

NATURAL SOLUTIONS



Protected Areas Protecting People – a tool for Disaster Risk Reduction

The International Strategy for Disaster Reduction (ISDR) notes: *“protection of vital ecosystem services is fundamental to reducing vulnerability to disasters and strengthening community resilience”* but also that: *“although the inherent links between disaster reduction and environmental management are recognized, little research and policy work has been undertaken on the subject. The intriguing concept of using environmental tools for disaster reduction has not yet been widely applied by many practitioners”*. While many communities instinctively use natural ecosystems such as forests, coral reefs and natural dryland vegetation to protect themselves against the impacts of natural hazards, others are suffering because environmental degradation has taken these ecosystem services away and left people, literally, exposed to the weather. Despite recent focus on this issue, the 2010 mid-term review of the Hyogo Framework for Action (HFA - the global blueprint for disaster risk reduction (DRR) from 2005 to 2015) highlighted that Priority for Action 4 Reduce the Underlying Risks had made the least progress and countries did not report much progress on *“successfully reducing underlying risk through sustainable natural resource management and the incorporate of disaster risk reduction measures into environment planning and management”*- Investing in ecosystem services for DRR is therefore a key priority, in a world where deaths from disasters have steadily been mounting for decades and where variable weather patterns are increasingly exacerbating the impacts of such disasters.

Protected area management is a well established and recognised mechanism for maintaining natural habitats and preserving ecosystem functions. In addition to many quoted examples from around the world, experiences from disasters such as the Western Indian Ocean tsunami (2004) and the Great East Japan Earthquake (2011) clearly demonstrate the critical role protected areas play for protecting people and their livelihoods from devastating impacts.



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Climate change exacerbates the challenge by increasing the frequency and variability of extreme weather events. The Intergovernmental Panel on Climate Change notes that *“Climate change will interact at all scales with other trends in global environmental and natural resource concerns... Their combined impacts may be compounded in future in the absence of integrated mitigation and adaptation measures”* Even apparently isolated events are affected by ecosystem loss: many deaths from earthquakes in mountainous areas, for instance, come from subsequent landslides and risks increase dramatically when steep slopes have been deforested. Environmental protection and restoration are thus increasingly recognised as important components of disaster reduction strategies. Some of our earliest “protected areas” were aimed at reducing the impacts of disasters, such as forest protection on steep slopes, which was introduced in Japan during the 15th and 16th centuries to counter landslides. Today, Japan has almost 12 million hectares of protection forests; with 17 uses including 12 relevant to reducing impacts of extreme climate events. Similarly, in the Middle East, protected areas called *hima* were established over a thousand years ago to prevent deforestation and grassland erosion.

Key Benefits from Protected Areas

Environmental degradation already increases the risk that extreme weather events and geological events will lead to a disaster for vulnerable communities. Cleared shorelines, denuded mountain slopes, bare earth and canalised rivers provide little protection against floods, tidal surges, storms and desertification. On the other hand, people living in healthy ecosystems have a much better chance of surviving extreme weather events, without them becoming a major disaster.

1. Maintaining natural ecosystems that buffer against hazards such as tidal surge (coastal mangroves, coral reefs); flash floods(wetlands, floodplains) and landslides (forests and other native vegetation)
2. Maintaining traditional/ cultural ecosystems and crops that have an important role in mitigating extreme weather events, such as agroforestry systems, terraced crop-growing and fruit tree forests in arid lands that can prevent desertification
3. Providing an opportunity for active or natural restoration of degraded ecosystems, such as reforesting steep slopes or restoring flood plains
4. Providing emergency sources of food, freshwater, building materials and living space following disasters (which if unplanned can itself cause problems for the protected area)

Table 1 demonstrates ways in which protected areas can help to mitigate hazards.

Hazard	Role of protected area	Protected area habitat type	Examples
Flooding	Providing space for overspill of water / flood attenuation	Marshes, coastal wetlands, peat bogs, natural lakes	The two reserves which form the Muthurajawella Marsh, in Sri Lanka, cover an area of 3,068 ha near Colombo. The economic value of flood attenuation (converted to 2003 values), has been estimated at US\$5,033,800 per year.
	Absorbing and reducing water flow	Riparian and mountain forests	Floods that had affected the coastal city of Malaga in Spain for 500 years were eliminated through reforestation and protection of an area of the watershed.
Landslide, rock fall and avalanche	Stabilising soil, loose rock and snow	Forest on steep slopes	Shivapuri National Park is the main source of water for domestic consumption in Kathmandu, Nepal. Landslide protection measures have been implemented in 12 localities in the protected area
	Buffering against earth and snow movement	Forests on and beneath slopes	Swiss forests are managed to ensure protection of steep slopes against avalanche and landslip, with about 17% of forests protected for this purpose.
Tidal waves and storm surges	Creating a physical barrier against ocean incursion	Mangroves, barrier islands, coral reefs, sand dunes	The indigenous communities living in the Rio Plátano Reserve in Honduras are reforesting the shore of the Ibans Lagoon with mangrove and other species to improve fish habitats and counter erosion of the narrow coastal strip.
	Providing overspill space for tidal surges	Coastal marshes	The Black River Lower Morass marsh acts as a natural buffer against river flood waters and incursions by the sea and is an important economic resource for 20,000 people.
Drought and desertification	Reducing grazing and trampling	Particularly grasslands but also dry forest	In Djibouti, the Day Forest is a protected area, with regeneration projects initiated to prevent further loss of this important forest area and further encroachment by deserts (UNCCD, 2006).
	Maintaining drought-resistant plants	All dryland habitats	In Mali, the role of national parks in desertification control is recognised, and protected areas are seen as important reservoir of drought-resistant species.
Fire	Maintaining management systems that control fire	Savannah, dry and temperate forests and scrub	In Mount Kitanglad National Park, Philippines, volunteers from different ethnic communities in the area undertake fire watching duties.
	Maintaining natural fire resistance	Fire refugia in forests, wetlands	Recent studies in the Amazon found the incidence of fire to be lower in protected areas relative to surrounding areas.
Hurricanes and storms	Buffering against immediate storm damage	Forests, coral reefs, mangroves, barrier islands	The protected mangrove system of the Sundarbans in Bangladesh and India helps to stabilise wetland and coastlines and contributes to buffering inland areas from cyclones.

A Cost Effective Investment

There is also growing evidence that the economic benefits of maintaining natural ecosystems to protect against disasters often outweigh those of either the disasters themselves or of alternative mitigation strategies. An analysis of the protective role of coastal wetlands in the US estimated that these provide US\$23.2 billion a year in storm protection services. Globally, wetlands are estimated to provide on average (year 2000 values) US\$464 per ha per year for flood control. A study of the value of mangroves in Thailand found replacement costs for shoreline protection were at least US\$3,679/ha based on a 20 year timeline. And in most cases disaster mitigation benefits are *in addition* to existing benefits from biodiversity conservation, livelihood, recreation and cultural values.

Ecologists, engineers and disaster relief specialists are therefore starting to look for an optimal balance between development, conservation and disaster preparedness, especially a better balance between engineered solutions and “natural solutions” such as habitat protection or restoration.



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The Whangamarino Ramsar site is the second largest swamp complex in North Island, New Zealand. It has a significant role in flood control (the value of which has been estimated at US\$601,037 per annum at 2003 values) and sediment trapping. Values can rise in years when there is flooding and it is estimated that flood prevention in 1998 was worth US\$4 million alone. There have been 11 occasions when the wetlands have been needed to absorb floods since 1995. The site is also of considerable biodiversity value and more botanically diverse than any other large low-lying peatland in North Island.

The Challenge

However, the examples quoted above are still exceptions rather than the rule and when politicians consider adaptation to challenges such as climate change they continue to instinctively look to dams and levees for water storage and flood control and further investment in coastal defences such as sea walls. The DRR policy makers often belong to different ministries to those working on nature protection and the former may not understand the potential role of ecosystems in risk reduction. They will also be lobbied by powerful business interests who would profit from engineering solutions. Natural conservatism probably plays a role too. After the devastating effects of Hurricane Katrina in New Orleans in 2005, the need for restoration of floodplain forests and wetlands was widely recognised, but still had to compete with pressures to continue developing the bayous.

Integrated Solutions to Protect Lives, Preserve Ecosystems and Adapt to Climate Change Impacts

How well protected areas can continue to deliver such ecosystem services also depends on how effectively they are managed, how well they are integrated with surrounding use strategies and supported by local communities, and the extent to which they are adopted into national, regional, community and commercial disaster mitigation and climate change adaptation strategies. “Paper parks” and other poorly managed protected areas may provide far less in terms of defence.

Unlike other forms of land use, protected areas already have many important management elements in place to protect and maintain natural habitats and their functions. Most protected areas have

agreed borders, usually legally defined and physically marked. Most such areas also operate under legal or equivalent cultural frameworks. Protected areas usually have agreed governance structures. They are backed by a range of supportive policies and laws at national levels and by various conventions and agreements at regional or international level. They are supported by associated government departments, policies, guidelines and established management procedures. Protected areas also have management processes that will be useful or essential for managing ecosystem services, and many have already invested in start-up costs and can draw upon existing funding from governments or trusts; efforts towards disaster mitigation using protected areas can sometimes complement those from other funding sources. Protected area managers may well have more training and expertise in addressing major disasters such as fires, storms or ocean surge than other people in the vicinity.

Jiuzhaigou Nature Reserve, in Sichuan, China, plays a major role in flood prevention. In 1996 a plan was agreed to reduce agricultural land in the buffer zone and plant trees on steep slopes. Initially this was mainly fruit trees, which had limited impacts on soil erosion, but a WWF project helped to develop landscape-scale policies. Most of the 31 mud and rock flows and landslides found in 1984 have been brought under effective control. Residents received compensation for giving up farmland and many of the remaining thousand Tibetan villagers work as hotel-keepers, craftsmen, guides and entertainers for growing numbers of tourists.

The role of protected areas can also be strengthened by integrating them more thoroughly into existing DRR planning, for example by:

- 1. Rigorous economic, engineering and environmental analyses:** government institutions, universities, and the private sector should be encouraged to invest in rigorous economic, engineering and environmental analysis of proposed infrastructure projects to determine when and where there are benefits of incorporating green infrastructure versus hard infrastructure into disaster reduction plans.
- 2. Broad scale spatial planning:** at a national and regional/transboundary scale disaster relief agencies should cooperate with partners to identify places where natural ecosystems could prevent and mitigate disasters and to develop associated ecosystem protection strategies. This should include where appropriate the establishment of new protected areas in vulnerable areas to safeguard vital ecosystem services that buffer communities.
- 3. Management plans:** Some protected area authorities may consider revising management objectives and management plans in order to maximise benefits in terms of disaster

mitigation and to increase awareness of these values among the general public.

- 4. Payment for ecosystem services and financing strategies:** Disaster risk reduction institutions can often usefully work with protected area managers to develop innovative financing strategies for protected areas, which recognise payment for ecosystem services. DRR funds should in some cases be used to establish or manage protected areas in places where these provide cost effective DRR.
- 5. Restoration:** in some cases it may be useful to protect and restore degraded ecosystems specifically to improve their role in disaster mitigation; in such situations some level of active management may be required, e.g. removal of invasive alien species to allow natural regeneration or planting of native species to restore natural processes.
- 6. Training:** protected area staff often provides some of the few trained government officials in remote areas; additional training specifically on DRR issues can help them to help communities both through management options within the protected area and through relief management if an extreme event takes place.

The Indian Coastal Regulation Zone (CRZ) Notification is a national attempt to legally protect sensitive coastal ecosystems from the high tide mark up to 500m inland, formulate guidelines and demarcate conservation areas. There are four CRZ categories. The first (CRZ I) includes areas that are ecologically sensitive and important such as protected areas, wildlife habitats, mangroves, coral reefs, breeding and spawning grounds of fish, areas rich in genetic diversity and areas likely to be inundated due to rise in sea-level. All activities in the various zones are subject to the conditions set out in the legislative framework.

Promoting Integrated Solutions...Together

The critical role of protected areas in reducing vulnerability and disaster mitigation is well documented. What is needed now is a greater appreciation of the multiple benefits that protected areas provide as well as innovative financing mechanisms and institutional arrangements that can protect and promote green infrastructure as part of national and local strategies to ensure the safety of citizens against disasters, buffer against impacts of climate change as well as meet long-term recovery and livelihood needs. The 3rd United Nations World Disasters Conference meeting in 2015 is a major opportunity to convince decision makers that natural infrastructure should be prioritised in reducing risks from disasters. IUCN, its World Commission on Protected Areas and The Commission on Ecosystem Management remain ready and willing to support the information collation, awareness raising and capacity building for disaster risk management to fully embrace the opportunities protected areas provide in making this world a safer place from disasters. As a first stage, IUCN staff and consultants are collating examples of DRR lessons from protected areas from around the world, as input to a major workshop at the forthcoming World Parks Congress. IUCN is also working on technical guidance for protected area managers on the potential and optimisation of DRR from protected areas around the world.



Dana Nature Reserve in Jordan has undergone desertification over centuries and pressures on land all around are still increasing. In Dana, this tendency has been partially reversed, by reaching an agreement with local farmers and herders to reduce stocking densities of goats by 50 per cent and providing alternative livelihood options through ecotourism and craft development. Despite continuation of grazing, the area of the reserve has undergone major natural regeneration, stabilising soil and providing important wildlife habitat.

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