



February 2005

The Indian Ocean tsunami Reducing Risk and vulnerability to future natural disasters and loss of ecosystem services

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The Indian Ocean tsunami presented an extraordinary humanitarian challenge but, as with almost all sudden onset disasters, the longer term implications for both humans and ecosystems often are forgotten in the rush to meet immediate needs. While attention has rightly been directed to humanitarian needs in the short term, issues of recovery and reconstruction, prevention of future disasters and sustainable development now need to be addressed. This recovery should focus on enhancing human livelihoods while reducing both human and ecosystem vulnerability to future disasters. These two objectives are closely linked, since recovery of ecosystems can ensure that they will provide the services needed to maintain livelihoods and thereby reduce human vulnerability.

Human livelihoods are underpinned by the services provided by healthy ecosystems. In the region affected by the Indian ocean tsunami this includes food fish for both domestic use and export, productive arable land, mineral resources, water for human consumption and irrigation, timber and non-timber products, and attractive locations for the tourist industry. Only a few months after the event, the region is already benefiting from significant and rapid reconstruction activity. These activities have focused on short term humanitarian needs, but longer term planning should recognise the wide range of opportunities afforded by rehabilitating and restoring ecosystems which may have been damaged by the tsunami, which will in turn reduce human vulnerability in the future.

Reconstruction efforts following disasters often give opportunities to bring about more far reaching and longer term changes which will aid recovery of both people's livelihoods and security and the ecosystems on which many rely. Those involved in the reconstruction now have that window of opportunity to change how they respond to the longer term tasks of reconstruction and sustainable life in the future and ensure that planning includes healthy ecosystems as the basis for recovery. But to make the most of this opportunity, they must be sure to draw from the lessons learned in coping with previous disasters and employ appropriate strategies as they develop their response.

Risk, vulnerability and disasters: a starting point for analysis of risks to biodiversity

The Indian Ocean tsunami and its impacts on millions of people in the region demonstrate the high vulnerability of people in disaster situations when many existing predisposing factors are also in place. These factors have been described in an analytical framework (Blaikie et al., 1994, Wisner et al., 2003) and is called the 'Pressure and Release Model' (PAR). The PAR model identifies a disaster as the outcome of, on one side, natural hazards, such as the Indian Ocean tsunami, and on the other, a progression of driving forces which shapes the degree of *people's vulnerability* to these hazards.

These driving forces, which are primarily socio-economic and political, determine the extent to which people can protect themselves and recover from the occurrence of a “natural” disaster. These slower acting, often insidious and tacitly acknowledged, aspects of political and economic life which shape people’s vulnerability are brutally exposed upon the sudden onset of a natural event, such as a tsunami, but can also include earthquakes, volcanic eruptions, wild fires, riverine and coastal floods, and storms. So people’s vulnerability and ecosystem vulnerability are shaped by long term and slow acting processes.... until a sudden event occurs, the impact of which is partly determined by long term processes which produce vulnerability of people and ecosystems. This sudden event appears in Figure 1 as “Indian Ocean Tsunami”, but it could re-appear as a tropical storm, earthquake, flood or other “natural” disaster.

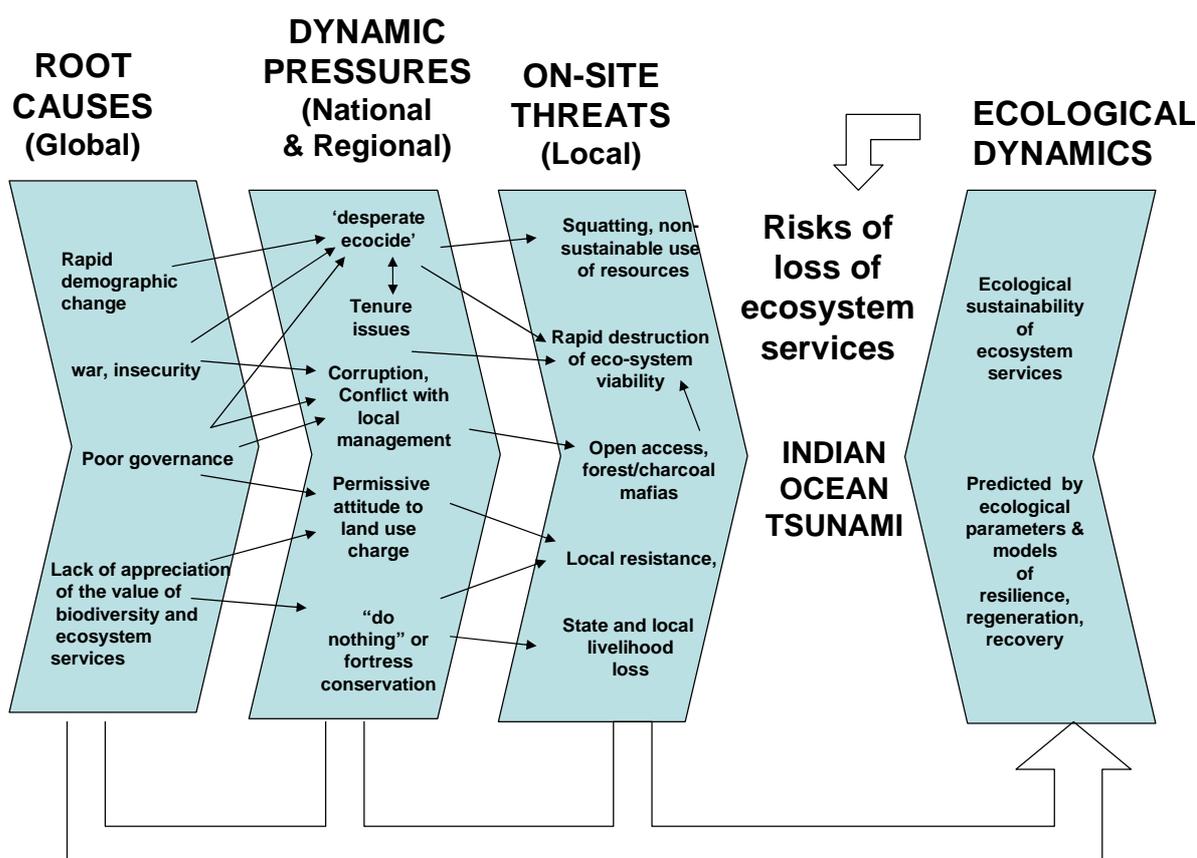


Figure 1 - PAR model of the Indian Ocean tsunami

Figure 1 shows an indicative selection of root causes, dynamic pressures and on-site threats that might apply in the case of post-tsunami biodiversity losses. Here the socio-economic and political driving forces on the left of Figure 1 are shown moving from the root causes (usually on a global scale or scale-independent), through dynamic pressures (operating at the national, and sub-national scales) to the reproduction of on-site threats. On the right of the diagram, there are the technical and ecological constants regarding the ecological losses associated with the tsunami. The pressures are coming from both the socio-economic and ecologic ‘sides’ and together underscore the vital importance of holistic and interdisciplinary thinking, drawing from both natural and social sciences.

People have different capacities to avoid or cope with disasters, in other words, differing *vulnerability*. Vulnerability is ‘the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with and recover from the impact of a natural disaster’ (Blaikie *et al.*, *ibid*:9, Wisner *et al.*, *ibid*:11). Vulnerability is created from specific socio-economic causes that are structured within sets of more pervasive, widespread and generalised ‘*root causes*’ (e.g. poverty, globalising trends of the extension and intensification of market relations) through to ‘dynamic pressures’ which operate in specific ways within root causes (e.g. changing population growth and distribution with a region, national policy frameworks including Structural Adjustment Programmes and debt repayment schedules, lack of press freedom, political **under**-representation of ethnic minorities and politically marginalized), to ‘*on-site threats*’ which are the most location and socially-specific (e.g. dangerous locations, unprotected buildings, lack of disaster preparedness at particular places at particular times). This chain of events creates a ‘*progression of vulnerability*’. Each set of driving forces of vulnerability is encapsulated in the larger body of the causes and shape the scene for the occurrence of the natural hazard, when it occurs (see Figure). People are “caught in the middle” between the socially generated progression of vulnerability on the one hand and the natural hazard event on the other. Therefore, the outcome of a disaster is shaped both by the physical nature of the hazard and the vulnerability of people who are involved.

The case of the Indian Ocean tsunami illustrates this clearly. In this case, the physical force of the tsunami was so overwhelming, severe and without warning that vulnerability to its impacts cut across all parts of society. Wealthy tourists as well as poor local fishermen lost their lives. However, the crucial difference will be the ability to recover. Who will best afford medical assistance and clean drinking water in the aftermath, insurance against loss, and recovery of livelihoods such as the purchase of fishing equipment while coping with flooding of fish ponds, salinisation of fields, loss of dwelling and capital equipment? Which of the stakeholders in the key industries of fishing and tourism will cope the best in the immediate aftermath and the longer term? What is the best approach to provide both short term needs for ecosystem services such as food, water and productive land, and longer term return to livelihoods that depend on those services? The answers to these questions lie in the PAR model and the lessons learned from past disasters.

The Pressure and Release (PAR) approach to biodiversity loss

For the case of disasters such as the Indian Ocean tsunami, the PAR model provides a structured approach to identify the pressure points which increase risks to human livelihoods resulting from risks to ecosystem services on which those livelihoods depend. By understanding the full spectrum of causes of vulnerability, a more effective and efficient plan for recovery can be developed, both for people and the ecosystems on which they rely. The PAR model outlines a cascading suite of factors – from root causes to dynamic pressures to local level threats – that need to be examined in order to provide an effective reconstruction plan that will decrease vulnerability in the future.

Root causes: Root causes are factors which are pervasive and non-specific to the situation. Globally, these factors include demographic changes (both in absolute numbers and distribution), conflict and civil unrest. In the case of vulnerability to natural disaster they also include issues of governance tenure and appreciation of the value of biodiversity and ecosystem services.

1. Governance issues and Politics

Governance issues are critical in any international effort to encourage recovery of ecosystem services and the natural resource management that underpins that recovery. Transparency, accountability, fair representation by different actors and technical competence are familiar enough indicators, but they are in intermittent, and sometimes scant, supply – in both the North and South. In the more acute

post-tsunami period, the political relations between multilateral and bi-lateral institutions and national governments have already presented problems to all parties. Issues of national sovereignty can challenge international efforts for conserving healthy ecosystems as well as providing humanitarian aid and the financial and material means for longer term recovery. In the case of the relief and reconstruction effort after the Indian Ocean tsunami, the political situation in both Sri Lanka and Aceh exacerbates sensibilities over what is seen as unwarranted incursions by outsiders. While these difficulties have already been faced in the provision of humanitarian relief, they will be more pronounced when more extensive and far reaching measures to address root causes are negotiated. They also will pose the question of *who* are best (and most effective) partners with whom to work.

In terms of negotiations about biodiversity and ecosystem services in normal times, the interface between international institutions and national governments may produce formal agreements and cordial joint statements, yet compliance may be (and often is) very different. Here, formal institutions of state are essential as target audiences for international institutions involved in biodiversity conservation, as contributors to the project, and as executive agents in passing laws and implementing policy. While bi- and multi-lateral agencies may bypass these institutions via support of non-governmental organisations (NGOs), many national governments in Asia, Africa and Latin America have become understandably nervous of the autonomy and lack of accountability of many environmental and development NGOs. This may well re-surface in a more acute way during the post-tsunami reconstruction phase. However, lower standards of governance may allow the political or economically powerful aspects of society to dominate the policy process as well as natural resources themselves and result in the dispossession of poorer sections of society. Case studies of this marked widening of the gaps between wealthy and poor exist for many countries including, in the tsunami zone, Bangladesh, China, India, Indonesia, Myanmar, Sri Lanka and Thailand. In turn this may encourage “desperate ecocide” on the part of the poor and encourage resource piracy on the part of the wealthy and powerful.

Lesson 1

Issues of governance and politics at all levels (local to international) will have an important impact on the efficacy of local level solutions.

2. Justifying Conservation of Biodiversity and Ecosystem Services

Another challenge which presents considerable risks to improved livelihoods post-tsunami is the difficulty of presenting persuasive arguments for natural resource conservation itself and for the linkage between that conservation and human well being. This is a scale-independent problem, but must be addressed universally in all negotiations. Discussions of ecosystem services and the biodiversity that provides them is a complex and difficult subject - scientific research is incomplete, and winners and losers are inevitable in each situation. As a result, political issues in any biodiversity conservation policy negotiation will always be on - or under - the table during negotiation. Differing social constructions of the problem are also based upon a wide variety of linguistic, cultural, and ethical beliefs and norms with respect to nature (see Hannigan, 1995:92-108, Skutnabb-Kangas, 2000). Widespread ignorance on the part of even senior administrators regarding the importance of ecosystem services to sustainable livelihoods exist throughout the world (Wynne, 1992). In the wake of the Indian Ocean tsunami, the particular industries (and associated livelihoods) most at risk include fisheries and tourism. Both of these are critically dependent on sound management of natural resources for both short and longer term supplies. However, the multiple relationships between conservation of those resources and the improvements to livelihoods have yet to be articulated. To

advocate a course of policy action on the basis of uncertainty is never a strong tool, however convincing the rational basis may be. Clearly more work is required to justify the importance of biodiversity and ecosystem services in recovery from all natural disasters.

Lesson 2

Clear articulation is needed of the rationale for including biodiversity conservation concerns as a key step in assuring necessary ecosystem services that are part of reconstruction planning.

Dynamic Pressures and On-site Threats:

Dynamic pressures are usually most usefully analysed at the country level (particularly for study of national policy, and compliance with international environmental accords), at the regional level, both macro-regional across a number of national territories (for example, fisheries issues in the Indian Ocean), and at sub-national level. On site threats are specific both to local ecological and social processes. In the case of the tsunami, for example, the configuration of the coast line, the existence of coral reefs, the maturity and denseness of mangroves and other factors mediated differential environmental damage across the areas affected, and these will result in differing impacts of the reconstruction process.

Tenure disputes

In post-disaster recovery, struggles over resource tenure and more generally over *property regimes* are usually central. Many private interests (both international corporations as well as local entrepreneurs) may not, as may seem obvious, push for private property regimes, but instead may be served best by gaining access to bio-resources through formal and informal arrangements with state agencies, and extracting those resources in a once-and-for-all operation ('mining' the resource). However, those private interests are usually under pressure from the state and both legal and illegal moves towards privatisation and therefore are often in a fragile state of institutional capacity (Bierkes, 1990; Blaikie & Brookfield, 1987; Ostrom, 1989).

Recurring drivers of risk to biodiversity loss at the on-site level include more general tenurial issues at the local level. Large bibliographies attest to the over-riding of customary rights to forest and pasture of local groups, the degeneration of property rights, to *de facto* open access, free rider problems, and illegal harvesting of resources (e.g. hunting wildlife for food, felling trees for sale or reconstruction of housing, charcoal manufacture). In each case they have to be assessed and approximate risks attached and identified, so that pressure points can be lessened wherever feasible.

Reform of tenurial rights governing resource use is an opportunity in the post-tsunami recovery, particularly the strengthening of common pool tenure (artisanal fisheries, social and community forestry and woodlots, village pastures and sources of grazing and thatching grass) which may become compromised by disasters such as the Indian Ocean tsunami. In Thailand, land tenure in many of the coastal villages is informal, based on long-term occupation of the land. Following the tsunami, more powerful interests are claiming the affected land with a view to replacing poor fishing villages with more lucrative tourism installations. In Sri Lanka, the government has proposed regulations requiring all new developments including housing reconstruction to be set back at least 100 metres from the high tide line in the South and West and 200 metres in the North and East.

However, partially damaged buildings within the no-build zone may be allowed to be rehabilitated, with government approval and on a case-by-case basis.

Lesson 3

Resource tenure will be a key issue to be resolved.

As people rebuild their lives, limited resources will generate pressure for '*desperate ecocide*', driven by a combination of marginalisation through government policy or through encroachment of more politically powerful groups in the reconstruction process, dispossession, and lack of alternative livelihood sources. This situation is exacerbated by the immediate losses of essential natural resources following the tsunami. In turn, this will create threats to biodiversity conservation. On site indications might be the widespread occurrence of illegal squatting in protected areas and state forests, the occupation of traditionally-held lands by local people by more powerful incomers. In Indonesia's Aceh province, for example, the most readily available source of timber for reconstruction is nearby Gunung Leuser National Park, an internationally recognized World Heritage site and one of the last remaining strongholds of the Sumatran tiger, rhinoceros and Asian elephant. Many other case studies exist in tribal areas throughout South Asia and south-east Asia of the results of inundation for hydro-electric schemes causing local populations to be banished to less suitable lands for cultivation. The lesson to be learned from this (and many other) case studies is that when any reconstruction project threatens local livelihoods, norms and values without compensation and democratic negotiation with local people, the risks for continuing or accelerated biodiversity loss will be increased.

Lesson 4

Successful recovery and reducing vulnerability to future disasters will require ensuring full participation of all stakeholders affected by the disaster in the recovery process.

Bringing about more protection for human beings, more and diverse opportunities for livelihoods, re-forestation for both the production of hydrological services, protection against floods, storm surges and soil erosion as well as for the intrinsic values of biodiversity should also look first for local skills and norms. Here again, recovery initiatives should be aimed to benefit the asset poor (the majority in most locations) and have real, accountable stakeholder participation in their design and implementation. Local people usually have institutional means and the knowledge for recovery, which must not be undermined or pre-empted by top-down blueprint planning. One simple example from the tsunami includes the case of the people of Simeleu Island – one of the islands closest to the epicenter of the earthquake – which suffered minimal casualties as the local people apparently "knew" to seek high ground when the coastal waters retreated. Similar reports have been made regarding local people in the Andaman Islands and among Thailand's Maken people (also known as 'sea gypsies'). Local knowledge and capabilities do exist and should be called upon as a complement to knowledge from other sources and similar experiences in other parts of the world. This local knowledge and capacity should be utilised in collaboration with more centralized and "expert" planning. The state or other centralised bodies must also show leadership for reducing vulnerability

Lesson 5

Include local solutions and "ways of doing things" and local institutions in recovery planning and implementation.

Reducing vulnerability in the future

This report has discussed several key issues for the reduction of risk and vulnerability of humans and the ecosystems and their services on which many livelihoods rely. It has highlighted some key lessons learned in other disasters that provide strategic suggestions for reducing vulnerability of ecosystems and societies.

Socio-economic monitoring of the post-tsunami pattern of livelihoods is an essential step. Dynamic processes of dispossession and appropriation must be monitored through time, and not left to a “one-off” baseline study. In addition, post-tsunami monitoring of the provision of ecosystem services (eg. fisheries catch per unit effort, water quality) is also required to anticipate longer term impacts of the disaster. Finally, management structures should be established that encourage and facilitate rapid response to changing situations that are identified through the monitoring programmes.

The impact of a disaster, both in the human as well as in the ecological sphere usually means that the goal of completely rebuilding institutions, patterns of livelihoods and the ecological fabric of the pre-disaster situation is both unrealistic and undesirable. Instead, planners should welcome the opportunities for reform rather than a return to the *status quo*. This reform is embodied in employing the principles noted below as the basis for planning and implementation of recovery planning.

Effective Recovery and Reduction of Future Vulnerability depends on:

- Recognizing that ecosystem services provide the basis for sustainable reconstruction and reducing future vulnerability
- Long term monitoring of both ecological and socio-economic parameters and a management strategy that encourages adaptation to changing circumstances
- Addressing issues of governance and politics at all levels (local to international)
- Providing a clear articulation of the rationale for including biodiversity conservation concerns in reconstruction planning
- Resolving resource tenure issues with all involved stakeholders.
- Ensuring full participation of all stakeholders affected by the disaster in the recovery process
- Including local solutions and “ways of doing things” and local institutions in recovery planning and implementation.

This report and discussion has been focused at general principles for reducing future vulnerabilities in the post-tsunami reconstruction. IUCN will provide more specific advice for specific sectors and specific countries and activities of the reconstruction including:

- Sri Lanka - Sustainable reconstruction; Controlling and preventing invasive species
- Sustainable housing
- Coastal Mangrove restoration

Literature Cited

Bierkes, F. (ed.) (1989) *Common Property Resources: Ecological and Community Based Sustainable Development*, London: Belhaven press.

Blaikie, P. M., Cannon, T., Davis, I. and Wisner, B. (1994) *At Risk: Natural Hazards, People's Vulnerability and Disasters*. London: Routledge. Second edition (2003) by Wisner, B., Blaikie, P. M., Cannon, T. and Davis, I. London: Routledge.

Blaikie, P. M. and Brookfield, H. C. (1987) *Land Degradation and Society*. London: Methuen..

Hannigan, J. (1995) *Environmental Sociology: a Social Constructionist Perspective*. London and New York: Routledge.

Ostrom, E. (1990) *Governing the Commons: the Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.

Skutnabb-Kangas, T. (2000) *Linguistic genocide in education – or worldwide diversity and human rights?* London: Lawrence Erlbaum Associates.

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Created in 1948, IUCN - The World Conservation Union brings together 79 States, 114 Government agencies, 800 plus NGO's, and some 10,000 scientists and experts from 181 countries in a unique worldwide partnership. IUCN's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

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