mining and other large-scale activities that open up remote wildlands to further development (Forman and Alexander 1998).

Different flora and fauna are variably sensitive to fragmentation. Birds are often most resilient given their mobility across distinct habitat patches, however, small mammals, being less mobile, can be perilously affected. Even larger mammals with the ability to traverse greater distances may face adverse consequences due to insufficient remaining habitat to maintain a viable range and population.

It is widely recognized that fragmentation of natural habitats not only affects the distribution and abundance of organisms, but that it may disrupt the important biological processes that maintain biodiversity; the same processes that are critical for the functioning and long-term existence of ecosystems. The pollination of plants by animals is an example of such an integral process - almost 100 percent of the flowering plants in tropical rainforests are pollinated by animals.

Furthermore, conversion of habitat for farmland, commercial, or other uses not only divides the habitat itself, but increases the relative amount of habitat edge. As habitat is fragmented, the edge created provides a different environment than the interior of the patch, and thus encourages different species composition (Saunders *et al.* 1991). This new microclimate of the habitat edge can often support flora and fauna which may differ, or even compete with that of the original habitat (Brothers and Spingarn 1992).

Invasive Alien Species

Increased edge-effect from fragmented landscapes, can also lead to magnified impacts of invasive alien species. Alien, non-native or exotic species are

Box 1:

Fragmented Landscapes

Central Africa - In a study area covering just under 2 million km^2 of tropical forest in the Central African Republic, Congo, Democratic Republic of Congo, Cameroon, Equatorial Guinea, and Gabon, significant impacts of forest fragmentation by roads were discovered.

The wide-ranging umbrella species of Central Africa require large, contiguous areas of forest, generally greater than 10,000 km^2, to maintain viable populations. An analysis of the study area, ignoring the presence of roads, shows that 83% of the total area is made up of forest patches greater than 10,000 km^2, in some cases significantly greater. However, when roads are entered into the equation, segmenting contiguous habitat, the percent of forest patches greater than 10,000 km^2 falls to only 49.

Furthermore, 42% of forest area in the six countries exists within 10 km of a road, and more than 90% can be found within 50 km of the same thoroughfares. Large forested habitat still exists in Central Africa, but with the increase of roads and other infrastructure, contiguous forested habitat that can support the full richness of species in their natural landscapes is rapidly disappearing.

Source: Matthews *et al.* 2000

* * * * * * *

Invaders in our Midst

Hawaii – The invasion of Hawaii by insects, disease organisms, snakes, weeds, and other pests is the single greatest threat to Hawaii's economy, health, and natural environment. Pests already cause millions of dollars in crop losses, the extinction of native species, the destruction of native forests, and the spread of disease. Even a single new pest—such as the brown tree snake—could forever change the character of these islands. Stopping the influx of new pests and containing their spread is essential to Hawaii's future well-being.

Despite the efforts of more than 20 state, federal, and private agencies, unwanted alien pests are entering Hawaii at an alarming rate - about 2 million times more rapid than the natural rate. In 1993, the federal Office of Technology Assessment declared Hawaii's alien pest species problem the worst in the nation. Hawaii's evolutionary isolation from the continents, and its modern role as the commercial hub of the Pacific make these islands particularly vulnerable to destruction by alien pests. Gaps in current pest prevention systems and a lack of public awareness add further to this serious problem.

Source: http://www.hear.org/#theproblem distinguished from natives because they have been introduced into a habitat beyond their natural distribution range (Shine *et al.* 2000). These species are defined as those that have crossed some kind of biogeographical barrier that would have otherwise impeded migration to the new habitat. An alien species becomes invasive if it acts as "an agent of change, and threatens native biological diversity" (IUCN 2000).

Much as a person with a compromised immune system has difficulty warding off or recovering from disease, an invasive species introduced into a modified or damaged ecosystem can cause compounded and irreparable harm to existing native populations. The introduction of invasive plants, animals and diseases has increased dramatically with the expansion of trade and the global mobility of humans. Alien species and diseases are carried on ships, in their bilge waters, on travelers' clothing and luggage, and in trade shipments of live animals, plants, and even pets. These biological invasions are now recognized as one of the greatest threats to the stability and diversity of ecosystems, second only to habitat loss (Box 1).

SOCIOECONOMIC CHANGE

Not only are there physical and biological changes affecting how we manage our environment, but diverse, global socioeconomic trends are also affecting the capacity of protected area managers to achieve their conservation objectives (see Table 1, page 14).

Growing Population

As a result of improved public health, increased food production and distribution, and the ensuing reduction in mortality rates, the past hundred years have seen Earth's human population grow from around 1.2 billion to 6 billion in 2000—a 5-fold increase (United Nations Population Division 2003). More recently however, declining fertility rates have significantly reduced the rate of annual population growth,[7] and thus population is projected to reach approximately 7.9 billion in 2025 and to stabilize around 9.3 billion in 2050.[8] Mortality from HIV/AIDS further dampens projected population growth rates, particularly in Africa and Asia (United Nations Population Division 2003).

Steadily increasing population has significant implications for our landscape and biodiversity. By far, the greatest population increase has occurred and is expected to continue to take place in the biodiversity-rich countries of the tropics. The population in tropical wilderness areas is, on average, growing at an annual rate of 3.1 percent, more than twice the world's average rate of growth (Cincotta and Engelman 2000).

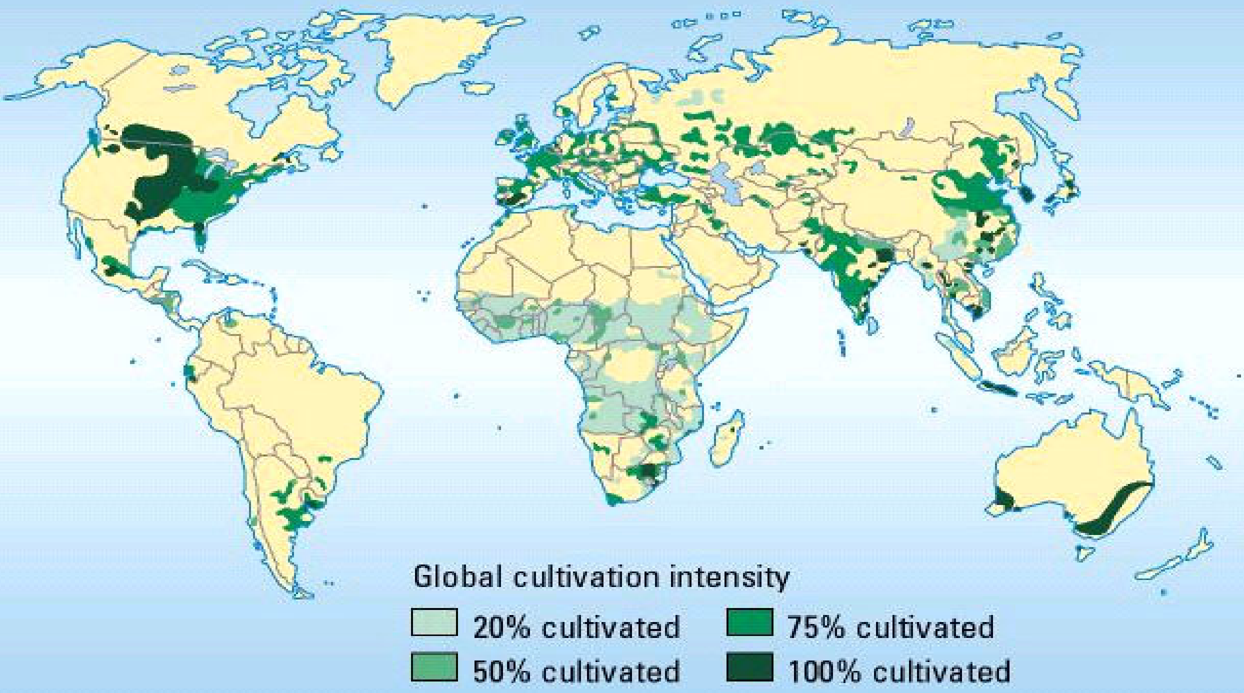
Rapid rural population growth, particularly in high biodiversity, low-income countries means that already densely populated areas will require additional land for settlement and infrastructure. The frequent result of increasing rural populations is greater pressure and encroachment on the boundaries and resources of parks and protected areas, often manifest in the poaching of flora and fauna, degraded water quality and flow, settlement related fragmentation of habitat, and the alteration of local climate conditions.

Even when population growth is concentrated far from the boundaries of ecologically sensitive areas, the impact can be critical nonetheless. Though cities occupy less than 2 percent of the Earth's land surface, they use 75% of its resources (Harrison and Pearce 2001). An increase in urban populations leads to an ever growing demand for natural resources, often appropriated from distant regions through trade and commerce.

Intensified Land and Resource Use

Beyond population growth, extent and patterns of growth in income and economic development are driving dramatic increases in demand for resource-based products: food (wild and farmed), fiber, water, energy, and industrial raw materials. World economic output has averaged 2.9 percent annual growth since

Figure 3: Global Cultivation Intensity



Source: Canadian Global Emissions Interpretation Center (CGEIC), 1996

1975. Per capita Gross Domestic Product (GDP) increased by about 280% in East Asia and the Pacific, 66% in North America, 23% in Latin America and the Caribbean, while it decreased by 17% in sub-Saharan Africa (Doering *et al.* 2002). The money spent on household consumption worldwide increased 68 percent from 1980 to 1998—much of which resulted in higher rates of resource extraction, frequently from within or on the boundaries of protected areas in the most biologically diverse regions of the world.

Higher-end consumption has been closely linked with environmental degradation (Stedman-Edwards 1997). The 20 percent of the world population living in industrialized countries account for 86 percent of all private consumption and over 80 percent of world trade (OECD 1998). Ever more frequently, patterns of land use are heavily influenced by decisions taken in countries far away, complicating processes of land and resource planning.

New demand for high-value products such as oil, meat, sugar, coffee, cocoa, and tea has led to large-scale forest clearing for commercial plantations and extraction. In many cases, the most destructive clearing of grassland and forest has been to produce feed for livestock. Furthermore, increasing demand for resource-based products has also led to more intensive production, in some cases as a result of productivity-increasing innovation, but often through unsustainable over-exploitation of the resource base (Figure 3).

Changing Values of Ecosystem Services

Historically, one of the most powerful factors working against conservation of biodiversity and ecosystem services was that these services were not valued within market economies. Perceived to be largely public goods, governments were given responsibility for managing environmental resources to deter environmentally damaging private use through regulation or taxation. Over the past decade, however, governments, private companies, consumers and conservationists have demonstrated increasing willingness to pay for biodiversity, watershed protection and restoration.

This trend reflects greater awareness of and demand for ecosystem services—in part the result of new and more broadly distributed documentation of their economic contributions and cost of replacement—and also growing scarcity (Daily and Walker 2000). As these services become progressively more threatened and/or scarce, and thus more valuable, they will increasingly become commodities bought and sold at market prices. With rising incomes, demand is increasing for some services such as landscape beauty and nature tourism. In other cases, services such as access to potable water and clean air are essential for survival of even the poorest in society, who already often find these commodities more costly.

INSTITUTIONAL CHANGE

Institutional change is different than, yet strongly tied to both biophysical and socioeconomic change. As wild areas become more scarce and human populations grow and shift, the institutions and governance structures that manage the interactions between people and their environment also change.

We generally think of institutions as the "sets of rules" that shape the interactions between societies and their governments. These rules are laws, policies, regulations, organizational frameworks, traditions, and other culturally-defined means that define the appropriate relations between and amongst individuals, groups, formal organizations (such as government agencies, non-governmental organizations and civil associations) and society at large. Institutional change refers to changes in the rules that structure these relationships.

Globalization

The rapid and pervasive flow of information, financial capital and goods (production and consumption) that has, and continues to create an ever more interconnected world is referred to as globalization. The policies and activities associated with such interconnectedness have diverse impacts on the protection of biodiversity and present a range of opportunities and tensions.

In a globalized world, there is more geographically widespread access to information and opportunities for those with shared interests to collaborate, as well as increased potential for multiple interests and values to be in confrontation with each other. Globalization of markets creates increasing tension between private and public, local and global interests, as international

Table 1: *Proximate Socioeconomic Threats to Biodiversity Conservation*

Socioeconomic threat to biodiversity	**Common negative impacts on biodiversity**	**Underlying conditions causing threat**	**Strategies to reduce threats**
Over-exploitation of wild species	Reduce wild population numbers	Unregulated markets; uncertain tenure; lack of employment; poor tourism	Domesticate key species; regulate markets; CBNRM
Conversion of natural habitat to crops, forest plantations, pastures	Sedimentation; habitat simplification, loss of fallow vegetation; high percentage of protected areas with farming	Open access tenure (institutional); policy decisions (institutional); lack of employment (income and wealth); low economic value of habitat (for ecosystem services)	Promote mosaic landscape with habitat corridors; promote payments for wild habitat management
Agricultural degradation	Habitat degradation—soil, land-form, vegetative change; water pollution, diversion; mono-culture; genetic loss	Growing demand for food, fiber; closing of agricultural frontier; high-input, high-pollutant technologies; low-yielding technologies; 2/3 developing world farmers on "marginal" land with out suitable technology	Certification for products; research on ecoagriculture; payments for habitat management
Damage from industrial logging	Habitat disturbance, destruction; sedimentation, fragmentation from roads; increased bushmeat demand	Growing demand for fiber, weak and disputed property rights, corruption in awarding concessions; lack of economic methods for sustainable timber management	Forest product certification; community property rights; modernization
Damage to hydrological function	Disruption of hydrological systems	Demand for energy; population growth; poor technology; income growth	Alternative energy; water efficiency
Transport, communications, infrastructure	Fragmentation of habitat, land conversion	Population growth; policy decisions; ecotourism demand	Improve transport planning; design technology
Damage from industrial, military pollution	Contamination of habitats, poisoning	Weak zoning and regulation, inadequate technology; income growth; policies	Improved technology, better regulation
Damage from oil and mining	Pollution, sedimentation	Weak environmental regulation; poor technology; demand for energy	Improved technology, better regulation

forces have increasing influence on decisions that affect local interests.

With globalized capital flows, regional and global markets influence governance structures worldwide (Hempel 1996). Under free trade agreements and transnational economic activities, markets are decreasingly regulated by nation-states.

Democratization

Democracy can be characterized by the presence of three elements: broad and relatively equal citizenship, binding consultation to state policies and personnel, and protection of citizens—particularly minorities—from arbitrary state action (Giugni 1998). A trend towards democratization has characterized the end of the 20th century, and will undoubtedly continue in the 21st century, increasing citizens' participation in governmental decisions.

As democratic transitions occur, opportunities often arise to build new bridges among interest groups and support positive collaboration across scales. On the positive side, globalization and democratization trends have powered a global momentum in support of conservation. The rising public interest in conservation offers many opportunities for collaboration and building political will to address the urgent issues of conservation. The Convention on Biological Diversity represents a consensus at the global level that biodiversity conservation is a high priority for all nations and that citizen participation is key to achieving conservation goals.

On the other hand, globalization presents challenges. The international nature of markets and investments makes it harder for states and/or citizens to hold investors and business accountable for their local environmental impacts. Hence, globalization demands new institutions to negotiate transnational corporations' commitment to incorporating biodiversity concerns and investments into their global portfolios in ways that are equitable and have positive local impacts. Globalization also raises challenging enforcement issues when the national governments' need for revenues influences its decisions during contract negotiations with international industries.

Decentralization

Encouraged by donors worldwide as a means for operationalizing democracy, decentralization has become a major trend within democratization. Decentralization involves the transfer of rights, responsibilities and authority to lower levels of government. In decentralization, the powers that can be transferred include: legislative powers (elaboration of rules), executive powers (making and implementing, and enforcing decisions), and judicial power. The discussion about decentralization often suffers from confusion because different processes, such as deconcentration, delegation, and co-management are all labeled as decentralization (Table 2).

Table 2: *Different Approaches to Decentralization*
Decentralization: any act in which a central government formally cedes power to actors and institutions at lower levels in a political-administrative and territorial hierarchy.
Political or Democratic Decentralization: powers and resources are transferred to authorities representative of and downwardly accountable to local populations, aims to increase public participation in local decision-making.
Deconcentration: powers are delegated to local branches of the central authority. These branches are considered local administrative extensions of the central state, also known as administrative decentralization.
Co-management: co-management is a decentralization notion specifically applied to protected areas, where officially designated protected areas are managed with the effective engagement of two or more social actors (decision-making power is shared), in particular a government agency and indigenous and local communities (Borrini-Feyerabend 2003).
Source: Ribot 2002

Decentralization offers opportunities to empower indigenous autonomous systems of governance and biodiversity management. It also offers opportunities for local and regional governments to assume responsibility for biodiversity management as part of sustainable development – from watersheds to corridors between protected areas. At the same time, however, decentralization can be disastrous for protected areas if local authorities are not committed to conservation, or if responsibilities are transferred without links to other agencies with enforcement authority – i.e., when local governments, communities or NGOs are supposed to manage protected areas but have no support from the appropriate enforcement and judicial authorities.

WHY CARE ABOUT GLOBAL CHANGE?

These large-scale and long-term global changes in the physical environment, in governance, and in the needs of human populations have the potential to overwhelm conservation efforts worldwide.

Even moderate projections of population growth lay out the possibility that the world will see an additional three to four-billion people added to its numbers by the middle of this century. The inevitable demand for natural resources, agricultural production, and access to land and fresh water that follows will result in even greater pressure on those areas on which we rely for resources and services—specifically protected areas.

Quite clearly, however, global change is impacting how we preserve, manage, and even conceive of protected areas. Climate change may bring storm surges along coastal protected areas, or modify the amount of rainfall to particular sites. Sea level rise may drown sites protecting coastal wetlands. And alien invasive species may displace or bring disease to native flora and fauna. The challenge global change presents is to manage protected areas adaptively, to protect against imminent and long-term threats, while capturing new opportunities to make areas more sustainable and effective in social, economic, and ecological terms.

STATE OF PROTECTED AREAS

Every country in the world has defined areas preserved for their natural, biological, cultural or recreational value. Most of these areas fall into a broad classification of protected areas, namely "*an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means*" (IUCN, Fourth World Congress on Protected Areas 1992).

In the past, protected areas were primarily associated with "national parks" such as the archetypical Yellowstone National Park established in the United States of America in 1872. This site and many that followed were perceived and managed as "wilderness" where there was no significant human impact, and where people were restricted to the role of visitor. Over time, however, the roles of protected areas have broadened significantly and many places where humans have a vital role in the landscape are now themselves considered a part of the global protected area system (UNEP/CBD/AHTEG-PA/1/3).

This expanded view of protected areas has also made it clear that the history of protection is far older than Yellowstone, extending back to include ancient sacred sites, royal hunting reserves and restricted fishing areas, many of which may go back centuries or millennia and were protected and managed by a wide variety of governing entities from kings to local communities. This same breadth of protected area managers and stakeholders from the past has reemerged into our current system. While sites legally designated and administered by national governments still form the core of globally recognized protected areas, many other models have emerged, including state or provincial protected areas, private reserves, and many traditional protection schemes implemented by indigenous and local communities. Additionally, current accepted definitions of protected areas also encompass land and seascapes in which conservation is pursued through sustainable use of natural resources.

In the past three decades, a series of international conventions have emerged that further reflect the growing breadth and importance of protected areas worldwide.[9] Most prominently, the Convention on Biological Diversity (CBD), opened for signature at the Earth Summit[10] in 1992, was the first formal recognition that the conservation of biological diversity is "a common concern of humankind." The vision of protected areas under the CBD embraces conservation as well as the sustainable use of biological resources, and the fair and equitable sharing of benefits derived from their use.[11] Furthermore, development

Table 3: *Protected Area Management Categories*	
CATEGORY I	**Strict Nature Reserve/ Wilderness Area: protected area managed mainly for science or wilderness protection.**
CATEGORY Ia *Definition*	**Strict Nature Reserve: protected area managed mainly for science** *Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.*
CATEGORY Ib *Definition*	**Wilderness Area: protected area managed mainly for wilderness protection** *Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.*
CATEGORY II *Definition*	**National Park: protected area managed mainly for ecosystem protection and recreation** *Natural area of land and/or sea, designated to (a) protect the ecological integrity of one of more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area, and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.*
CATEGORY III *Definition*	**Natural Monument: protected area managed mainly for conservation of specific natural features** *Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.*
CATEGORY IV *Definition*	**Habitat/Species Management Area: protected area managed mainly for conservation through management intervention** *Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.*
CATEGORY V *Definition*	**Protected Landscape/ Seascape: protected area managed mainly for landscape/seascape conservation and recreation** *Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced and area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.*
CATEGORY VI *Definition*	**Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems** *Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.*
Source: IUCN, WCPA and WCMC 1994.	

and maintenance of national protected area systems have become central elements of national strategies to implement the Convention (UNEP/CBD/AHTEG-PA/1/3).

Decades prior to the CBD, two other conventions established the foundations upon which the discussion of biological diversity and protected areas flourished. The Convention Concerning the Protection of the World's Cultural and Natural Heritage (the World Heritage Convention, WHC) was adopted by the General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1972. Under this convention, Parties agree to "identify, protect, conserve, present, and transmit to future generations" those places of natural value and heritage,[12] thus laying the legal foundation for the establishment of many naturally and culturally significant protected areas.

The Convention on Wetlands (Ramsar Convention), also adopted in the 1970s, approached the issue of conservation from the perspective of a specific biological ecosystem.[13] The Ramsar Convention provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Although sites designated under the Ramsar Convention do not require recognition under formal State protected area systems, they nonetheless often fall within the IUCN protected areas category system (Table 3). To date, the Convention on Wetlands remains the only global environmental treaty governing activities within a particular ecosystem.

While each Convention emphasizes a different objective for management, the key concepts of *in situ* protection and sustainable use are evident throughout all. Most importantly, the emergence of such

Conventions reflects a common global commitment to the priorities of conservation.

Since the emergence of these international conventions, the establishment of protected areas has grown more than 50-fold. Recent figures boast more than 100,000 protected areas worldwide, covering more than 11% of the earth's land surface[14] (WCMC, personal communication 2003).

While the numbers may sound staggering, and certainly are if one considers that formally protected areas numbered only 1,823 little more than three decades ago,[15] they may still be insufficient to realize long-term biodiversity conservation.

During past decades the greatest threats to protected areas have included lack of legislation and policy to protect areas and secure their use; poaching and illegal harvesting of flora and fauna; human settlement within protected areas; unsustainable tourism (extent and practices); and an overall lack of trained and professionally prepared management personnel. As we enter the first decade of the 21st Century, it becomes clear that in addition to these issues which remain relevant and critical, evidence shows that global-level issues are of growing concern. Protected area stakeholders are now faced with not only addressing the issues that have challenged their management of the past, but now in addition they will need to mobilize their limited capacity and energy to address factors of global change that carry profound implications for the future integrity of protected areas.

How Can We Adapt to Change?

Building a Global Protected Area System

Despite such seemingly positive numbers for protected areas, there are significant barriers to the maintenance and further growth of the existing global system. Initial barriers are often associated with fundamental problems of protected area design and coverage. For example, most protected areas were designed without the benefit of recent guidelines from the emerging sciences of conservation biology and landscape ecology. With out benefiting from current guidelines on reserve design, many older sites are insufficiently large in extent to include the necessary habitats required by the species and communities the area is intended to protect. The core or wild zones often abut directly onto adjacent cultivated lands including farms, grazing lands, managed forests, and community settlements. Additionally, core zones are commonly isolated from other wildlands leading to genetic erosion of the conserved species and communities.

While these issues of design are indeed critical elements of concern for the current and future success of protected areas, global change is adding yet another dimension to the complex task of designing a global protected area system.

To design protected areas that have a high probability of achieving their objectives, including the conservation of biodiversity and the sustainable use of biological resources in the face of global change, protected area planners can consider the following *Options & Guidelines*:

- **Anticipate problems associated with global change that are likely to affect a given site, and design the protected area with those in mind.** Protected area planners can be proactive, not simply reactive. Although it is not always possible to predict what problems may crop up in the future at any given site, certain issues are more pertinent in one location than in another and should be anticipated. If an area is nearby to local or indigenous communities, then likely population pressures and co-management strategies will need to be considered. Sites on the edge of expanding urban areas will want to consider the likelihood of increased development and infrastructure, and thus will probably want to anticipate the concern of fragmentation and invasive species. Climate change will likely affect all areas, though in considerably different ways. Protected area planners should think through potential concerns and prioritize the level of threat as it applies to their individual area.

- **Make protected area core zones as large as possible**. As a rough guideline, ecologists and geneticists propose that species require at least 500 individuals in a given population to maintain viability. Habitat requirements can be mapped. Ecosystem functions and processes, such as stream flow, wetlands, in-shore currents, up and down-slope migratory routes, and other criteria can determine the fundamental content of core zones. Having sufficiently large core zones that can support large species population densities will help both floral and faunal communities to withstand the impact of changes in climate, or the effects of natural disasters.

- **Ensure consistency between the objectives for management and the resources featured in the core area**. For example, where the objective is to conserve biodiversity in its natural state, the core zone should feature wildland resources with a minimum of ongoing human impact. In contrast, where the purpose of the protected area is to support sustainable use and provide direct benefits to residents within and immediately surrounding the area, then the landscape within the given site should include those resources that will produce the goods and services required. Where landscapes of interest for conservation have a long history of human settlement and use, yet the objective is to maintain maximum possible diversity, then the core zones should at least contain the best samples of remaining diversity.

- **Make protected area sites as round as possible**. Edge area, that is the linear boundary of the core zone, should be kept to a minimum. It is along this edge where exotic species, diseases, fire, poaching and illegal extraction, and other negative influences enter the protected area. As roads and development infrastructure grow, fragmentation and the resulting increased access and opportunities for invasive species and human exploitation of resources become of increasingly grave concern for protected areas. The extent to which a given area can be kept as intact and with minimal edge as possible, the better the chance for successful protection of biological resources and diversity.

- **Surround the core zones with buffer zones designed to filter out negative external influences upon core zones.** Buffer zones can help insulate the core zones of protected areas from surrounding agriculture, forestry, roadways, and other origins of noise, air, water and soil pollution. They can also be useful in the opposite direction to filter out negative influences from within the core zone onto neighboring farmlands, for example from marauding animals and diseases. In terms of increasing human population and pressures associated with global change, buffer zones can help provide a transition between human settlements and intensively used lands and water, and the boundary of a protected area.

- **Link isolated core zones by biological corridors.** Fragmentation, among other factors of global change, is increasingly isolating protected areas and the species they house from one another. Biological corridors can promote and facilitate migration, dissemination and adaptation of species in response to global change. For example, corridors can be designed to provide pathways up and down slope to enable species to migrate seasonally in response to moisture and temperature change. Beyond seasonal time scales, moreover, such corridors of biodiversity friendly landscape can anticipate shifts in migration and adaptation on much longer time scales related to climate change. While in some cases an ideal corridor features wildland habitat similar to the cover in the core zones, in many situations, the lands beyond the core zones will already be settled and in farm, grazing, forestry, fishing, or village. In these cases, the land use in corridors will consist of activities that are managed to be as biodiversity friendly as possible (such as pesticide-free agriculture, sustainable forestry, well-drained roadways and bridges, etc.), while still providing the base for human livelihoods. Elsewhere, the lands may be restored to appropriate ecological habitat.

- **Surround the entire cluster of core zones, buffer zones, and corridors, with land uses that are "biodiversity friendly".** Protected area planning can reach out from these clusters to entire ecosystems and landscapes as proposed in bioregional planning and ecosystem approaches (Miller 1996, UNEP/CBD/COP/4/1B, UNEP/CBD/COP5/6).

PARTICIPATION AND EQUITY

Along with concerns about design and coverage, there are further unresolved conflicts regarding protected area designation and establishment. Twentieth century protected area establishment has generally been a "top down" process whereby national governments declared protected area systems to shelter important biological, historical, and cultural sites and services against global development and environmental degradation trends. In many cases, ownership or settlement patterns of local populations were afforded little consideration in the selection of sites and all too often local and traditional communities faced relocation without adequate compensation or concern for their livelihoods. Affected communities have often lost access to the natural resources that sustained them economically, socially, and culturally, and rarely have been offered an equitable share of the benefits generated by protected area establishment.

Despite past inequities, current protected area institutions have made great strides to remedy and overcome poor decisions, and to turn former adversaries into allies by building greater cooperation between protected areas and indigenous and local communities. A variety of socio-economic and institutional factors of change have begun to transform the way in which protected areas are selected, implemented, and even managed, in some cases making equitable relationships even more difficult to come by, and in others providing opportunities to bridge the equity gap between governments and communities, rich and poor, local and distant, and today's versus tomorrow's generations.

Growing population, increasing consumption, and globalization have all impacted the way in which protected areas are pressured and used. Land and resources "tied-up" in protected areas are often perceived as inequitable for those living in and around them, whose livelihoods may be based on the resources within. Increasing consumption patterns far from protected areas and outside local communities are often skewing how protected area benefits are allocated. Natural resources are often bought and used by wealthy people far away from the resource base, and economic benefits from related activities such as tourism generally accrue to international corporations or large national companies rather than locals. Each of these trends poses a potential threat to individual protected areas, and complicates the equitable distribution of benefits.

On the other hand, democratization and decentralization can provide potential opportunities for greater equity by changing the role of local and indigenous stakeholders. Democratization often calls for greater participation in design and selection of new protected areas, and decentralization can lead to greater access to decisions and management by communities in and around protected areas.

Presented below are *Options & Guidelines* for making protected areas more equitable in the face of change:

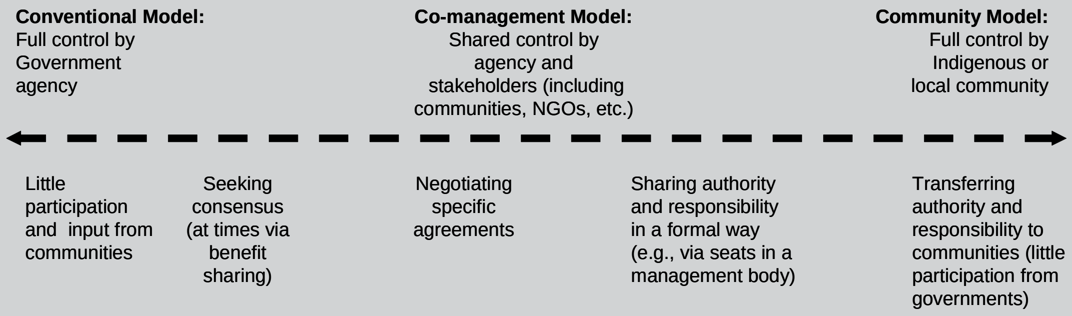
- **Select and design protected areas through a participatory process.** This guideline specifically relates to the selection of new protected areas, however, participation should also be a goal when management structures and objectives for existing protected areas are revised. Participation provides critical recognition that all of the involved interests have a seat at the table to ensure allocation of benefits and costs is done fairly. A challenge under this guideline is to identify the most appropriate representative of each stakeholder group. Too often, the stakeholders who maneuver for participation are already politically and economically powerful.
  - **If relocation is to occur, ensure equitable compensation to the affected individual, family or community.** In some cases, relocation may be necessary or requested to secure an adequate core zone or locate a suitable corridor. If the protected area design and selection has been done through a transparent and participatory process, the idea of relocation should not be seen as inequitable. It is imperative, however, that equitable compensation is agreed upon, be it through incentives or land swaps of comparable productivity, location, and social value.

- **Governance and management structures should be transparent.** Perhaps no step builds confidence in the decision-making process faster than adequate transparency in information collection and sharing, deliberations, and decisions. If stakeholders are to have confidence in their representatives, they need to see that those individuals can indeed represent their interests. Transparency is particularly important when new structures of management are put into place, and new decision-making bodies established.

- **Design a clear and effective mechanism for accountability.** The purpose of accountability in the case of protected areas is to provide a way to ensure that the objectives of management and other policies are being achieved. For example, where the management of tourism services has been decentralized to a local non-governmental organization, the contract will specify a list of services to be provided, at what quality level and volume, and the criteria for quality control and reporting. At the larger scale, governments are responsible to their citizens for achieving management and protection goals. Thus, annual reports and public meetings can provide a method by which their achievements are measured, documented, and explained to society.

- **Management should be adaptive.** Adaptive management recognizes the dynamic nature of the world (global change) and embraces it. By freeing management from prescriptive formulas, encouraging self-reflection, and setting clear goals for performance, adaptive management shifts attention from rigid compliance with rules and long-term directives to a creative search for the best ways to achieve the objectives. Through adaptive management, "management by objectives" becomes a dynamic process with clear indicators, continual monitoring, and feedback to modify the objectives—a "learning-by-doing" process.

Figure 4: Protected Area Management Continuum



- **Determine the best management and governance structure for each individual protected area.** There are infinite combinations of how governments and communities can relate to protected areas, however, a useful way to view these interactions is spread along a management continuum (Figure 4). At one end of the continuum, a government agency manages the protected area and its resources with little input from the local community. At the other end of the continuum, the local community manages the area and resources with little input from government agencies. Neither extreme is predominant in current protected area management strategies and most interactions fall somewhere in the middle ground. While it is generally considered positive to pursue increased involvement of community stakeholders in protected area efforts, it is important to ensure that local goals are aligned with the conservation objectives.
  - **Consider basic questions when determining management strategy**. The basic question for selecting a management and governance structure is *Who can best provide the management services required?* Among central government agencies, local government offices, non-governmental organizations, and local communities, who has the best:
    1. Access to the area?
    2. Facilities and equipment in the area?
    3. Personnel trained for the job?
    4. Probability of providing continual and consistent service to the area?
    5. Highest level of confidence among national and local constituents for managing the area?
    6. Relationship with the local landscape (people, communities, businesses, etc.)?
  - **When management structure is already decided, design the specifics with sufficient input from a variety of sides.** For example, where it has already been decided that management will be devolved to form a cooperative management arrangement between government and local communities, the groups can cooperate to:
    1. Discuss and design the approach to and criteria for management.
    2. Analyze the various tasks involved in the proposed approach.
    3. Determine what capacities are needed to accomplish each task.
    4. Distribute those tasks to the appropriate partner based upon who has the capacity.

- **Through a participatory mechanism, carefully analyze options for the fair distribution of costs and benefits.** Identification and distribution of costs and benefits should be an integral part of management planning and evaluation. While the analysis of benefits distribution is increasingly common, seldom is there a parallel analysis of the distribution of protected area costs. Clear identification and consideration of both sides of this equation is essential for equitable protected areas.
  - **Analyze both the material and non-material values.** Benefits and costs can be both material and non-material in scope, and both must be considered. Material benefits include wild meat and fish, building materials, fuelwood, and genetic resources, among others. Non-material values can include recreational services, tourism, spiritual sites, scenery, carbon sequestration, nutrient cycling, and air and water filtration.

CAPACITY TO MANAGE FOR CHANGE

When protected areas are designed and managed in an equitable manner, they can help meet social objectives. Clearly, however, for protected areas to be effective, they must seek to achieve both social and biological conservation goals.

Factors of global change require that protected areas be managed adaptively to address weaknesses and threats, as well as take advantage of strengths and opportunities when they arise. To do this will require that managers and supporting institutions have sufficient knowledge, capabilities, and resources to plan, manage, monitor and enforce protected area objectives—in short, that they have the *capacity* to manage for change.

Capacity can be defined as the ability to perform functions, to solve problems, and to set and achieve objectives. In the face of global change, managers are called upon to expand their capacity not only to deal with existing and ongoing daily pressures, but also with anticipating and adapting to change. Managers will need to assess and periodically revise their policies, strategies and practices to ensure they are not surprised by change. To do this, two distinct components of capacity are needed:

1. An ***enabling environment*** which includes legislation, policy, means for public engagement, budgeting and adequate resources, personnel administration, rewarding career paths, physical facilities, and infrastructure; and
2. ***Human capacity*** which includes skills in planning, management, budgeting, working with science, monitoring, public outreach, community relations, cooperative management, and the use of technology, among others.

Both components of capacity are equally vital to achieve conservation goals, and each requires distinct approaches for their development.

Enabling Environment

To develop an enabling environment that supports protected areas, governments and policy-makers can:

- **Ensure that each protected area has adequate and clear legislation.** It is important that each area has a clear legal designation of purpose, authority, and governance including responsibility for implementation and management. The designation of an IUCN management category for each area is particularly important to clarify the objective(s) of management, and the responsible institutional authority (see Table 3, page 17).
    - **Ensure that governmental management authority falls under the most appropriate ministry.** Countries vary in the way in which they design institutional protected area oversight and management.

In many cases environmental issues in general, and protected areas in specific fall under the management of ministries in development or other productive sectors. This can be problematic if conflicting interests, such as conservation versus development, compete for priority. When protected area agencies are linked with environmental ministries, rather than with ministries responsible for productive sectors, this conflict of interest can often be minimized.

- **Formulate a body of policies that will give guidance to managers on how to implement the legislation for each area.** Specific policies may be required for governing issues involving third parties, such as with bioprospecting, or for appropriately dividing authority and responsibility, as may be required with cooperative management arrangements.

- **Develop inter-institutional and inter-sectoral coordinating mechanisms**. To ensure adequate cooperation with agriculture, forestry, transportation, science, education, and other related institutions and sectors, protected area agencies and managers should establish ways and means for communication with these bodies, and methods for negotiation when necessary (Box 2).

- **Promote scientific and technical research on emerging issues for conservation and protected areas**. It is important that science be strengthened and further integrated into the process of developing protected area policy. As managers become more engaged in adaptive management they can be expected to find a growing need for baseline information against which to review management targets. New questions will be identified as field practices become more specific to the individual area. New opportunities will arise for sharing emerging information and experience, thereby establishing the basis for generating new knowledge.

- **Allocate sufficient financial resources to ensure effective protected area management**.

> Box 2:
> **Inter-Institutional Coordination in Kanha National Park**
>
> Kanha National Park, located in the heart of India, is a prime example of inter-institutional coordination among different sectors and levels of government. Those responsible for the park have established structures and mechanisms that define clear rights and obligations of the Ministries and Departments involved in management.
>
> The mechanisms of cooperation were established by the Indian Ministry of Environment & Forests and involve a variety of departments, including Agriculture & Rural Development, Non-Conventional Energy, and Forest & Environment, among others. Through their structured roles, the programs of each department are integrated to avoid negatively affecting the protected area and to achieve common solutions for conservation and development goals.
>
> *Source*: Management Capacity Workshops, 2003

A growing awareness of the importance of protected areas to the basic livelihoods of people around the world will call for expanding resources to secure both conservation functions and the delivery of ecosystem services. Historically, nationally established protected areas received the majority of their operating budgets from central governments. As protected areas and their associated costs increase, it has become clear that this method of funding, for most countries, is not sustainable. Over time, governments may consider themselves forced away from fully funding protected area programs given the other social and developmental priorities they face. However, in the legislation of most countries, the state has ultimate responsibility over social resources of common interest to all present and future citizens. Thus, even when some form of co-management arrangements have been established to both cover the costs of management and share in management activities, it is important that the state maintain adequate oversight to ensure that national goals and standards for protected areas are met.

- **Develop a financial strategy or "business plan".** As mentioned above, the operational costs of protected areas are increasing and a major challenge for coming decades is to develop a secure funding base for each protected area. On accepting the concept and reality that protected areas provide society with valuable ecosystem goods and services, resource use and management is recognizing the need to become more "business-like". Income budgets are scarce. Funds, time, equipment, and services to the visiting public need to be allocated according to rigorous criteria. To be able to select priorities for investment of funds and time, managers should understand the demand for their "outputs," and the potential supply of the associated inputs from their resource base. A business plan to compliment the protected area management plan can assist in providing analysis of these factors, and lend rigor and efficiency to the operation of the site.

Human Capacity

Single individuals cannot be expected to learn all the skills needed to manage protected areas in this and future decades. Rather, to develop human capacity we rely on establishing teams of individuals, each of whom brings particular skills and strengths to the job.

Effective protected area management will depend upon a team that can:

- **Learn and integrate new ideas as they are developed.** Achieving the protection of biodiversity and ecosystem services will depend ultimately upon a well-trained cadre of managers and policy makers. Training can be implemented through university programs, short courses in the field or in classrooms, and extension services, depending upon the level of responsibility and time available for participation.

- **Work at various spatial and temporal scales.** Protected areas are embedded in several spatial scales, from the international and regional, down to transboundary ecosystems, individual parks, and on the ground practices. Managers will need to have access to and be familiar with policies developed at all levels: International conventions warrant attention as they set the rules for biodiversity conservation in situ. Regional programs cover river basins, mountain ranges, and coastal zones. At the ground level there are programs of habitat restoration, reintroduction of extirpated species, and the control of invasive alien species. Managers also expected to deal with different periods of time simultaneously. Strategies for habitat restoration or climate change mitigation might cover decades and centuries of time, while other activities, such as fire control and poaching, may require immediate action. The skills to work at distinct scales in time and space revolve around strategic and lateral thinking, setting priorities, and adapting to changing circumstances.

- **Work productively with local communities and stakeholders**. In many, if not most cases, the goals and objectives of protected area management will only be achieved to the extent that productive partnerships are established. Social skills form a vital characteristic of a well-prepared manager. These skills include the ability to visualize, plan, negotiate, and oversee cooperative arrangements with neighbors and other organizations to implement elements of the protected area strategic plan. Co-management arrangements provide mechanisms to share authority and responsibility over defined areas and tasks. Partnerships can be sought out with organizations, communities, and individuals that offer complimentary capacities and can help set priorities and implement strategies. Local municipalities may direct tourism services; local

small business may sub-contract sanitary and trash disposal; local knowledgeable individuals can serve as tour guides and orient eco-tourism services; and the regional university can manage research programs, information, and knowledge development.

- **Provide effective communication and outreach**. The messages of conservation can be disseminated through educational facilities in protected areas, as well as through integration into formal education curriculum. Both students and the general public can learn about the role of protected areas and biodiversity in their daily lives, as sources of their clean water, how nutrients flow into their food production, the beauty of nature, and the cultural and spiritual values they can provide. A local public that appreciates and understands these values will be a community that defends the long-term existence of the area.

- **Make use of the best available technology.** Globalization and the increasing connectedness of markets, combined with the rapid growth of technology is changing both the materials and the methods available for protected area management. Although advanced technologies

Table 4: *Evaluation can improve management effectiveness in a number of ways:*
» enabling adaptive management » "action learning" for better management » encouraging a learning organization and culture » signaling global and local changes and threats » informing management planning » ensuring impacts on communities are recognized by management » providing positive reinforcement when protected area management is effective » showing gaps in protected area systems, and identifying major constraints in management » showcasing management techniques for broader landscape management

and infrastructure, like computers and the internet, are not available in all places or budgets, protected area managers should make full use of those options which are available to them.

- **Anticipate and adapt to the impacts of change.** In the context of rapid global change, managers must identify new opportunities and how they may be captured, and put in place plans and actions to adapt objectives and activities accordingly. This involves establishing a set of indicators that can serve to measure change of selected factors, e.g., rates of fragmentation, changing rainfall patterns, entry of alien species, increasing density of human population along area boundaries, wildlife population numbers and patterns of movement, among others. A monitoring program can follow these indicators and signal to management when and where remedial action is required.

- **Share knowledge and lessons learned with others**. Protected area management that can anticipate and respond to change depends upon the ability to share new ideas, science, and field experience. Presently, many managers work in isolation and do not benefit from, or contribute to new ideas and innovations. Protected area programs and facilities will need to provide personnel and stakeholders with ways to communicate with peers.[16]

EVALUATING MANAGEMENT EFFECTIVENESS

It is clear that to meet the challenges of global change, protected area managers will require the capacity to be resilient—to anticipate, respond and adapt at all scales. Even after these capacities have been identified and developed, how does one know that they are being put to use appropriately—and thus that a protected area is managed effectively?

Evaluation of management effectiveness is a vital component of responsive, proactive protected area management that can cope with global change (Table 4). Through evaluation, each success and failure can be an opportunity for learning, and continual improvement can be combined with anticipation of future threats and opportunities. Rapid changes in biophysical, social and institutional environments emphasize the need to bring forward effective strategies for conservation. Effectiveness evaluation enables managers to know: are protected areas effectively conserving the values for which they exist? Is management effective, and how can it be improved? Are specific projects, interventions and activities of management effectively achieving their objectives, and how can they be improved?

The management team implements the evaluation process. They may employ professional evaluators, or ideally, learn to perform the task of evaluation themselves, with input from stakeholders near and far from the site. Critical is that the evaluation process examine the indicators related to those forces of change that are affecting the area, and prescribe options for adaptation.

The periodic evaluation of management efforts also focuses on changing societal values. For example, it is now commonly accepted that decision-making procedures, including planning and budgeting, should be transparent to stakeholders. Evaluation can serve as a form of public reporting to provide reliable and timely information for donors, governments and communities about the use of resources and the effectiveness of protected area management. With increasing competition for financing, evaluation can be a strong asset to protected area managers who want to show clear benefits and outcomes.

Presented below are *Options & Guidelines* for evaluating management effectiveness in the face of global change:

- **Good communication, team-building and stakeholder involvement is essential in all phases of the project.** Effectiveness evaluation involves a group of people, including managers, evaluation specialists, and stakeholders. Good communication is essential throughout the evaluation process to ensure a sense of teamwork and reinforce the objective of obtaining positive change. In most cases, effectiveness evaluation should NOT be approached as a punitive process where participants are unwilling subjects of an unwanted "inspection".

- **Effective evaluation requires the strong support and commitment of all parties involved.** The most desirable situation is for evaluation to be integrated into the management process so that it becomes an accepted, integral part of regular activities. This integration can be achieved through two focal points: agencies (i.e. the institutions and/or communities responsible for managing protected areas) and evaluators. In the early stages of implementing management effectiveness evaluation, these two sets of actors are often distinct. However, over time it is desirable that these actors become one and the same.

  Agencies can:
  - o Foster a learning environment and use an adaptive management approach wherever possible (U.S. Department of State 1994).
  - o Build evaluation and the monitoring which underlies it into business planning, policies and management plans, preferably backed by legislative mandate.

  Evaluators can:
  - o Understand and address the factors that may discourage institutional adoption and integration of effectiveness evaluation systems. These include capacity issues such as resources and staff training, and stakeholder willingness to undertake regular evaluations.
  - o Ensure that results of evaluations are interpreted in an appropriate manner for all levels of the organization.
  - o Widely disseminate results to stakeholders to maintain support for the evaluation process from the broadest possible group.

- **It is desirable to base management effectiveness evaluation on a consistent, accepted framework.** Approaches for evaluating the effectiveness of management should be consistent from one year to the next. It is only through consistency that indicators can enable evaluators to determine the rates of change, and the appropriateness of response. Furthermore, while there must be flexibility to respond to local conditions, a consistent framework[17] can better harmonize different evaluation approaches across sites, countries, and regions, and can provide a solid theoretical and practical basis for monitoring.

- **A clear purpose, scope and objectives are needed prior to initiating evaluation.** The different purposes of management effectiveness evaluation (management improvement, resource allocation, accountability, and advocacy) influence how the evaluation process is designed and implemented. It is important at the beginning of an evaluation to know exactly what the process is expected to achieve. All parties need to agree on these expectations at the outset.
  - o Where possible, the scope of evaluation should be broad enough to capture the relationships and inter-linkages between various factors affecting protected area management.
  - o Agreement among all partners on criteria, evaluation objectives and broad questions is important before a more detailed methodology is selected or developed. It is an essential step before detailed questions and indicators are selected—everything that is measured should relate to one or more of these criteria or objectives.
  - o To frame the evaluation objectives and questions and to select elements for evaluation, it is critical that the management goals and objectives for the protected area being evaluated have been clearly identified. This is particularly important for outcome-oriented assessments which measure whether and to what extent these goals and objectives have been achieved.

- **The methodology and design should suit the purpose of the evaluation.** Well-designed evaluation processes yield results with greater explanatory power, giving ideas as to why outcomes have or have not been achieved. Clear questions, explicit assumptions and meaningful indicators all help to increase the ability to understand and interpret the results.

- **With limited exceptions, it is desirable to repeat similar evaluations periodically.** Evaluations over time become a method for active monitoring and adaptive management to provide clear and accountable comparability.

- **Evaluation findings must be communicated and used positively.** Advice from evaluations needs to be clear and specific enough to help managers improve conservation practices. They must be realistic, addressing priority topics and feasible solutions. Finding and recommendations should feed back into management systems to influence future plans, resource allocations and management actions. Evaluations that are integrated into the management process or community's culture are more successful and effective in improving management performance in the long term.

THE CHALLENGE FOR PROTECTED AREA MANAGERS

As those responsible for safeguarding our Earth's vital biological systems and diversity, protected area managers face enormous challenges in the decades to come, but they are also presented with important opportunities. Be they public servants, private enterprise, non-governmental organizations, local governments, communities, or indigenous groups, each manager faces a future where human demands on protected areas and biological resources has never been greater. Careful management will be crucial if humans are to coexist with healthy ecosystems and thriving wild species populations—and perhaps most critical is that balances are found in areas of high human population, often coinciding with Earth's most biologically rich regions.

To manage carefully and critically, managers must understand the vulnerabilities of their areas to change, and adapt their strategies and practices to strengthen protected areas and encourage resiliency. Given the pace of global change, managers must begin now, to ensure the security of protected areas well into the future.

THE CHALLENGE FOR POLICY MAKERS

While managers take on the daily challenges of protected areas, the ultimate success of their efforts is largely dependent upon a supportive policy framework. Without legal underpinnings that recognize the importance of conservation and sustainability, efforts on the ground can easily be dismantled by competing interests and priorities from above. The challenge for policy makers in the coming decades is to create an enabling environment that not only supports the protection of biological diversity, but that adapts, as managers do, to emerging threats and opportunities of change. Policy makers are ultimately those tasked with setting the framework that will either encourage and facilitate the efforts of managers to adapt to change, or hinder and discourage their work.

Annex 1: Summary of Options for dealing with Global Change

Options for Protected Area Managers:

1. Managers and stakeholders can learn to understand the factors of change and how they impact upon protected areas, either positively or negatively.

2. Managers can design indicators that will enable them to track the rates and types of change taking place in their areas, and the resulting positive and negative impacts. Indicators will need to monitor biophysical, socio-economic, and institutional types of changes.

3. Managers can become informed as to what options are being developed and tested by others as they seek ways to adaptation to change. They can form their own "research" program from which to learn the approaches for adaptation that will be of greatest use in their own areas.

4. From their experience, and that shared by peers, managers can derive guidelines for use by their team and peers as they seek to deal with factors of change.

5. Procedures can then be developed and applied for evaluating the utility of the adaptive methods being tested.

These options can be selected and implemented with the following considerations in mind:

- ✓ Experience demonstrates that the functions of management can most effectively be implemented by teams consisting of those with authority and responsibility, and stakeholders associated with the area involved. These teams can determine goals and objectives, methods and procedures, approaches for implementation, and evaluation of effectiveness.
- ✓ Management teams can be successful under two primary conditions:
    - o Members of the team have access to adequate training and capacity building, and
    - o The team works within an enabling environment in terms of legislation, policy, budget, etc.

Options for Policy Makers

1. Ensure that each protected area has the legislation necessary to secure the long-term future of the area under national law.

2. Provide a body of policy that sets the direction and orientation needed by managers to implement the legislation, prepare management plans, provide ecosystem services, and deal with new and challenging topics, (e.g., bioprospecting).

3. Establish budgeting methods that are efficient, transparent, and participatory. Managers need to be fully engaged in the process of assigning funds to the different lines to ensure that priorities for action are reflected in the allocation. Promote and advocate as strongly as possible adequate levels of funding, and take leadership in establishing "sustainable finance" tools to secure the areas over the long term.

4. Establish cooperative mechanisms among agriculture, forestry, fishing, land use, and other sectors to facilitate achieving biodiversity-friendly landscapes around key protected areas. Such cooperation can include sharing of equipment and installations, information, data, and science, and personnel to share capacity and minimize overall costs.

5. Convene appropriate organizations to establish a set of indicators that can be employed by all parties engaged in protected area management. Such cooperation can maximize the sharing of information and promote more uniform adaptation strategies and practices.

6. Similarly, the same exercise can determine the most appropriate approaches to monitoring the status and trends in change factors, impacts both positive and negative, and response levels to interventions.

7. Take leadership on the higher scales of policy and action. In particular, the policy-making level should coordinate national level programs with respect to international instruments that involve biodiversity and protected areas, and the representation of the interests of the country in those negotiations. This is particularly the case with the Convention on Biological Diversity, World Heritage Convention, UNESCO MAB, and the Ramsar Convention on Wetlands. Transboundary protected areas and regional (multi-country) programs will also need high-level leadership.

Notes

1. Botkin, D., D. Quammen, J. McPhee, S.J. Gould, and L. Margulis. 2000. *Forces of Change - a new view of change*. Smithsonian Institution and National Geographic: Washington, DC.

2. Estimated figures from the revised 2003 assessment by the World Conservation Monitoring Center, to be made available at the Vth World Congress on Protected Areas, September 2003 (Personal communication, Stuart Chape, WCMC July 30, 2003).

3. Also frequently referred to as "global warming". This term, however, reflects only one result of the greenhouse effect. In some areas of the globe, regions will actually experience a gradual cooling of atmospheric temperature over time, and thus climate change is a more appropriate and inclusive descriptor for the same phenomenon.

4. The greenhouse effect is the rise in global temperature resulting from increased atmospheric concentrations of heat-trapping gasses, including carbon dioxide, water vapor, nitrous oxide and methane (U.S. Environmental Protection Agency).

5. The swiftest rise in global sea level since the last glacial maximum (about 20,000 years ago) occurred between 15,000 and 6,000 years ago. However, since that period, sea level rise had slowed substantially to an average rate of 0.1 to 0.2 mm/yr over the past 300 years (IPCC 2001).

6. I.e., corresponding to a change in ocean volume.

7. Growth rates peaked at 2.04% in 1964-70 and declined to 1.35% between 1995 and 2000. Fertility rates have declined from about 4 children per woman in 1975 to less than 3 children per woman in 2000 (a steady state replacement rate is 2.1; Europe and North America rates are below this [Doering *et al.* 2002]).

8. These estimates are from the United Nations medium variant projections. Note possible impacts of Aids, etc.

9. There are five international conventions related to biological diversity: the Convention on Biological Diversity (CBD), 1992; the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973; the Convention on the Conservation of Migratory Species of Wild Animals (CMS), 1979; the Convention on Wetlands (Ramsar), 1971; and the World Heritage Convention (WHC), 1972. Of these conventions, the CBD, WHC and Ramsar Convention serve as the most important international agreements concerning the *in situ* protection of biodiversity through the creation and management of protected areas.

10. "Earth Summit" is the colloquial name given to the 1992 United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil. It is also frequently referred to as simply the "Rio summit".

11. The CBD focuses primarily on equitable benefits sharing with respect to genetic resources.

12. "Natural heritage" designates outstanding physical, biological, and geological features; habitats of threatened plants or animal species and areas of value on scientific or aesthetic grounds or from the point of view of conservation (Article 2, Convention Concerning the Protection of World Cultural and Natural Heritage, http://whc.unesco.org/nwhc/pages/doc/main.htm).

13. The Convention on Wetlands was adopted in the Iranian city of Ramsar in 1971, and entered into force in 1975 (http://www.ramsar.org)

14. Estimates by the World Conservation Monitoring Centre in July 2003 recognize a total of 102,101 protected areas, covering 11.5% of the Earth's terrestrial surface. This figure includes all areas, both marine and terrestrial, regardless of size. However, the percent coverage of Earth's surface is limited to terrestrial areas and does not account for the coverage of marine protected areas (Personal communication, Stuart Chape, WCMC July 30, 2003).

15. In 1972 there were 1,823 protected areas recognized by the World Conservation Monitoring Centre (McNeely and Miller 1984). In 2003, the number has grown to 105,000, however the method for counting protected areas has also changed. Early assessments by WCMC only accounted for terrestrial protected areas 1,000 hectares or larger. Whereas, recent assessments have embraced a broader conception

of protected and include designated sites, both marine and terrestrial, of any size.

16. The *Protected Areas Learning Network* (PALNet) of IUCN's WCPA is one such mechanism which will enable managers and policy makers to share their experiences and lessons learned through an interactive, web-based network.

17. The IUCN - World Commission on Protected Areas has developed a framework for management effectiveness that provides a consistent basis for designing evaluation systems (Hockings *et al.* 2000).

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