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Illustration: This Japanese print criticizes the ineptitude of deities who have allowed the M 6.9–7.1 Ansei Earthquake (1855) to occur. The giant catfish (namazu) represents the earthquake. Our source is Gregory Smits' (Pennsylvania State University) online textbook "Topics in Japanese Cultural History". For more details see page 19.



Environmental management for disaster reduction

Editorial
Klaus Toepfer

The clean-up after the unprecedented tsunamis that ravaged South Asia last month is still on-going. In the weeks following this horrific human tragedy environmental concerns from widespread water pollution to the removal of debris and waste on a massive scale have been all too apparent.

While the strongest earthquake in decades and the devastating tsunamis that followed could have been less tragic if warning systems had been in place, it is increasingly clear that the negative effects of this, and other kinds of natural disasters, could have been and can be lessened not only by the speed and efficiency of our relief efforts, but also by maintaining the proper environmental infrastructure.

It is premature to draw final conclusions on the South Asia tsunami, but an earlier tragedy in the Caribbean, where floods and mudslides caused by Hurricane Jeanne killed up to 3000 people in Haiti

and left another 200,000 affected, demonstrated all too vividly how natural disasters strike differently, depending on how the ground was "prepared for them".

In Haiti, extensive deforestation left large hillsides bare, allowing rainwater to run off directly to the settlements at the bottom of the slopes. In neighbouring Dominican Republic, hit by the same storm, there were many fewer victims to mourn, and part of the reason is that their hills are still covered by a protecting forest.

A similar disaster unfolded more recently when half a million people were affected by successive storms in the Philippines. As in Haiti, the destruction and loss of life wrought by the storms was made worse by deforestation in the hills above villages and towns. In response to the crisis, President Arroyo banned all commercial logging as rescuers rushed aid to wet and hungry survivors.

These two examples clearly show that taking care of our natural resources,

and managing them wisely, not only assures that future generations will find better living conditions, but it reduces the risks that natural hazards pose to people today.

In this vein, and in close cooperation with our United Nations partners, UNEP's goal is to reinforce the centrality of environmental concerns in disaster management, and to promote sound management of natural resources as a tool to prevent disasters or lessen their impacts on people, their homes and livelihoods.

Population growth, industrialisation and environmental abuse have opened a Pandora's Box of catastrophes across the planet. From spectacular industrial accidents like Bhopal and Chernobyl to the horrors of drought in Africa and the extreme weather that battered Japan and the USA last year, the world is more and more aware of natural and man-made disasters. The question is how to prevent them, and if they should nevertheless happen, how to respond. It is these questions that the

Kobe World Conference on Disaster Reduction and the necessary follow-up action, must address.

This edition of the Environment Times illustrates the problems and challenges before us, showing many practical examples on how useful preventive action can be taken. It lays out why we must think "environment" at every stage of disaster management, be it in preparing, preventing, mitigating or reacting.

Today, we are sadly witness to a growing number of devastating hurricanes, typhoons, droughts and floods across the globe which as a result of climate change are set to become more frequent and violent. As last year's horrific pictures from Haiti and the Philippines show, and with the almost incomprehensible scale of the South Asia disaster unfolding before us, it has become painfully clear that without the environment firmly in the equation there will be no long-term disaster risk reduction.

Dr. Klaus Toepfer is the Executive Director of the United Nations Environment Programme.

Dear reader, The Editorial Team

While we are adding the last editorial touch to this Environment & Poverty Times, the world is under shock. All along the coast of the Indian Ocean, villages, entire islands have been washed into the sea. Before anything else, we want to express our compassion for the victims and their families. With a bit of distance, we hope that this publication contributes to a better understanding of the mechanisms that are needed to minimise the effects of in themselves unavoidable natural disasters.

When reading our Environment Times, you will sometimes wonder, "What on earth has this article got to do with disaster management?" Our understanding of disasters and its causes is indeed a very broad one in this publication. We are interested in the relations between different environments – the social configuration, economic possibilities, the institutional arrangements and political systems,

the state of the environment, natural predispositions of an area - and how these influence the occurrence of disasters and their effects. Where is the border between natural and man-made catastrophes? What can be done to alleviate a dangerous set-up? What factors aggravate the risks? Our choice of articles wants to allow all those angles to be looked at. And above all, to show examples where good approaches have been taken, alongside of pointing the finger at practices yet to be improved. After all, we learn from our mistakes. Let's hope that tragedies have at least this one positive effect.

A number of articles talk about developments caused by human action that so far have passed unnoticed, but might well in the near future lead to a catastrophic situation. What needs to happen before we intervene? This is our opportunity to avoid future disasters. We have the knowledge to do so, all we need is to convince the decision-makers of the urgency of a situation.

As for the structure of the paper, the intention was to present the material

in the order of the stages of disasters: from prevention early warning and preparedness to relief and reconstruction. This proved to be difficult, as we all know that 'reconstruction starts with prevention', but we nevertheless kept this basic roster, although certain articles could fit in different categories. The four stages are each preceded by an example of a natural event and an industrial accident, where the authors show the linkages between environmental management, risk reduction and effect on livelihoods. The end of the paper gives the floor to different industrial sectors and features the role of the local level in disaster management. Another double page is dedicated to more general reflections on the role of environmental management in disaster risk reduction. The central pages feature a set of maps displaying issues related to disasters that possibly are not necessarily perceived as such.

Enjoy reading!

All responsible for disaster reduction

Sálvano Briceño

Over the past 10 years the world has suffered an increasing number of "natural" disasters affecting more than 2.5 billion people, killing 478,100 and causing economic losses of about \$690bn. We may not necessarily be able to prevent natural hazards such as earthquakes, volcanic eruptions, hurricanes and floods, but we can certainly act to prevent their disastrous effects on vulnerable communities.

The World Conference on Disaster Reduction (WCDR) coincides with the 10th anniversary of the great Hanshin-Awaji (Kobe) earthquake that claimed more than 6,000 lives and cost a stunning \$100bn. It is an opportunity to share experiences in disaster reduction practices such as environmental management and look at ways of reducing risk worldwide.

The WCDR is a milestone event that will build on the findings of the review of the Yokohama Strategy adopted 10 years ago. It will develop elements for an articulated programme for dis-

aster risk reduction, addressing the objectives of the Johannesburg Plan of Implementation, essential to achieving Millennium Development Goals.

Building disaster resilient communities means that disaster reduction is everyone's responsibility. A disaster reduction strategy is a global challenge that involves communities, schools, the media, researchers, scientists, non-governmental organizations, various sections in governments and regional and international organizations including many agencies and programmes of the UN system. UNEP is the specialist programme in this field and at the International Strategy for Disaster Reduction secretariat we are looking forward to closer collaboration with UNEP to follow up WCDR decisions and recommendations in order to strengthen environmental capacities in vulnerable countries and thus reduce risk and vulnerability while achieving sustainable development.

Sálvano Briceño is the Director of the Inter-Agency Secretariat of the International Strategy of Disaster Reduction UN/ISDR (see also www.unisdr.org)

Hooligans in the Caribbean

The 2004 hurricane season was one of the worst ever. Does that prove climate change is disturbing hurricane patterns? How do political systems impact on people's vulnerability? And what of the level of development? This year's hurricanes showed how much social, economic and political factors amplify the impact of natural phenomena. Poverty accounts for the most victims in natural disasters, witness the difference in Hurricane Jeanne's toll in Haiti and the Dominican Republic. Similarly Ivan caused severe structural damage to buildings in Grenada but barely marked Cuba.

Widespread deforestation and urbanisation make the poorest countries even more vulnerable. As the Asian edition of Time magazine wrote, in its coverage of Winnie: "Had man not helped, a typhoon alone would not have caused such devastation." It went on to focus on the devastating effects systematic logging had on mudslides following heavy rain. Improved planning, environmental practice and management, with more precisely targeted foreign aid, can help poor nations reduce loss of life and livelihood following natural disasters.

Storm-tossed lessons

Julia Taft

From Trinidad to Tallahassee, Fla., tropical storms have ravaged the Caribbean basin, exacting a multibillion-dollar toll on housing, schools, hospitals, roads and sewage systems.

Most of the casualties were in Haiti. But almost no community escaped unscathed. In Grenada, half of the population is now homeless, the famed nutmeg groves flattened, the power plants wrecked. The tourism industry that was the island's lifeblood could take years to recover. Many other islands – including Tobago, Jamaica and Grand Cayman – also suffered.

The biggest killer in natural disasters is poverty. The same hurricane tides that flood houses in Florida sweep away entire neighborhoods in places like Gonaïves, Haiti. And while survivors need places to live, simply rebuilding their tin-roofed shacks in flood plains guarantees they will suffer again. Better planning, and more focused foreign aid, can help even poor nations reduce the loss of life and property from natural disasters.

Compare the consequences of the storms in the two countries that share the island of Hispaniola. In the Dominican Republic, which has invested in hurricane shelters and emergency evacuation networks, the death toll was fewer than 10, as

compared to an estimated 2,000 in Haiti. And Cuba's proven ability to survive hurricanes with few casualties – Ivan claimed no lives there because two million people were swiftly moved out of harm's way – is a testament both to the value of disaster response planning and the need for it throughout the Caribbean.

According to climatologists, vulnerable coastal communities should be prepared for greater erosion and more severe floods in the future. Poor countries need help to rebuild and to better protect themselves against future such calamities. The United Nations started appealing last autumn for emergency humanitarian aid for Grenada and Haiti to provide food, temporary shelter and basic health care.

But long-term development assistance in the Caribbean from agencies like mine, as well as from donors like the United States, must focus on reducing the destructive impact of these storms. Virtually every school, road, hospital or housing settlement destroyed in Grenada by Hurricane Ivan or in Haiti by Hurricane Jeanne was financed with foreign assistance.

Reconstruction often occurs with such haste that countries end up with even greater exposure to future hurricanes. But housing developments can be sited and designed to avoid the worst damage.

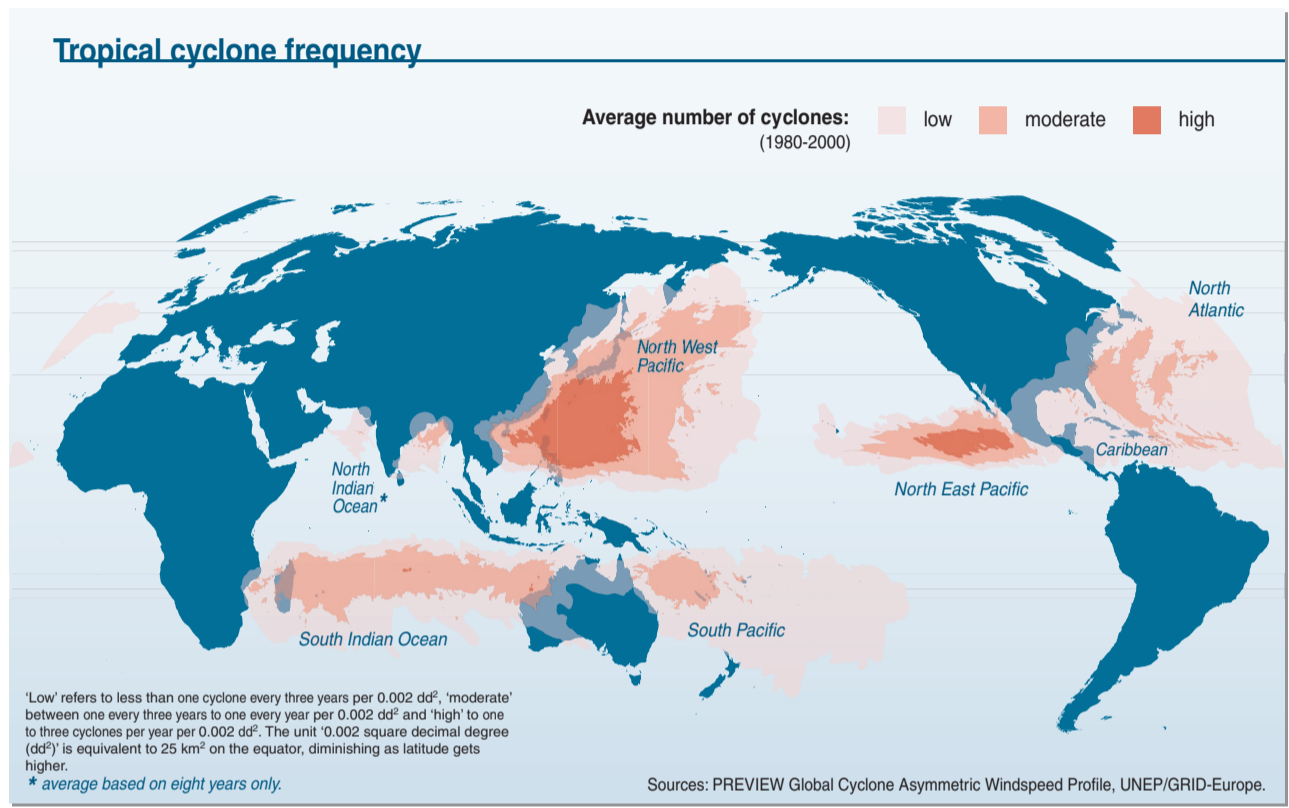
In an effort to promote better long-term planning, the United Nations Development Programme early this year evaluated disaster preparedness in scores of nations. It showed Haitians were 100 times more likely to die in an equivalent storm than Dominicans. In the storms that hit last week in Gonaïves, flash

floods occurred in just a few hours because upstream terrain has long since been stripped of forests and topsoil.

The magnitude of the destruction in Haiti and Grenada underscores the need for vulnerable island states to develop policies that will enable them to withstand

these storms. And from the international development community, they deserve not just more aid, but smarter aid.

Julia Taft is assistant administrator of the United Nations Development Programme. This article was first published on 3 October 2004 by the New York Times. Copyright New York Times.



"Ivan" breathes new life into the Cuban Revolution

Richard Bauer

A finely tuned disaster-prevention programme helped Cuba escape the worst of hurricanes Charley and Ivan. As Castro turned the fight against natural forces into an all-out military battle, the government attributed Cubans' sense of solidarity and discipline to their revolutionary upbringing.

Cuba was wracked by two hurricanes in close succession, leaving a trail of devastation in their wake. Around mid-August, Charley's eye slammed the island west of Havana. A month later Ivan battered into large parts of Grenada, Jamaica and the Cayman Islands. The strongest cyclone to hit Cuba since the Revolution then grazed the island's western tip, flooding the province of Pinar del Río. Fortunately Havana was spared, averting the monumental catastrophe many feared would decimate the city.

A well-oiled organisation

The authorities sounded the hurricane alarm in good time, mobilising the country's military-style civil-defence system in exemplary fashion. Some 2 million of the country's 11 million inhabitants were temporarily evacuated. In a society controlled by the Comités de Defensa de la Revoluc-

ción, the neighbourhood organisations, everyone was well drilled in what to do in an emergency. Disaster prevention forms part of primary school training in Cuba. Once a year the entire population takes part in a two-day drill to prepare for the real thing. Three days before Ivan made land entire villages in some particularly exposed coastal areas were brought to safety, along with their domestic animals and belongings. Special troops harvested semi-ripe bananas and citrus fruits, and the electricity was cut as a precaution in the areas most at risk.

Neighbours and relatives showed enormous solidarity in offering lodgings to those living in the more precarious houses and flats. For three long and oppressive days, as Ivan threatened to strike Havana, life in the capital of 2 million souls came to a standstill. The public bus service was suspended, while shops and snack stands remained closed. Children made the most of the break playing football or baseball on the deserted streets. Those living in the top storeys of high-rise buildings were urged to seek shelter with friends or in assembly camps. Hospital beds were vacated and patients sent home. Bread, bottled water and tinned foods were snatched up by those with the means to do so.

No strangers to hardship, Cubans hurried to safeguard their potted plants, ventilators and VCRs, while state-run radio and television broadcast uninterrupted messages of resistance. The fight against the forces of nature turned into an act of national self-affirmation. In the eyes of the government, the material deficiencies of a cash-starved infrastructure were more than made up for by Cubans' revolutionary willingness to stand up and fight the catastrophe facing them. "We have our unity and discipline to thank for making us what we are," beamed one television journalist.

Good PR for the Revolution

State-controlled media and government spokespersons almost gave the impression that Cuba was at war. For once the enemy was not Uncle Sam, but Ivan the Terrible. According to official statements, the entire country was "at the ready" and "in the trenches", ready to "win the battle". Fidel Castro, the Comandante, was standing "in the line of fire" and "shoulder to shoulder with his people". For Castro, the two-part natural disaster – which on the whole turned out to be relatively benign – was an opportunity to polish up his image as a caring father to the nation; for the party hierarchy, it was a chance to justify the very existence of the now feeble Revolución.

Before the hurricane made landfall, Castro and his entourage were the last to venture into Sandino, a small village on the western tip of the island in the direct path of Hurricane Ivan. And he was the first to turn up after all the storms, inspiring the mopping-up of Pinar del Río before the ever-present camera.

Earthly fantasies

In the days preceding the storm, Castro spent hours in the mesa redonda, a round-table discussion broadcast live by all television channels and many radio stations. Together with the head of the meteorological service, the Comandante – looking as robust and as lucid as ever – deciphered maps, in an effort to identify the projected path, expounding on all possible scenarios and offering advice.

With his television appearances, and his smile and his look, Castro gave the entire nation a sense of security, wrote Celia Hart, a fervent chronicler of the Revolution in the daily newspaper Juventud Rebelde after victory had been proclaimed. It was as if Fidel himself had batted down the windows in her home, she said. There is, however, more than some doubt as to whether all Cubans display such reverence for their bearded leader. An evening spent with friends in

Havana proved to be a good opportunity to find out. As the round-table discussion got going, everyone waited eagerly around the television. But they did not spend too long on the couch. Once Ivan's possible route and the time before landfall was known, the lady of the house called everyone into the kitchen. Not long after that, the 20-year-old son slipped out and the teenagers took over the television with their PlayStation.

Meanwhile, Carlos, an inhabitant of one of Havana's poorest districts, did not show much public spirit either. A short time ago he added a second room to his house, built – it must be said – with blocks stolen from a state-run company. Instead of protecting his home against the hurricane, however, he and his wife took down the wooden posts holding up the crumbling roof, hoping that the winds would finish it off completely. That would put him on the priority list when it came to asking for building material. But, as it happened, Ivan spared Havana, thwarting poor Carlos' plan...

Richard Bauer is a Mexico-based correspondent for the Neue Zürcher Zeitung. It first published this article on 1 October 2004.

Translated by Avril Wright.



MSEY – Mahe, Seychelles



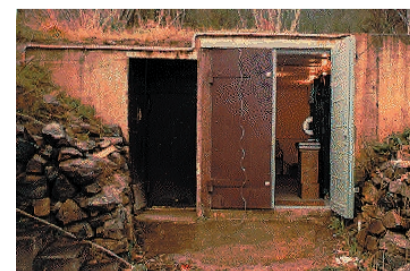
RPV1 – Rancho Palos Verde, California



SBC2 – Santa Barbara, California



ABKT – Alibek, Turkmenistan



TAU – Hobart, Tasmania

Hurricanes Ivan and Jeanne in the Caribbean, a record 10 typhoons in the Pacific Ocean and other weather-related disasters cost the insurance industry at least \$35bn in 2004, the highest figure in 50 years, up from \$16bn in 2003, according to Munich Re, the world's largest reinsurer. (www.bloomberg.com)

Tropical cyclones: paying a high price for environmental destruction

Pascal Peduzzi

Haiti did not need this. In 2004 alone floods claimed 2,665 victims in May, week-long rioting ousted President Aristide and Hurricane Jeanne killed 2,754 more. But to blame it all on bad luck or coincidence would be a mistake.

Tropical cyclones are certainly powerful atmospheric hazards causing heavy rain, high wind and sea surge, but the related disasters are not falling from the sky. Disasters are always the combination of a hazardous event and vulnerable population. There is no such thing as a "natural disaster". Otherwise how can we explain the range of casualties in various communities affected by the same event with comparable winds and rains? For instance the Dominican Republic and Haiti are located on the same island, but Jeanne claimed, respectively, less than twenty and over 2,700 victims. This was perhaps an exceptional event, but if we

look at the statistics for 1980-2003 the death toll per inhabitant exposed to cyclones is on average 4.6 times higher in Haiti than in the Dominican Republic.

Does wealth explain such an enormous difference? The Dominican Republic is certainly 4.1 times richer than its neighbour. What about development? After all a higher level of development means better access to education, more resources to buy equipment and thus response capability, or build more robust homes. The United Nations Development Programme's Human Development Index (HDI) – based on literacy, life expectancy and gross domestic product – is closely and inversely correlated with the proportion of people killed by hurricanes (see graph 1). The higher the HDI, the fewer people are killed. Yet Cuba (with a 0.808 HDI value) has proportionately fewer casualties on average than the United States with (HDI of 0.937). The difference between Cuban preparations

for cyclones and Florida's "hurricane parties" may provide a partial explanation, but another hypothesis is emerging. Research has revealed an 89% correlation between the extent of deforestation and incidence of victims per exposed. Both variables follow the same trend with a tight fit, as shown in the graph. The Haitian part of the island of Hispaniola has low forest coverage (3.2% in 2000) with a high deforestation rate (5.7% of remaining forest). In comparison the Dominican Republic is much greener, with a high degree of forest coverage (28.4% in 2000) and no recorded deforestation. Vegetation protects from winds and helps to stabilise the soil. Haiti's bare soils offer much less resistance, which explains why landslides caused most of the casualties. Mangrove forests significantly reduce the impact of wave surge (see article on Vietnam on page 14-15). There are no mangroves in Haiti, compared with 69,600 hectares in the Dominican Republic. Most of the media cited the poor quality of the Hai-

tian environment as the main factor in the population's vulnerability. This post-disaster consensus sounds like an indictment of poor environmental practice, as if tropical cyclones were the ultimate penalty for environmental destruction. But this introduces a notion of guilt. Did Haitians really have the choice?

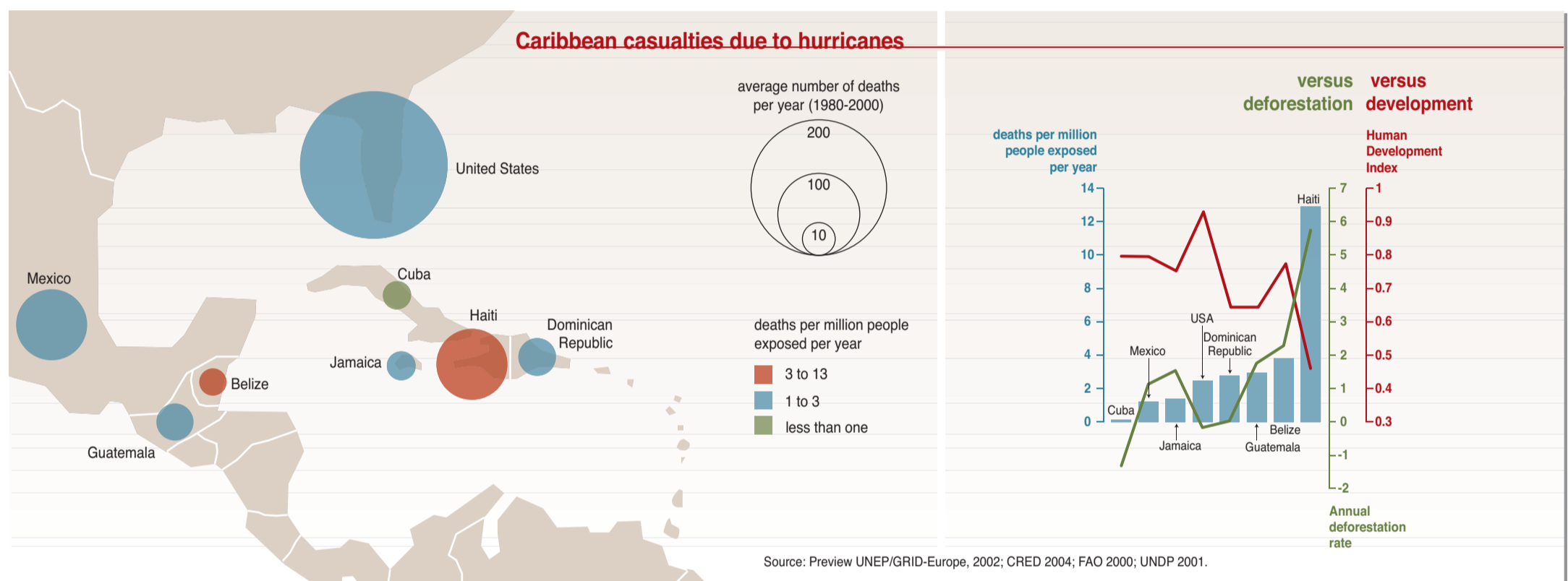
Firewood and charcoal represent 70% of Haiti's total energy supply. With an average monthly income of \$30.5 people cannot afford to use gas stoves or other energy sources. Given the scant remaining forests, switching to other energy sources is a burning issue in every sense of the term, indeed a matter of life or death. The recent rioting may just be a foretaste of future violence.

Haiti is not the only poor country on the verge of environmental collapse. Many countries in their predicament – notably Burundi, Colombia, El Salvador, Guatemala, Jamaica, Madagascar, Nepal,

Nicaragua, Panama, Peru, Rwanda, Sri Lanka, Uganda and several West African countries – suffer from high rates of deforestation and political tension. The international community urgently needs to provide solid backing so they can achieve sustainable use of their environmental resources, replant their forests and develop alternative energy sources. Developed countries must also stop importing natural raw materials which deplete the environment of the poorest members of the community.

Vulnerability to disasters is not only linked to environmental quality. Climate change is also playing a part. Political and economical leaders must make environmental protection a bigger priority than at present. They must understand that by destroying our forests and environment we are sawing the branch on which we sit.

Pascal Peduzzi is head of the Early Warning Unit at UNEP/DEWA/GRID-Europe.



Is climate change to blame for a deadly hurricane season in the Caribbean?

Solveig Olafsdottir

In August and September four devastating hurricanes pounded North America and the Caribbean killing some 2,500 people and leaving more than 300,000 homeless. 2004 will go down in history as one of the most active and destructive hurricane seasons in the region – unless, as some scientists have already warned, it is the start of a trend brought on by global warming.

The International Federation of the Red Cross and Red Crescent Societies (IFRC) responded to these disasters by deploying local, regional and international relief teams, and appealing for \$17m to assist 175,000 victims in the six worst affected countries. Assistance targeted mainly Grenada and Haiti, which bore the brunt of devastation caused by hurricanes Ivan and Jeanne. International insurance companies estimate that the total insured losses for the 2004 North Atlantic hurricane season amount to \$25bn.

In Grenada 90% of all buildings suffered structural damage as hurricane Ivan battered the island. It destroyed most infrastructures too and it will be months before electricity and communication systems are restored throughout the country. Two-thirds of the island's total population of 90,000 received emergency assistance. After leaving Grenada wind speeds increased making Ivan a category five hurricane, yet Cuba suf-

fered only minor damage when the northernmost part of the island was hit.

The floods caused by Hurricane Jeanne are thought to have killed some 2,700 people in Haiti. Yet only 19 died in the neighbouring Dominican Republic (see article opposite).

What could have been done to reduce the impact of these disasters? Can climate change be blamed for a series of four deadly storms in just one month? We need to find answers to these questions and above all we need to react. Responding to disasters is part of the IFRC mandate, but it is also committed to understanding and addressing risks to which people are exposed. It can thus reduce the frequently horrible consequences of natural disasters.

There is solid evidence that disaster reduction measures can alleviate human suffering. In the Caribbean, the Cuban authorities, supported by the national Red Cross, have set up an excellent emergency preparedness system (see article on opposite page). The Dominican Republic has not exploited its natural resources in the same way as neighbouring Haiti. Though the same deadly hurricanes battered Cuba and the Dominican Republic the incidence of casualties was very different from many other countries in the region.

The Caribbean boasts well trained Red Cross disaster response teams and risk

reduction activities, but we can do more to prepare communities to protect themselves more effectively against the effects of climate change. Disasters are increasingly frequent and severe, a trend aggravated by anarchic urban development and rapid population growth. Climate change is very probably already contributing to the trend and we need to raise the awareness of communities at risk. All too often it is the poor and deprived in society that are the hardest hit. They are the people that the IFRC is targeting worldwide with its risk reduction programmes.

"The Red Cross and Red Crescent see the increasing social cost of disasters, in terms of lost lives, destroyed livelihoods and setbacks to human development," says Eva von Oelreich, Head of the IFRC Disaster Preparedness and Response Department in Geneva. "While donor governments are usually quick and generous in post-disaster relief and reconstruction, they dedicate fewer resources to risk reduction which is less tangible and visible. An urgent action is needed to provide more substantial investment in disaster reduction measures."

Supporting community resilience to hazards and awareness of threats such as extreme weather events and more weather variability is the key to reducing the impact of disasters. Disaster preparedness and risk reduction is a crucial part of the IFRC's work, and the effect that climate

change can have on vulnerable communities is one of the risk factors that it must be prepared to address in the future. It is of obvious concern if, as a result of climate change, four deadly hurricanes occur within one month and devastate the same region.

The scientists, who argue that global warming accounts for the ferocity and frequency of the hurricanes that battered the Caribbean in 2004, blame one factor in particular: the unexpectedly warm water that has been building up in the mid-Atlantic and Caribbean Oceans over

the past years. Hurricanes need specific conditions to form. Two of them are warm water and high water-vapour levels. Most experts agree that these conditions currently prevail, though the scientific community does not agree on whether climate change is to blame. But the IFRC cannot afford to wait for the results of that debate – it must be prepared here and now.

Solveig Olafsdottir is the liaison and communications officer for climate change and disaster reduction of IFRC/Red Cross Red Crescent Climate Centre in Geneva. She worked as a press and TV reporter in Iceland before joining the IFRC in 1998.

Climate change: More impacts from tropical cyclones in the future

According to the report 'Climate Change 2001: Impacts, Adaptation and Vulnerability' issued by the IPCC, there is still uncertainty about the increase in cyclone frequency, but modelisation indicates with a high level of confidence (67-95%) that in the future cyclones will be more violent and accompanied by heavier rainfall. In Asia sea level rise associated to increased strength of tropical cyclones could induce the displacement of tens of millions of people, while the predicted increase in rainfall will lead to a higher risk of floods. Also in Latin America the risk of human and infrastructure losses from tropical cyclones will increase.

The warmer the climate, the higher the chances for a hurricane to form. The prerequisites for a cyclone to develop are a sea temperature higher than 26°C to a depth of 60 metres and low atmospheric pressure. Tropical cyclones transform the heat energy conserved in the sea water into kinetic force: wind energy. With increased sea temperatures that come with climate change, more energy will be available to cyclones. While the instability in the vertical structure of the atmosphere prompts a controversy and some uncertainty among scientists about whether the number of cyclones will rise in the future, a large part of the scientific community assumes that the excess energy stored in warmer seas will be released as stronger winds.

Environmental disasters and human tragedies caused by industrial accidents such as Bhopal, Seveso, Schweizerhalle or Tchernobyl have forced governments and industry to improve safety standards, bolstering prevention and accident response. The Baia Mare cyanide spill in Romania in 2000 fortunately had few lasting consequences. But it is a good example of an event that made various players learn from

past lessons and adopt new approaches to avoid future accidents.

The risk factors in less developed parts of the world are different. Just as with natural disasters, industrial accidents are linked to poverty. People who don't know where their next meal will come from care little for environmental management regulations and emergency plans, witness the recurrent mining accidents in Africa and China.

Learning from Baia Mare

Fritz Balkau

On 30 January 2000 a tailings dam at the Aurul Mine in Romania overflowed and released 100,000 cubic metres of effluent containing cyanide into the Tisza River. By the time the overflow was detected, the alarm raised and emergency measures taken to staunch the flow, heavily contaminated wastewater had reached the Danube River and was on its way to Hungary and beyond. Traces of cyanide, albeit at a very low level, were still detected in the river water when it reached the Black Sea two weeks later.

A storm of protest arose over large quantities of cyanide in the drinking water of numerous towns in seven countries and in water supplies serving thousands of people and agriculture. Accusations, denials, assurances and recriminations flew in all directions, and it did not help that some of the reassuring statements by experts about how quickly cyanide degraded proved to be incorrect. The fact that the ecology of the rivers began to recover just a few weeks after the incident was also of less interest to the media. What counted was 70 tonnes of cyanide in the river; over 1,000 tonnes of dead fish, depriving local fishermen of their livelihood; and a shattered tourist industry. Understandably there was indignation that such an accident could have occurred in the first place. So what had led to such a disaster?

An Environmental Task Force, led by UNEP, set about investigating the damage and trying to understand why the accident had occurred. UNEP set up an internet information system to provide updates on the situation and relevant scientific information for a regional audience. The system provided ongoing progress reports on the situation, but also placed particular emphasis on giving practical and unbiased information about cyanide and its use in industry, together with other technical details necessary for a full understanding of the situation. Much of the technical information was retained after the incident and incorporated into a library of documents and other information on the use of cyanide in mining¹, underpinning some of the follow-up actions described below.

The Baia Mare spill marked a turning point for a number of functionally related issues such as waste disposal technology, mine management, accident prevention and management of environmental emergencies, the adequacy of current regulations to ensure public safety, and communication with the public. Almost all the players found some deficiencies in their mandates, practices and methods of communication.

It often takes a disaster to force us to improve safety standards and, even then, the lessons learned are not automatically translated into actual system improvements. The Baia Mare experience, however, did result in major changes in

the way we approach mine safety and respond to accidents generally. How these changes came about is described below.

First it has to be said that some things worked well during the Baia Mare spill. The company eventually blocked the flow of polluted water from the mine. The early warning system of the International Commission for the Protection of the Danube River (ICPDR) swung into action and alerted downstream riparian authorities of the polluted water coming their way. Towns downstream were able to block the pumps drawing river water and make other arrangements for drinking water. Pollution levels were measured regularly at key points along the river.

Other things did not work so well. In particular, attempts to neutralise the cyanide in the river were unsuccessful, and simply added more noxious chemicals to the water. Attempts at public information by various parties were guarded, cautious and often insubstantial. Although the physical damage was only temporary there were widespread fears that the cyanide would cause lasting ecological and economic damage. The psychological effect was permanent. Civil Society lost its trust in industry and government experts.

After much debate it was concluded that little else could be done immediately except wait for the pollution to be flushed out further downstream. Meanwhile various agencies began to review their mandates in search of measures to prevent such an event recurring.

Almost everyone was quick to suggest solutions. Some advocated simply banning the use of cyanide altogether, and/or anything to do with the mining industry (overlooking the fact that the mine at Baia Mare had been reprocessing old mine dumps causing pollution). But it was already clear that simplistic cure-all options would not be effective in dealing with the multitude of causal factors that had led to this combination accident. A more comprehensive approach involving a variety of stakeholders was needed.

Regulatory agencies reviewed their procedures. The European Commission focused on two things: how to bring the hazardous mining activities under the Seveso II directive; and how to incorporate mine residues into the EU Waste Directive. This review eventually resulted in amendments to the respective directives making mining a more central concern of environmental legislation than previously.

UNEP focused on improving the mining industry's safety performance. The Assessment Report of the Baia Mare Task Force identified several factors that had contributed to the accident (see box), and UNEP's programme of work addressed each of these factors in turn.

First, with input from the industry, UNEP prepared new guidelines for the mining

industry, on Awareness and Preparedness for Emergencies at Local Level (APELL). These guidelines² were eventually taken up at international level, and have now become a priority item in the forward work plan of the International Council on Mining and Minerals (see p. 18). A number of companies around the world have already used them to develop their own emergency preparedness plans.

At the same time, the handling procedures for cyanide were reviewed. With the cooperation of the then International Council for Metals and the Environment, a multi-stakeholder process was launched to develop a management code for cyanide – to our knowledge, the first industry code to involve outside partners in its preparation. The International Cyanide Management Code³ (see p. 19), monitored and advised by an international Institute with its own Board of Directors, is now available for global use.

Technical design issues were taken further through the Tailings Committee of the International Commission on Large Dams (ICOLD). UNEP joined with ICOLD to produce two Technical Bulletins⁴ laying down design requirements and providing lessons from past incidents as a guide to designers. Future collaborative work involving UNEP and ICOLD will focus on the concept of fail-safe design for tailings dams.

To address the issue of adequate review at the financing phase of the design of mines, UNEP joined forces with the World Bank and other financial institutions to investigate how banks evaluate the safety performance of the projects in which they invest. It became apparent that while pollution had been a visible item in such reviews, accident risks, and in particular the

possible impact on outside communities, as in the case of Baia Mare, were usually not so visible. This initiative has made banking institutions more aware of the need to include public safety criteria in their project screening process.

The final element for improvement was the regulatory process. It became clear that procedures within the regulatory agencies for mine permitting and monitoring do not usually include much emphasis on emergency preparedness, in contrast to on-site mine safety. UNEP has now run two international seminars with mining inspectorates to give this area more visibility among regulatory agencies.

The Baia Mare accident has become one of the classic situations in the mining industry, acknowledged by industry, professionals and NGOs as something from which we can all draw important lessons.

It is also an important example of how environmental investigations, if properly planned to examine the causal factors, can lead to meaningful improvements in environmental security and emergency preparedness. All the initiatives by UNEP and other players were based on the investigations of the Baia Mare Task Force. They have led to real gains, with better technology, management, regulation and emergency preparedness.

The industry was especially marked by this incident, and major companies and their associations have worked hard to deploy new hazard reduction and contingency procedures.

The revised EU regulations will strengthen requirements for mine safety and waste disposal, with UNEP assisting in

Baia Mare contributing factors:

- insufficient safety evaluation during the financing process
- processing plant and tailings facility design shortcomings
- lack of contingency planning and emergency preparedness
- ineffective enforcement and inspection by regulatory agencies
- inadequate chemical handling procedures
- lack of awareness of hazards by potentially affected communities and authorities

capacity-building as well as with implementation and enforcement.

The incident made it all too clear that accurate information is in short supply during a crisis, and that viewpoints rather than by facts weigh heavily on public opinion. The presence of a trusted, neutral and accurate information system accessible to everyone is a real asset in mounting a coherent response to environmental incidents. Such a system should aim to foster public understanding of the factors and facts underlying the situation, not just give a description of the event.

Baia Mare caused no human fatalities, but under different circumstances it might well have done so. The lessons learned and applied from the follow-up programme will reduce the likelihood of such accidents and any future fatalities.

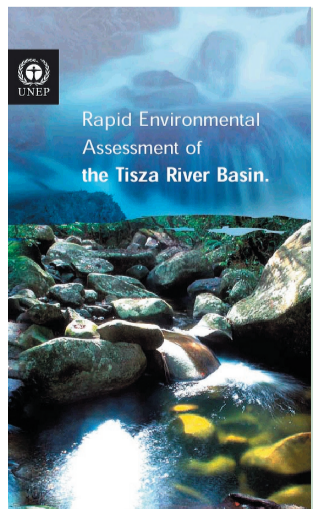
Fritz Balkau is Chief of the Production and Consumption Branch of UNEP's Division of Technology, Industry and Economics (DTIE) in Paris.

1. www.mineralresourcesforum.org/incidents/BaiaMare
2. www.mineralresourcesforum.org/initiatives/apell
3. www.cyanidecode.com
4. www.unep.org/pc/mining/library/publications/books.htm

Industrial hot spots Tisza river basin



adapted from UNEP/DEWA/GRID Geneva Source: Tisza River Assessment, UNEP 2004



Rapid Assessment of the Tisza River Basin

Almost five years after a cyanide spill from a gold mine in northern Romania travelled down the Tisza river, local communities in the region remain at risk from floods and industrial pollution. The new report "Rapid Environmental Assessment of the Tisza River Basin" from UNEP, says more concerted action is needed to address environmental threats or "insecurities", and recommends an "Integrated Sustainable Development Strategy" for the entire catchment area of the river Tisza, which includes Romania, Ukraine, Slovakia, Hungary and Serbia and Montenegro. In the wake of the Baia Mare spill, hot spots of potential accidental pollution risk from mining operations (including from obsolete mining sites) are singled out for particular attention.

www.grid.unep.ch/product/publication/download/tisza.pdf

Informal mining in the Democratic Republic of Congo

René Nijenhuis

This summer eight people died and 13 were seriously injured while digging for cobalt in the Shinkolobwe uranium mine in the Democratic Republic of Congo (DRC) when their hand-made tunnel collapsed. This accident was just the climax of a string of concerns about child labour, radiation exposure and pollution by heavy metals.

In the DRC, thousands people earn their living from digging with bare hands and simple shovels to extract ore. They live with the constant risk of exposure to toxic and radioactive substances. Moreover they run a high risk of being buried by a collapsing tunnel, security measures being almost non-existent.

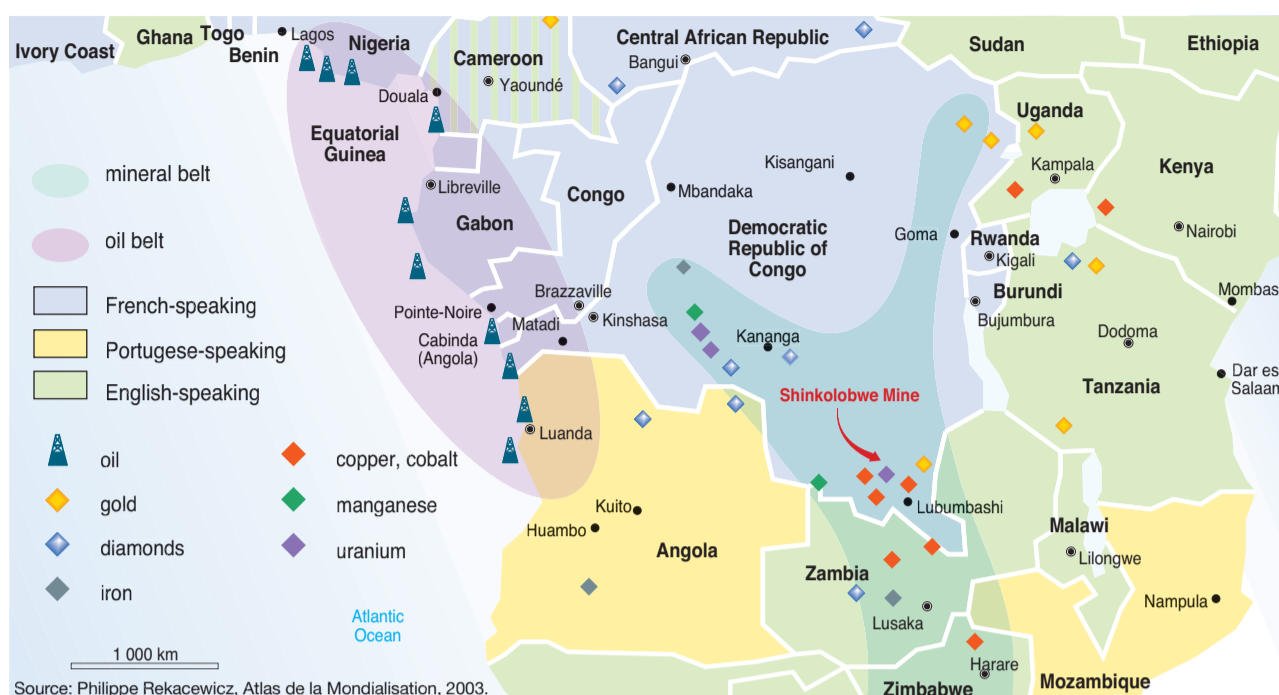
The Shinkolobwe mine first came to international attention as the supplier of the uranium used in the atomic bombs dropped on Nagasaki and Hiroshima in 1945. The mine had been closed for many years, but yielding to increased demand for cobalt the government decided to allow informal digging for cobalt to resume. With no training in safety or mining people started digging in a completely disorganised fashion, ultimately causing one of their tunnels to cave in.

In October 2004 the Joint UNEP/OCHA Environment Unit, the International Atomic Energy Agency, the World Health Organisation and the UN mission in the DRC sent a team of experts in response to a request for international assistance from the Minister of Solidarity and Humanitarian Affairs.

The UN investigation clearly showed that the risk of further collapses was high enough to justify recommending the government close mine. Worse still on-site measurements revealed that workers had very probably been exposed to ionising radiation exceeding international safety standards.

Soil, dust and water samples were analysed for heavy metal content (cobalt, uranium, copper, and nickel). The long term risks associated with heavy metal contamination must be seen in the larger context of the area's poor quality drinking water.

The assessment mission highlighted the close links between poverty, environment and development. Poverty and unemployment in the region will send diggers back to Shinkolobwe, despite being fully aware of the risks incurred. Problems associated with informal co-



Source: Philippe Rekacewicz, Atlas de la Mondialisation, 2003.

balt and copper mining are probably all too common in the mineral-rich province of Katanga. UN experts accordingly recommended setting up an inter-agency working group on informal mining in the province, in partnership with the government.

This relatively minor incident is symptomatic of innumerable other cases in Africa and further afield demanding an integrated approach to prevent human and environmental disaster. The environment is a cross-sectoral issue that is closely enmeshed with poverty. A one-

dimensional solution to the problems at the Shinkolobwe mine would only lead to more of the same elsewhere.

René Nijenhuis is an environmental expert at the Joint UNEP/OCHA Environment Unit in Geneva.



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Legal measures to prevent industrial accidents

Sergiusz Ludwiczak

International treaties

Industrial operations may involve substances that do not usually represent a major threat to our health or environment but are nevertheless potentially hazardous. Industry itself has been trying to make its operations safer, but even the safest plant is never totally risk-free.

In the early 1990s, following industrial accidents at Seveso in Italy and Schweizerhalle in Switzerland, UNECE concentrated on preventing such occurrences and especially their transboundary effects in the region. Its work led to the adoption of the Convention on the Transboundary Effects of Industrial Accidents in 1992.

The convention aims to protect people and the environment against industrial accidents. It seeks to prevent them altogether as much as possible, reduce their frequency and severity, and mitigate their effects. It promotes active international cooperation between contracting parties, before, during and after industrial accidents. Thirty-two UNECE member countries and the European Community are currently parties to the convention.

The Baia Mare industrial accident in Romania in 2000, with severe transboundary effects, demonstrated that operations involving hazardous substances still pose a serious threat to our environment. It also showed that accidental water pollution can have far-reaching transboundary effects even if it occurs far from an international border.

In response to this accident, the international community started negotiations

on a legal instrument on civil liability within the UNECE framework (Industrial Accidents Convention and Water Convention). In 2003 the fifth ministerial conference Environment for Europe, in Kiev, adopted the joint protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters.

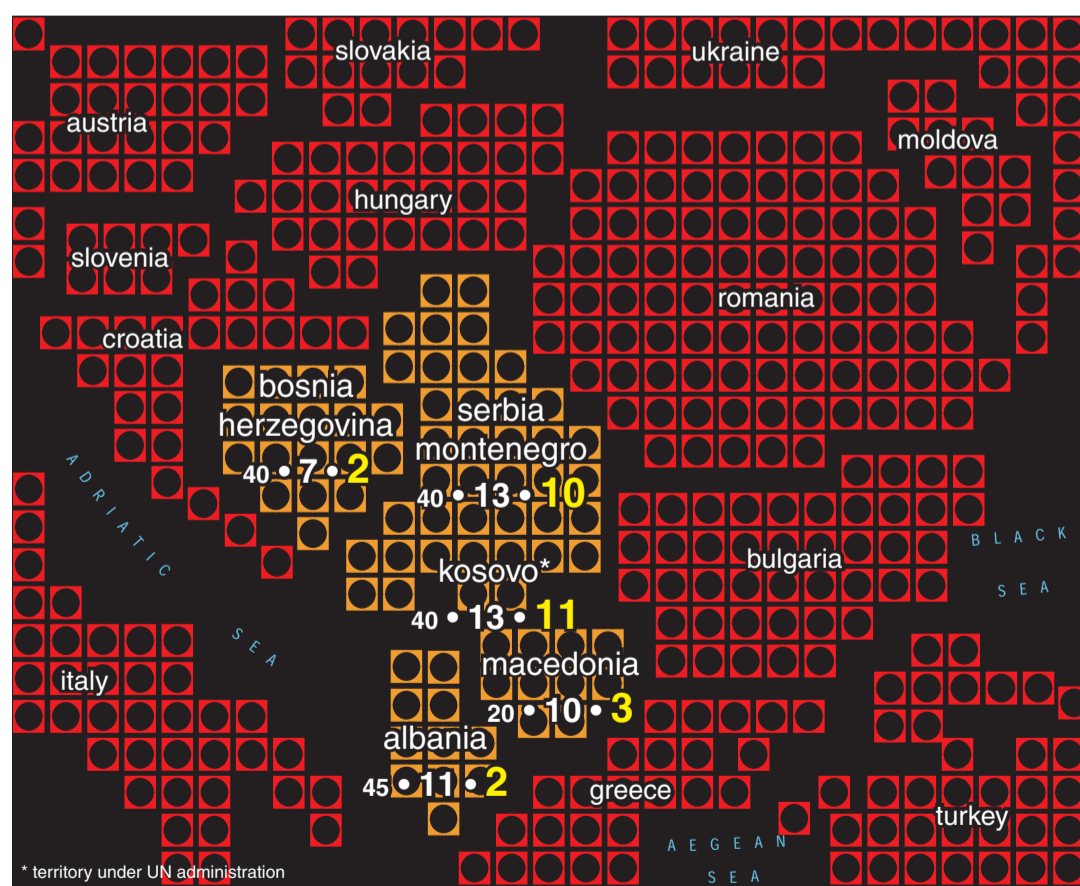
International assistance

The Industrial Accidents Convention imposes concrete obligations on the competent authorities and operators of hazardous installations to prevent, prepare for and respond to industrial accidents. To improve industrial safety and reduce the risk of industrial accidents and their transboundary effects, it is important that all countries of the region fully implement the convention.

This is not yet the case. While implementation of the convention has made good progress in Central and Western Europe, it is proving more difficult in Eastern and South-Eastern Europe, the Caucasus and Central Asia.

An internationally supported assistance programme for these countries is addressing the key obstacles to accession and implementation. Four main things are lacking: an appropriate regulatory and institutional framework; adequate human resources for implementation, monitoring and enforcement; sufficient financial resources; and up-to-date technology.

Sergiusz Ludwiczak is the Secretary to the Industrial Accidents Convention and an environmental affairs officer at the UN Economic Commission for Europe in Geneva.



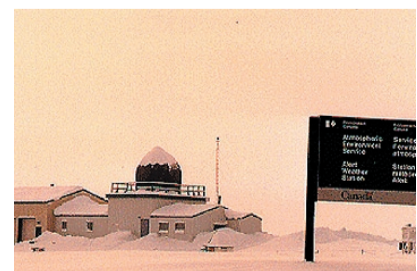
western balkans: how many 'baia mares'?

country name

identified number of sites (mining and processing) **40 • 11 • 10**

total sites concern transboundary risks

source: UNEP OSCE UNDP 2005: Reducing Environment & Security Risks from Mining in South Eastern Europe



ALE - Alert, Canada



ZOBO - Zongo Valley, Bolivia

What (is) a disaster

There is no such thing as a natural disaster. One way of differentiating disasters is their time scale or the duration of their impacts. The most shocking events occur suddenly killing many innocent people in one blow. Sometimes however, their effects can be undone relatively soon after, where as in other cases areas remain unusable for years, if not centuries. Slower processes also bring disasters in their

wake. The most striking example is climate change. Its effects at a local, national and international level demand far greater attention. We will have completed an important step when the Kyoto protocol comes into force in February 2005, an achievement finally made possible when the Russian Federation ratified the protocol in November 2004.

Asking for disaster

Pascal Peduzzi

A man jumps from a skyscraper and as he passes each floor says to himself: "So far so good!" This sums up our short-sighted way of thinking. Our daily lack of concern, let alone action, regarding depletion of natural resources, increasing poverty and poor spatial planning, is a recipe for disaster. We behave carelessly and then we are surprised when things go wrong.

Most disasters are not random events without underlying causes. They are the sudden manifestation of slow but continuous degradation processes. Risks multiply through lack of concern or our failure to find alternatives. For example we cannot put all the blame for the death of 2,750 Haitians on Hurricane Jeanne. The long process of deforestation that preceded it was greeted by deafening media silence. Only after the disaster did USA Today write: "The torrents of water that raged down onto this city, killing hundreds of people, are testimony to a man-made ecological disaster. Poverty has transformed Haiti's once verdant hills into a moonscape of bedrock ravaged by ravines." Would any of the mainstream media have written about Haiti's 98% deforestation rate before Jeanne struck?

Why does slow degradation go unnoticed? Why are we blinded by footage of one disaster flickering across the screen

until the next tragedy takes its place? Our relationship with the media resembles that of a scavenger. The higher the death toll the bigger the audience. Politicians travel to the scene of a disaster and express their concern for families, but once the tragedy is forgotten what happens to the measures needed to prevent the next disaster?

The explosion at the Chernobyl nuclear power station shocked the whole world. But with privatisation of the electrical sector we read more about cutting costs than improving the safety of nuclear reactors. The media reported every detail of the wreck of the Kursk submarine with the loss of 118 sailors. But they say nothing of the dozens of Russian nuclear submarines slowly rusting in the Barents Sea. Much has been written about the crude oil escaping from the wrecks of Prestige and Erika. Yet every day petrol tankers are voluntarily degassing to cut down on cleaning costs, while media and politicians remain largely indifferent. Double-hulls are still not compulsory. Nor is tank cleaning. Overfishing affects 72% of our oceans but no regulations are being drafted for international waters, despite the fact that simple measures – the introduction of nets with a bigger mesh and a ban on bottom trawling – would help to prevent depletion of fish reserves. These are just a few examples of slow degradation of environmental and social systems by humans that may ultimately lead to disaster.

The world's environment ministers made a very clear statement with the UNEP Malmö Ministerial Declaration in May 2000. "Environmental threats resulting from the accelerating trends of urbanisation and the development of megacities, the tremendous risk of climate change, the freshwater crisis and its consequences for food security and the environment, the unsustainable exploitation and depletion of biological resources, drought and desertification, and uncontrolled deforestation, increasing environmental emergencies, the risk to human health and the environment from hazardous chemicals, and land-based sources of pollution, are all issues that need to be addressed."

Common sense dictates that we treat these issues as a top priority. But only sudden events catch our attention. Our societies seem to be led by short-sighted visionaries. There are several reasons for this affliction.

We prefer to avoid trouble. Nobody can be accused of causing tropical cyclones, but it is relatively simple to identify the culprits behind continuous environmental destruction. Government leaders and the senior management of large companies are directly responsible for contamination of rivers by mining, erosion following unsustainable timber exploitation or soils pollution by industry. But to make such accusations against influential people is tricky. Putting the emphasis on natural hazards is a much safer attitude.

We are fascinated with speed, which makes it difficult to make the headlines with continuous degradation. Although the long term impact may be much worse, the media just will not make a week-long issue of the underlying causes of thousands of people dying of starvation. It is an uphill struggle keeping readers' and viewers' attention. The media need rapidly changing events to avoid boring their audience.

With our blinkered vision, security and the fight against terror have monopolised the global debate. Climate change threatens millions of people with more frequent heatwaves, rising sea levels, landslides and more severe storms, among others. But combating it will never attract the same amount of funds.

Our perspective is strictly short-term. To stand a chance of being re-elected politicians must focus on what can be achieved in a four to five-year mandate. Long term issues tend to be sidelined. Our political and economic reflexes prefer quick benefits, leaving the mess to be cleared up later.

We are obsessed with visibility. The media will focus on aid following disasters and government rescue operations. But preventive measures are not attractive enough to make the headlines.

Lastly we imagine natural resources are infinite, so their price does not reflect the cost

of producing such resources. For example there is no such thing as a petrol producer. Bacteria produce petrol. It takes them 200 million years to transform 24.5 tonnes of fern into one litre of crude oil! If we restricted oil consumption to the quantity produced the previous year its price would be stupendous. We can apply the same reasoning to many natural resources.

As long as our main concern is economic growth, we forget that our planet is a finite space in which continuous growth is impossible. We cannot catch more fish than the numbers that hatch each year. The same is true of the trees we cut down. Such unsustainable practices can soon lead to the collapse of entire systems on which a large proportion of the population depends.

We can no longer wait for the next disaster to happen. We urgently need to reduce the impact of our mismanagement on communities and the environment as a whole. It is a huge task but the goal can be achieved. We must stop ongoing degradation of society and the environment by helping all communities to live on sustainable resources. Priority must be given to renewable energy sources and resources, to supporting development, and promoting family planning and education. Only then we will see a significant reduction in risks. Our economy will certainly benefit from this. We cannot afford to postpone investments in our future. Otherwise the bill will just be too high.

Identifying vulnerability

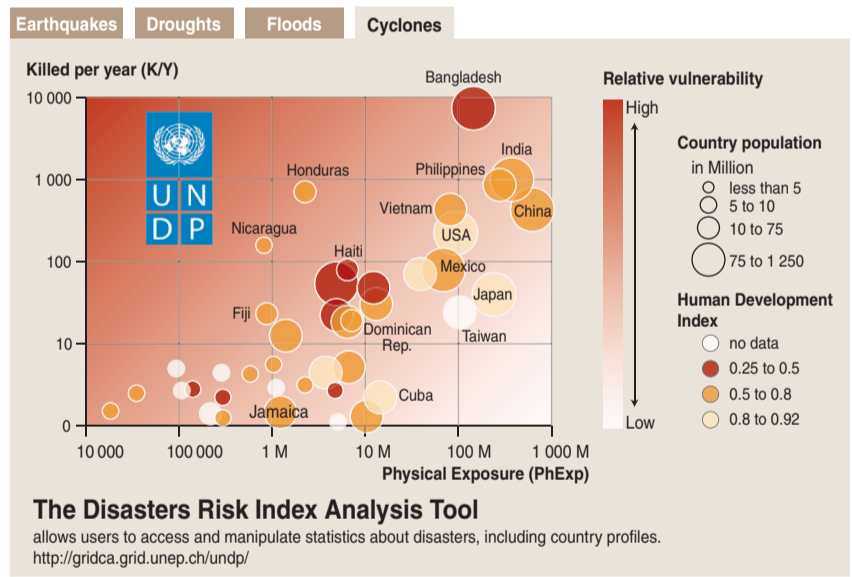
Pablo Ruiz and Pascal Peduzzi

The UNDP report "Reducing Disaster Risk: a Challenge for Development", published in 2004 in collaboration with UNEP, highlighted the link between development and vulnerability. It measured for the first time global exposure to key natural hazards. Today 75% of the world's population lives in areas affected at least once by earthquakes, tropical cyclones, floods or drought between 1980 and 2000. Such events cause more than 180 deaths a day worldwide.

But these disasters are not "acts of God". While only 11% of the people exposed to natural hazards live in low human-development countries, they account for more than 53% of recorded deaths. High human development countries, home to 15% of those exposed, account

for less than 2% of deaths. So the level of human development matters and helps to explain why disasters are not so "natural". Some of the disaster impacts could perhaps be avoided.

So far the international community has mostly reacted to disasters, investing only limited budgets in prevention. This might be because disasters attract more media attention (see article above). Prevention programmes (e.g. sound urban planning, reforestation or capacity building for risk management) will never be as powerful as pictures of disasters. But even if there was a global will to invest in prevention, the next question would be where? A decision of this nature obviously must not be based on media coverage. The floods that killed 2,000 people in India, Nepal and Bangladesh in August 2004, attracted very different media coverage



compared with Hurricane Charley, which claimed 16 victims in Florida. So the Disaster Risk Index (DRI) is a vital first step towards providing decision-makers with more scientific, development-oriented

tools drawing on independent sources, including at national level.

Since the project started new data (on deforestation, armed conflict, corruption)

has become available, with the prospect of new applications for its findings. But some lessons have already been learnt. The DRI may not qualify as a proper early-warning tool, but it has anticipated some disasters. Iran, for example, was the DRI's second most vulnerable country for earthquakes, even before the Bam disaster in 2003. Over and above Small Island Developing State vulnerability to tropical cyclones, the DRI showed that Haiti had "the highest relative vulnerability, perhaps linked to its small economy, degraded environment and weak institutions of governance". Recent floods in May and October (with more than 4,000 fatalities) dramatically confirmed this analysis. Early warning and action are still major challenges in most developing countries.

Pablo Ruiz is a Disaster Programme specialist in the Disaster Reduction Unit at the UNDP Bureau for Crisis Prevention and Recovery in Geneva.

Seismic stations



BAR1 – Barrett Dam, California



GSC1 – Goldston, California



KAAO – Kabul, Afghanistan



KIP1 – Kipapa, Hawaii

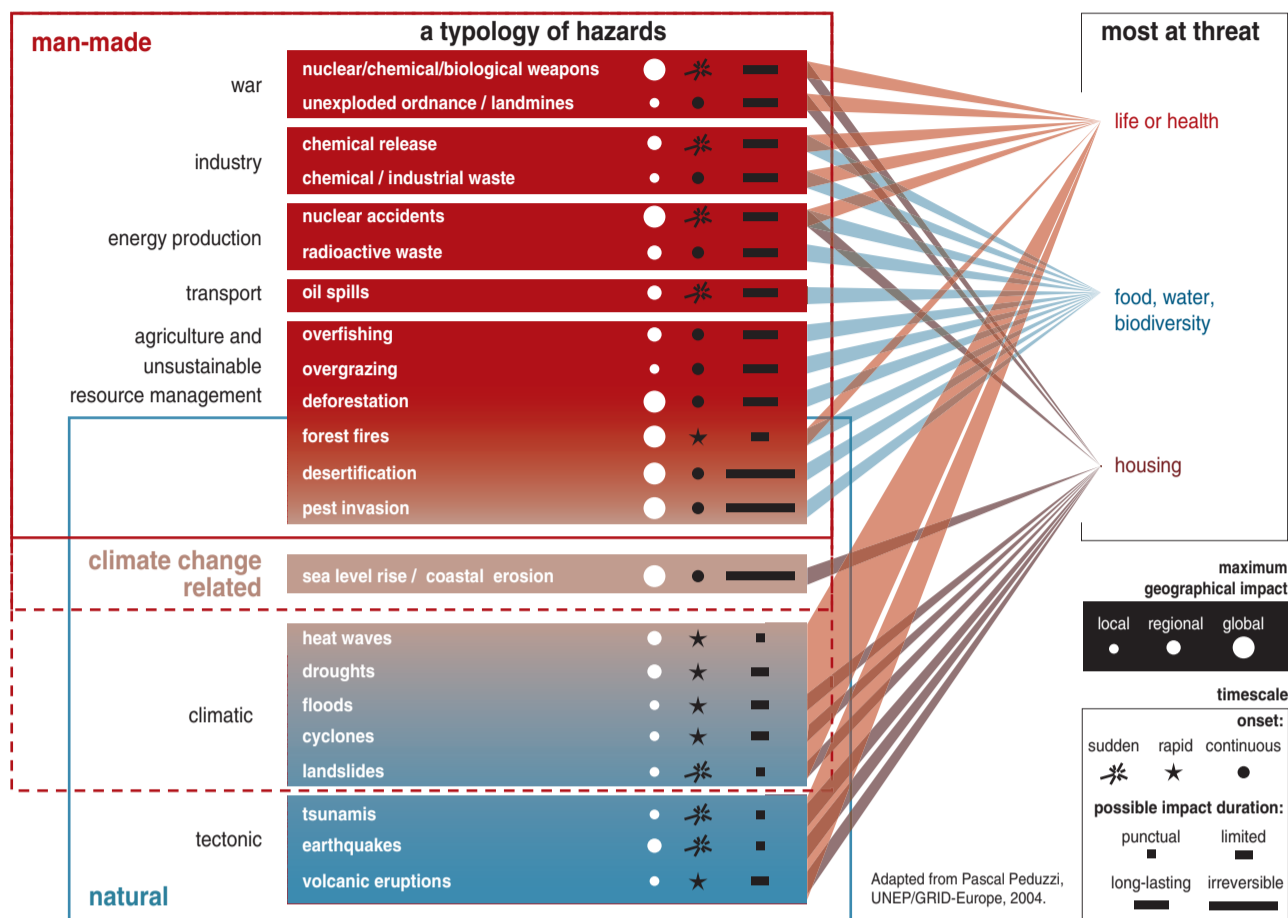


BDF – Brasilia, Brazil

The concept of this picture series was developed by Florian Dombois, the Director of the Institute for Transdisciplinarity at the "Fachhochschule der Künste" in Bern, Switzerland. The stations are all affiliated to the Global Seismographic Network (GSN), comprised of 128 stations that are recognisable by their 3 to 4-letter universal code.

It forms a truly global, operational network of extremely high quality, standardised stations designed to study the structure of the Earth's interior using worldwide recordings of earthquakes, underground explosions and volcanic activity, set up to register disasters.

www.iris.washington.edu/stations/stations.htm
www.hkb.bfn.ch/y



Climate change and disaster reduction

Henning Wuester

The world is witnessing an ever increasing number of natural disasters, with a 68% increase in frequency over the last 10 years, according to the IFRC World Disasters Report for 2004. Drought and famine have proved the deadliest disasters of the decade worldwide, accounting for at least 275,000 deaths since 1994. According to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), climate change is likely to affect the severity, frequency and spatial distribution of extreme climatic events such as hurricanes, storm surges, floods and droughts. IPCC scenarios have linked higher atmospheric concentrations of greenhouse gases, in particular CO₂, to a rise in mean global temperature. This is associated with larger and more abrupt climatic variations resulting in more frequent and increasingly devastating natural disasters.

reducing emissions, improving energy efficiency, creating sinks. The importance of such work preventing long-term increases in disaster risks cannot be underestimated. Greenhouse gas concentrations in the atmosphere urgently need to be stabilised before they reach levels to which it is no longer possible to adapt.

However the climate system is characterised by inertia. The international community must consequently give high priority to adaptation measures, of which disaster reduction is a crucial part. In particular adaptation refers to actions to help communities and ecosystems cope with changing climatic conditions. Reducing vulnerability to climatic hazards today is essential to building future resilience. Mankind needs to significantly strengthen its ability to withstand the adverse effects of current and future natural disasters, likely to be even more severe. Adaptation is necessarily a global issue, but it is particularly relevant to developing countries, as they are likely to be the hardest hit by the effects of climate change.

Mankind faces several huge challenges. We must address the consequences of burning fossil fuels and other greenhouse gas-emitting activities. We need substantially to reduce greenhouse gas emissions. We also have to adapt to changed and often threatening environmental conditions. Nor is there any way of putting the clock back. Urgent action to mitigate climate change and its effects, at local, national and international level is required.

Both adaptation and risk reduction strategies must focus on raising the adaptive capacity of the most vulnerable groups, including small-island developing states and least developed countries. Current strategies include capacity-building to manage climate risks, disseminating traditional coping mechanisms such as disaster-resistant housing and enhancing the development of private sector financial risk-sharing mechanisms, particularly micro-insurance, insurance and reinsurance, for vulnerable populations and communities.

Eventually adaptation to climate change and disaster reduction efforts need to be mainstreamed into national and sectoral policies, programmes and plans to ensure adequate funding and effectiveness. The global community has a responsibility to raise its capacity to deal with the adverse effects of climate change and natural disasters.

Henning Wuester is the special assistant to the Executive Secretary of the Secretariat of the UN Framework Convention on Climate Change in Bonn.

Is climate change increasing the frequency of hazardous events?

Pascal Peduzzi

With growing population and infrastructures the world's exposure to natural hazards is inevitably increasing. This is particularly true as the strongest population growth is located in coastal areas (with greater exposure to floods, cyclones and tidal waves). To make matters worse any land remaining available for urban growth is generally risk-prone, for instance flood plains or steep slopes subject to landslides. The statistics in the graph opposite reveal an exponential increase in disasters. This raises several questions. Is the increase due to a significant improvement in access to information? What part does population growth and infrastructure development play? Finally, is climate change behind the increasing frequency of natural hazards?

be influenced by climate trends we may take them as a benchmark. If we look at data from EM-Dat¹, the only publicly available global database on the impact of hazards on humans, we can see that the occurrence of reported earthquakes is increasing along similar lines to other hazards. The increase is certainly exponential but mainly due to a significant improvement in access to information worldwide. How, the reader may ask, do we know that?

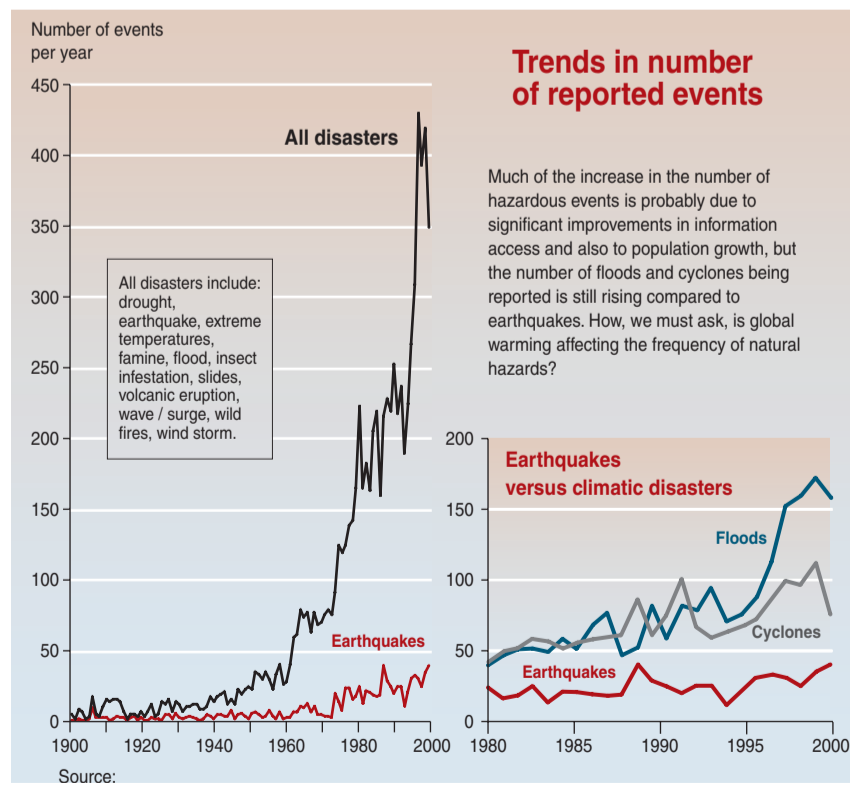
The number of earthquakes (of sufficient magnitude to register on a seismograph) that hit populated areas has not increased. On the contrary it is steady. But EM-DAT only reported some of them. In the 1970s only 11% of earthquakes affecting human settlements were reported. The figure for the 1980-92 period increased sharply reaching 25%. It carried on rising, to 31%, for 1993-2003. Demographic factors cannot explain the sudden increase

in reporting. The most logical explanation is the tremendous improvement in information technology. By the end of the 1970s the media had achieved global coverage. For the first time television channels broadcast live coverage of a war (in Vietnam). Before 1980 only places with a powerful information network supplied data on events involving natural hazards and only major disasters were likely to be reported.

The second sharp increase appears in the mid-1990s (circa 1995). The emergence of the internet as a global means of information access immediately springs to mind. But we cannot rule out the impact of climate change on the frequency of hazardous events. The small graph shows that though the number of reported earthquakes is very steady (with an annual range of 20 to 40 events), the number of reported floods and cyclones increases dramatically over time (a correlation of R₂ = 0.81 and 0.64 respectively, compared with 0.25 for earthquakes). If the flow of information was increasing the number of reported earthquakes would be increasing too. But if tectonic events are steady and climatic events on the increase, there is cause for serious concern about the impacts of climate change on the frequency of associated hazards.

If the scientists can demonstrate that global warming is causing higher casualty rates then countries facing higher risks may decide to sue the largest CO₂ producers to cover the extra cost of adaptation. It is equally possible that families of the victims of tropical cyclones may sue them for gross negligence. The failure to introduce measures to combat global warming may rebound, with victims sending in the bill much as they did in the United States when they took the tobacco industry to court.

1. EM-Dat, created in 1988 by the Centre for Research on the Epidemiology of Disasters (CRED) at the university of Louvain (Belgium)



The precautionary principle 1896-2000

The last 100 years have seen many health and environmental hazards and numerous disasters resulting from scientific and industrial developments. This report sets out to discover what lessons we can learn for the future from some of the most spectacular failures of the past. It presents 14 detailed accounts of occupational, public and environmental hazards, such as asbestos, PCBs, the damage to the ozone layer, the collapse of fish stocks, radiation and "mad cow" disease. The editors provide illuminating introductory and concluding chapters to this study of the concept and application of the precautionary principle, and of its capacity for averting the potentially far graver risks we face in the coming century.

reports.eea.eu.int/environmental_issue_report_2001_22/en



A variety of factors are usually involved when an event caused by a natural hazard turns into a disaster for people or the environment. What are the roles of the various players? How do institutions adapt to new situations? What influences the

angle the media take in reporting disasters? On the following pages, we take a theoretical approach to shed light on the interrelation between the various factors that contribute to a disaster.

Maladaptive behaviour and disaster risk management

Randolph Kent

Rapid change and complexity will be the hallmarks of the 21st century. In many respects these will be driven by scientific and technological change, that will profoundly affect the global economy and environment, as well as demographic trends and political and security structures in most parts of the world. An unintended consequence may be an exponential rise in human exposure to disasters and emergencies. Such humanitarian crises may in no small part be due to planners' inability to anticipate potential hazards and appreciate their significance, and to decision-makers' inability to reconcile competing demands for resources.

Many of the psychological and institutional constraints that currently hamper or inhibit sensitive and effective planning and decision-making may well have more serious consequences for an ever growing proportion of the globe in the future. Psychological dynamics at individual and group levels may continue to distort information flows, influencing in turn responses to potential risks and hazards. Institutional behaviour may all too often prompt responses to potential or actual humanitarian crises that reflect standard operating procedures, institutional interests and linear thinking. Inter-organisational behaviour patterns may similarly reflect the interests, perspectives and survival instincts of the organisation rather than more rational and less self-serving objectives. And decision-makers will most likely feel compelled to deal with the contending interests that they must reconcile in ways that reflect short-term compromises rather than a longer-term vision.

In that sense, one inevitably must wonder whether there exists within policy planning and decision-making communities sufficient capacity to adapt proactively to rapid change and complexity. One may also query the extent to which planners and decision-makers can be expected to anticipate and address the broad range of potential outcomes that might arise out of any single set of trends, plan or decision. In other words, borrowing the example so often used in explanations about "dynamical-systems theory", to what extent can one be expected to anticipate and deal with the consequences of the turbulence initially caused by a seemingly small event eventually intertwining with larger ones?

The 1999 earthquake in Taiwan underscores the point. It was not only costly in terms of life and property on the spot, but also disrupted economies as distant as California, where electronic industries ground to a halt for lack of essential components normally supplied by Taiwan firms. The quake also highlighted the need for a more holistic and integrated approach to the prospective dangers arising out of random and haphazard growth along the Pacific rim. Planners nevertheless seem to ignore the potentially catastrophic consequences of allowing large concentrations of people, economic activities and complex infrastructures to squeeze into such areas. Little attempt seems to have been made to "retrofit" societies, distributing populations, industries and infrastructures in ways that would diffuse the impact of over-concentration.

A 1999 earthquake in Taiwan underscores the point. In this instance, the disaster was not only costly in terms of life and property in Taiwan, but it also disrupted economies as distant as that of San Jose, California, where electronic industries ground to a halt due to a lack of essential components normally supplied by Taiwanese companies. In the immediate term, the earthquake revealed an interesting [if not totally unforeseen] dimension of globalisation: the economic vulnerability of Californian workers – in the form of large-scale layoffs – to an event thousands of miles away. However, from a longer term perspective it served as a poignant warning of the need for a more holistic and integrated approach to dealing with the prospective dangers arising out of random and haphazard growth along the Pacific rim.

This was the central issue at a 2001 conference – entitled "Crowding the Rim" – at Stanford University, California. Geologists and disaster mitigation and relief experts assessed the possible effects of various natural disasters, including earthquakes and volcanic eruptions, on the Pacific Rim – also known as "the ring of fire", extending from Lima through Los Angeles, Seattle, Anchorage, Tokyo and Taipei.

This region contains an extraordinary array of transportation, communication and economic nodes...These nodes, rapidly growing along with the human population of the Rim, lie on a map that features high seismic and volcanic activity, along with coastal mountains that are

vulnerable to landslides and the heavy precipitation that causes them².

As one eminent analyst noted, "The linkages that we have built to connect the US west coast and Asia are all vulnerable to 'echo' disruptions of this kind, and much larger and devastating earthquakes are in prospect for Seattle and San Francisco"³. Despite this increasingly apparent threat, however, planners seem to ignore the potentially catastrophic consequences of allowing large concentrations of people, economic activities and complex infrastructures to squeeze into such areas. Little attempt seems to have been made up to that point to "retrofit" societies in order to distribute populations, industries and infrastructures in ways that would diffuse the impact of over-concentration.

The adaptive organisation will always be concerned with one fundamental question: to what extent could it adjust to the alternative environments that contending scenarios pose for the organisation? Unfortunately most organisations – even many of those that go through scenario development exercises – rarely try and answer that question. One reason is that little value is placed on speculation as a core organisational activity.

All too many humanitarian organisations, be they multilateral, bilateral or non-governmental, regard speculation as "a bit academic." The idea that core organisational time could be devoted to reflecting on the "maybes" and "the-what-ifs" is anathema to most in the humanitarian sector, who all too often pride themselves on their practical and pragmatic approach to the world around them.

This is not to suggest that strategy-making and policy formulation – in so far as they, too, involve speculation – are not regarded as of institutional value. Yet, if one looks at most humanitarian organisations, there is a bifurcation in which policy, programmes and projects run along parallel lines, rarely intersecting ... except at conferences and seminars. The bifurcation narrows though as policy becomes more tactical and less strategic in conception. In other words, the more policy steps outside the bounds of convention, the less it actually is seen as relating to the needs, and, hence, behaviour of the organisation.

Effective speculation forces the organisation to look outside its own narrow con-

finer. It actively seeks to search for new ways of thinking about old problems, and to anticipate new issues with which the organisation should become engaged. The problem for most organisations is that speculation can be very disruptive, challenging organisational self-images and standard operating procedures. Yet to be an organisation that is sensitive to the dynamics of complexity and rapid change, speculation is vital.

Raising awareness through scenario development and speculation is useful to ensure that the organisation has opportunities to think not only beyond the immediate but also beyond the all too conventional present. The challenge in using either or both is how far they feed back into organisational adaptation. Two tests are worth considering. The first is how closely the organisation's present strategies and policies are aligned with its programmes and projects. The second is the extent to which there are a series of institutional adjustments that the organisation might be willing to make. Both tests have certain basic maxims to follow.

A simple way to determine the fit between policy and programmes is to evaluate a sample number of programmes and related projects to assess how they reflect broader organisational strategic and policy values. Another way is to ascertain the frequency with which those responsible for an organisation's strategy and policies meet with those responsible for programme and policy formulation; and the extent to which these interactions are reflected in the organisation's activities on the ground and vice versa.

Based upon preliminary findings with international non-governmental organisations, there seems to be considerable disconnection at all three levels. In part this suggests that the value of speculation and conceptual innovation is frequently discarded as one continues to implement routine and "organisationally comfortable" programmes and projects.

There is an extensive array of adjustments that the organisation can make to close the gap between innovative and conceptually challenging strategies, and programmes and projects. Among other things they are designed to make the organisation more adaptive to its present and changing operating environment. A few examples encapsulate at least the spirit though by no means the full range of approaches that should be considered:

- develop cross-systems organisations, or "exploration competencies," enabling the organisation to harvest ideas and expertise from a wide array of sources – in and outside the organisation. Adaptive organisations will need to develop open information and communication linkages with new types of partners, institutionally as well as geographically;

- reduce the impact of unanticipated strategic options to ensure that those responsible for strategic planning and policy formulation are communicating regularly so that "the future" fits into a pattern of events that will not come as a surprise to decision-makers;

- eliminate functions that create unnecessary closure. A starting point is to assess the various types and levels of pressure that determine why and when decisions are taken. Too little time in the humanitarian world is devoted to communicating with vulnerable communities and understanding indigenous distribution systems and coping mechanisms. This failure largely reflects a concession to administrative and other organisational pressures that have little to do with the organisation's purported aims;

- communicate the centrality of speculation. Management must ensure that everyone knows that the organisation values long-range strategic analysis and planning, considering it a part of its ethos. Management will find ways to foster that ethos, such as promoting knowledge networks and communities of practice.

Enhancing the adaptive capacities of organisations responsible for disaster risk management is by no means the only answer to mitigate the causes and consequences of disaster hazards. But it is a crucial one. Unless participants make a concerted effort to promote greater organisational adaptivity, all the WCDR's well meaning intentions will succumb to the maladaptive behaviour of conventional organisations.

Randolph Kent is a Senior Research Fellow at the International Policy Institute at Kings College, London.

1. This so-called "butterfly effect" is well explained in Gleick, J., *Chaos: the amazing science of the unpredictable*, Vintage Books, London, 1998, p.23 ff
2. Kennedy, D., "Science Terrorism and Natural Disasters", *Science*, vol. 295, No. 5554, 18 January 2002, p.405
3. *ibid*, p.405

Where death really counts

Richard Adams

The satirical US magazine *Spy*, during its heyday at the end of the 1980s, ran a regular feature calculating the space the New York Times would devote to a tragedy. The greater the number of dead US citizens and the closer they were to Times Square, the calculation predicted, the more column inches the Times would devote to it.

Every month or so, *Spy* would compare its prediction with the actual coverage, and voila! the algorithm was proved correct - so a murder on Fifth Avenue was worth hundreds of African famine victims. British newspapers have never been quite so parochial but clever mathematicians might bend their minds to creating similar arithmetic for British media.

Designing such a calculation is going to be harder. Based on the relative coverage of the flooding in Bangladesh last July

and the hurricane in Florida last August, it's not just proximity or the presence of Britons that makes the difference. There's something else going on, something that's harder to put into figures. Xenophobia is one thing, but how does an equation account for skin colour?

Obviously, things that happen in Britain are going to be more extensively covered. Flash-flooding in Cornwall rightly gets rolling news coverage. But how can we explain the huge discrepancy between the space and effort devoted to Hurricane Charley in Florida, and the flooding in Bangladesh? Obviously, one place is a long-haul flight away, is regularly prone to natural disasters and political unrest, and many of the residents belong to a foreign culture and do not speak English - yes, that's Florida.

Bangladesh, on the other hand, was a British colony up until 1947, is still a

member of the Commonwealth and has a large number of its citizens living in the UK, as well as many other cultural and financial links. Yet all that counts for little when weighed against the key issue: Bangladesh is not home to Disneyworld.

It may have an ancient culture dating back thousands of years but it does not have Disneyworld. So when people see "breaking news" with warnings of titanic floods in Bangladesh, followed by live footage of the looming disaster, they do not think: "Oh no, I wonder if this will affect the beautiful 18th century Kantaji Temple in Dinajpur." But when they see storm warnings about Florida, they worry about a theme park built on a swamp by a rightwing weirdo. Of course there were no "breaking news" flashes or breathless live coverage of the impending disaster in Bangladesh. In fact the number of British correspondents there is very small indeed, whereas one can

barely spit in the US without hitting a British journalist.

Given that the US is the world's economic and military superpower, it's no surprise that that it gets more coverage. But Bangladesh is a country of 140 million, mainly Muslims, making it rather important. It is also the world's No 1 contributor to UN peacekeeping missions, and has a vital role to play in world affairs, given that it sits right by India and China, the likely powerhouses of the future.

It's no good saying that Bangladesh is always getting hit by floods, since Florida is always getting hit by hurricanes. Just on raw statistics alone, Florida should barely get a mention. The floods in India, Nepal and Bangladesh caused a death toll of nearly 2,000. Nearly half of those occurred in Bangladesh, where more than 30 million people have been affected by homelessness and disease.

In Florida the death toll was 16 - yet by Monday Britain's newspapers had carried 19,000 words in six days of coverage. In a month since the flooding in Bangladesh began, only 9,000 words were carried. The easy conclusion is that people in Florida are white and speak English (except that lots of them are Latin and speak Spanish) while Bangladeshis are neither white nor English-speaking.

But it's worse than that. The only time Bangladesh even gets a mention on the news here is when there's a deadly flood. The media are caught in a cleft stick, that the only way developing countries get coverage is in a manner that does serious harm to our perception of them. The more that is written about floods and disasters, the less we take places such as Bangladesh seriously.

Richard Adams is a leader-writer for the Guardian. This article was first published by the Guardian on August 20, 2004. Copyright Guardian Newspapers Limited 2004.

Escape Vehicles



The "Escape Vehicles" are the work by the artist Andrea Zittel. These small "living units" represent in a way mankind's desire of security and safety. A well protected (individual) space far away from the smaller and larger disasters of everyday life.

www.zittel.org

The vulnerability of cities

Mark Pelling

On 10 July 2000, a mountain of solid waste collapsed at Payatas, the main rubbish site in the city of Manila, in the Philippines. It killed 300 people. The story of Payatas tells us much about what makes cities dangerous places and how this danger can be abated. The hazard came from a combination of bad weather (heavy rainfall) and bad management. Vulnerability was present in the 300,000 people who found Payatas to be the only place they could live and work, relying on rubbish recycling for their family livelihoods. But resilience can also be found in this disaster. The Philippines has a strong tradition of civil society and legal system, the residents of Payatas organised, and with the help of human rights lawyers, set about suing for compensatory and moral damages.

Cities have long been seen as places of refuge at times of drought or flood in the countryside. But the rapid expansion of urban populations and worsening economic inequality has shifted the balance of disaster risk from rural to urban (sometime around 2000–2010 the global population became predominantly urban). Life in cities tends to be more dangerous than rural life. People have to survive in a money economy, may be more socially isolated than in rural communities and have to contend everyday with many economic and social as well as environmental hazards. However this need not be the case. Urban hazard and vulnerability are not givens but the product of inadequate access to basic urban services, of economic and political inequality and of poor governance.

Urbanisation has changed the personality of disaster risk. Cities have become 'crucibles of risk'. There are complicated and concentrated interdependencies between infrastructure, transport networks and peoples' lives which mean that small

events can have large knock-on effects in the city. All the more so if city infrastructure has neither spare capacity nor overlapping functions in its design. In such situations a local landslide or flood that closes a small section of road or railway can lead to massive downstream disruption in the urban economy. One measure of a city's resilience is its flexibility to cope with closures in elements of its infrastructure networks be this health care, education or transport.

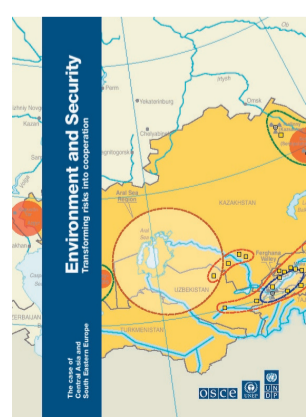
For individuals as well as the city as a whole, inadequate building construction and planning are the most important contributing factors to urban disaster deaths. The 30,000 deaths in December 1999 caused by landslides in Venezuela or the 43,000 deaths in Bam, Iran could all have been significantly reduced. In Venezuela poverty forced people to live on steep slopes and in Iran housing had not been retrofitted despite the high earthquake risk. These examples point to the more fundamental challenge to urban disaster risk reduction – urban governance. Planning guidelines and hazard maps are of little use if they are circumvented or ignored. The deaths in Venezuela and Iran were a wake-up call. We need new ways of making disaster preparedness and hazard prevention a core concern of urban planning. This is quite a challenge, for some cities more than 50% of the population lives and works outside of formal planning control. How can we hope to reduce urban risk when city authorities often do not have the resources to fully map let alone respond to the needs of more than half their residents?

The answer, or part of it, lies in expanding the scope of urban governance. Inclusive governance can bring together the energies, knowledge and resources of civil society as well as the public and private sectors. There are dangers in partnerships. It is important that vested inter-

ests do not have undue influence, and that the vulnerable and economically poor do not have additional burdens for risk reduction dumped upon them. But there are examples where partnerships have led to increased security. In the neighbourhood of Los Manguitos in Santo Domingo, in the Dominican Republic, six community organisations and a local nongovernmental organisation called IDDI have worked together to build a local garbage collection service. The process of building this community strengthened business ties between the various groups involved. During Hurricane Georges in 1998 around 200 households were damaged in Los Manguitos, however community members organised the evacuation of vulnerable households and helped meet basic needs for a week after the event when outside agencies arrived.

Local or municipal government is perhaps the most critical actor in urban governance. Only local government can act as a facilitator between local communities and the state, between civil society and the private sector. Most importantly it is only local government that is elected and can represent the diverse communities of the city. In recent years it has not been fashionable for donors or national government to support local government but the tide here is turning and real opportunities exist for building imaginative urban development policy centred around inclusive governance. The experiences of Los Manguitos and Payatas show how important good governance is to urban risk reduction.

Mark Pelling is the Senior Lecturer at the Department of Geography of King's College, University of London and the author of *The Vulnerability of Cities: natural disasters and social resilience*, Earthscan, London, 2003.



Environment and Security

The Environment and Security (ENVSEC) Initiative, launched in May 2003, is run jointly by UNEP, UNDP and OSCE in the southern Caucasus, south-eastern Europe and Central Asia. ENVSEC both assesses the potential contribution of environmental factors to conflict and promotes the use of environmental management as a strategy for reducing insecurity. Governments, academia and civil society meet to map, discuss, investigate and do cross-border field work to visualise, prioritise and draw the attention of politicians and people to high-risk hotspots with important linkages between environment and security. The priorities identified and agreed by all partners are subsequently addressed one by one with targeted activities. These include enabling societies to deal with the issues by strengthening institutions, catalysing integration of environmental policy with conflict prevention and peace-building, and supporting clean-up operations.

www.iisd.org/natres/security/envsec

Deconstructing disasters

Erin Bohensky

What is a disaster? The simple definition is a sudden, devastating, and sometimes surprising event or misfortune. A more comprehensive explanation of a disaster is that: first, it typically follows a prolonged phase of inappropriate action or inaction, often due to a lack of awareness of the underlying drivers of the problem that spirals toward its ultimate disastrous conclusion; second, it is rarely the result of a single management failure or an environmental change, but rather an interaction of the two; third, the victims of disasters frequently lack options for responding to their situation.

Improved disaster prevention and preparedness requires a greater awareness of how disasters arise, and an expanded set of response options. A recent analysis of people's responses to ecosystem change by the Southern African Millennium Ecosystem Assessment (SAfMA) (1), part of a global initiative to evaluate the relationships between ecosystem services and human well-being at multiple scales, offers a few lessons for making responses more robust to the uncertain future of this region in transition, which also apply to the anticipation and mitigation of disasters.

Disasters are elements of complex systems, in which people and their environment are linked. Complex systems repeatedly give rise to several problems. First, because complexity is daunting, people tend to simplify the complex world they inhabit. People (whether scientists, managers, or resource users) break problems down to cope with them, but then don't restore the pieces to their former whole. They act without considering the full consequences of their actions. A second problem is that managing complex systems often requires trade-offs that favour different sectors of society. Southern African ecosystems, like others throughout the world, have historically been managed within the context of individual economic sectors, which tends to obscure the trade-offs between them. Third, people and societies impose social or political levels of organisation and time frames on ecosystem processes, which usually operate at very different spatial and temporal scales. This can cause a mismatch between ecosystem and management processes, as evidenced in the design of many southern African protected areas that have truncated wildlife migration routes at national borders. Last but not least, because understanding of complex systems is poor, decision-making must contend with partial, uncertain, or incorrect information, and with mental models, which are influenced not only by available information, but also by the powerful forces of interpretation and persuasion.

What makes this behaviour especially dangerous is that it disregards the critical thresholds that characterise complex systems. Changes in complex systems are often non-linear; thus, an abrupt or extreme change is not always possible to anticipate, and seemingly small incremental changes can have massive effects. We typically have no idea where these critical thresholds are or how close we are to them. When we fail to observe or fully understand the interconnectivity of different parts of the whole system, we miss the big picture and increase our vulnerability to disasters.

The design of institutions and policies is crucial to mediating disasters, and three aspects are particularly important. The first is that institutions and policies must be scale-appropriate, yet collectively extend over multiple scales; complementarity and communication between institutions are key. Disasters often occur at the intersection of processes occurring at different scales – climate change, a policy change, and a change in local land use, for example. They also tend to emerge when responses to problems at one scale ignore those happening at others. In southern Africa, numerous large-scale government interventions during past decades that

were designed to improve ecosystem service delivery compromised local capacity to deal with unexpected events, because local knowledge that could have been tapped to monitor important variables was not transmitted to higher levels of decision-making. This is beginning to change in southern Africa, particularly in the water sector, which is striving to implement new institutional arrangements which entail multi-subsidiarity: local organisations, catchment management agencies, river basin organisations, and national ministries will collectively work towards a shared vision of equitable, efficient, and sustainable water use.

Second, institutions and policies must ensure that feedback allows information to flow freely between scales and sectors. Feedback is essential to self-evaluation – it tells us how well or poorly we are doing our job. Too often, however, feedback is dampened or lost. Agricultural subsidies, for example, suppress natural feedback because they distort perceptions about the true costs of food production. This encourages dependency, which can thwart the restoration of natural feedback. The South African government has now begun to phase out agricultural and irrigation subsidies, but has had to make special provisions for some emerging farmers and communities for whom farming would not be economically viable otherwise.

Third, institutions and policies need to go deeper and address the causes of disasters, and not just treat their symptoms. While many disasters have the potential to inspire a positive change in management, the opportunity is frequently foregone. It is simpler and less costly, in the short term, for a managing authority to make it look like it's doing "something", even if that something is bound to set the stage for a repeat performance. When a drought strikes in southern Africa, water use restrictions may be imposed on more affluent consumers to reduce domestic consumption, but are lifted as soon as the first raindrop falls. Rather than create an opportunity to change attitudes towards water use, this practice allows people to revert to their previous behaviour of wasting water that they believe is abundant.

Perhaps most importantly, institutions need to adopt a longer-term perspective on disasters. Scenario planning is a structured way to stimulate dialogue about alternative, plausible pathways to the future. Scenarios can be a useful tool to improve understanding of disasters because they force us to identify the slow variables that drive the system – the ones most likely to catch us off-guard because we are not watching them carefully. When conducted with a broad group of stakeholders, scenarios can also help diverse or conflicting groups to reach consensus on difficult issues. To envision possible futures for southern African ecosystems, SAfMA employed several approaches to produce and communicate scenarios, including adaptation of existing scenarios, stakeholder workshops, and community theatre. Indeed, the communication process was often fundamental to the success of the exercise.

Greater effort needs to be made to understand the broader contexts in which disasters strike, and to designing institutions and policies that can capture this understanding. Disasters can be opportunities to learn from past actions, serve as a wake-up call for positive change, and provide a clean slate on which a system can reorganise more sustainably. However, a disaster that is not well managed tends to self-perpetuate, bringing much destruction and devastation before benefits for learning can be realised.

Erin Bohensky is a Ph.D. student in the Centre for Environmental Studies, University of Pretoria, South Africa. This article is based on the work of the Southern African Millennium Ecosystem Assessment (SAfMA), which was completed this year.

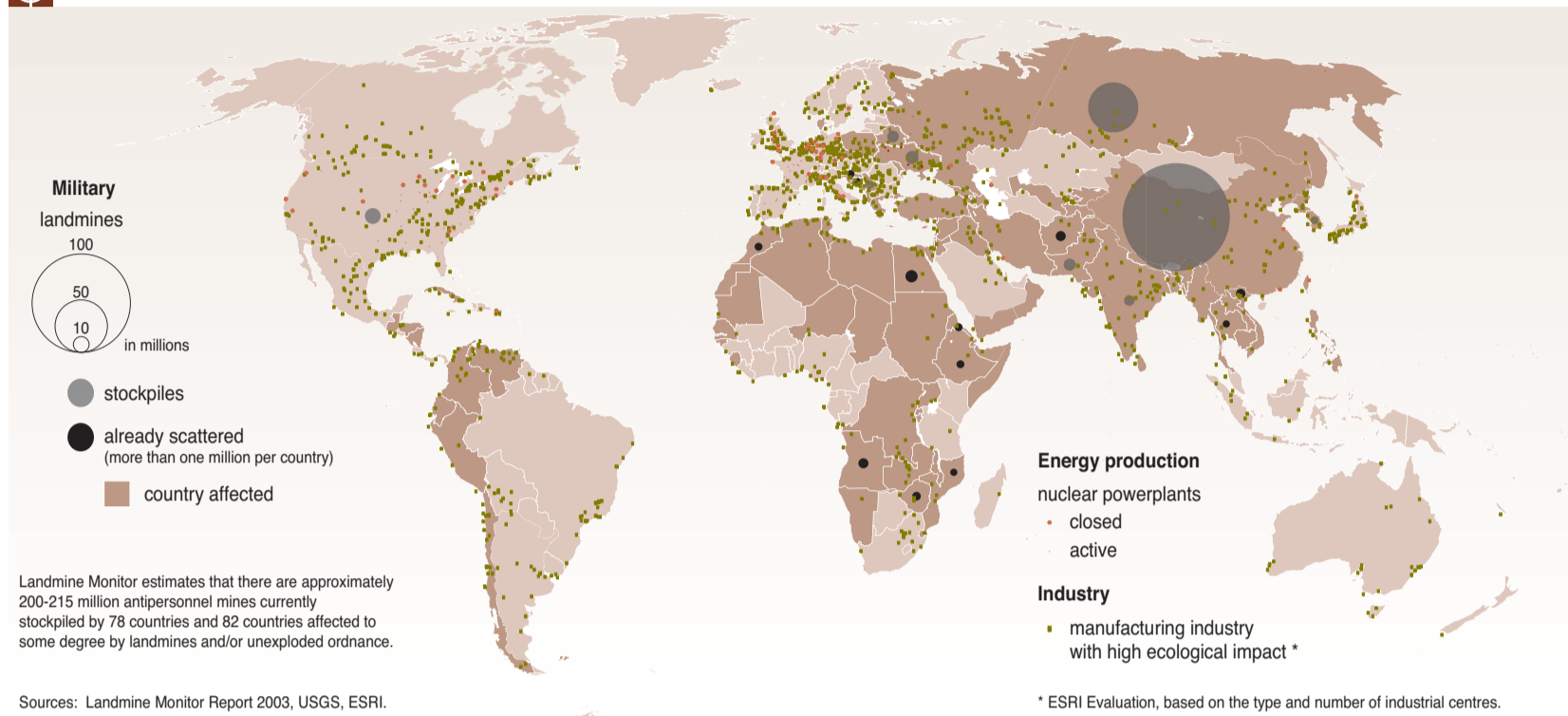
Fragilised environments

Some places are more prone to disaster than others. But what does it take to turn a cyclone into a disaster in one place and just a climatic event somewhere else?

The main reasons are obvious enough. Economically deprived people living in shacks are more likely to suffer from any calamity. Rich countries may have more to lose financially, but they also have more resources for anticipating hazards. There

are many ways of determining vulnerability, apart from economic factors: previous environmental damage leaving barren land, nearby industrial sites aggravating a hazard's potential, poor social organisation and transparency, shortage of key resources, etc. Whatever you focus on, developing countries seem – predictably – to be the most frequent and most vulnerable victims of disasters.

potential POWDER KEGS



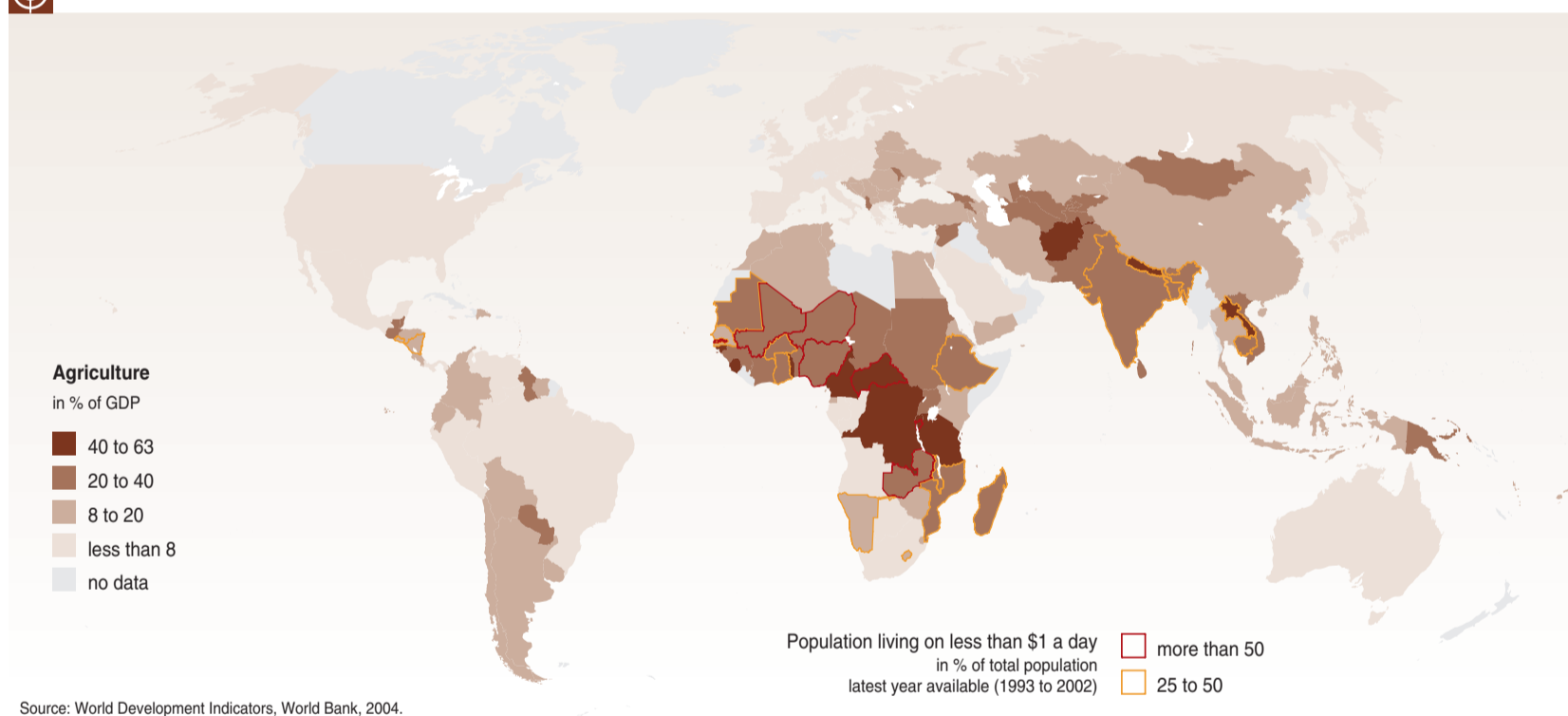
The planet is scattered with hazardous or explosive leftovers from a succession of technical breakthroughs – be they military or industrial – just waiting to be washed away by a flood or mudslide or carried off by a hurricane.

If disaster strikes these “powder kegs” multiply the danger to people and the environment (posing a particularly acute threat to already scarce water resources).

Not all industries are potential powder kegs. But many by-products and effluents can be hazardous, and storage may also pose problems. The following sectors are a source of potential concern: chemicals (including pesticide stockpiles); mining (tailings being the prime concern); arms and energy production (oil, gas and nuclear).

Literal powder kegs exist in numerous countries in the form of unexploded ordnance, a missile on a mountain side in Afghanistan for example, bombs dropped in World War II that are still found occasionally, landmines that turn vast areas of previously fertile agricultural land into unusable zones.

Economies AT RISK

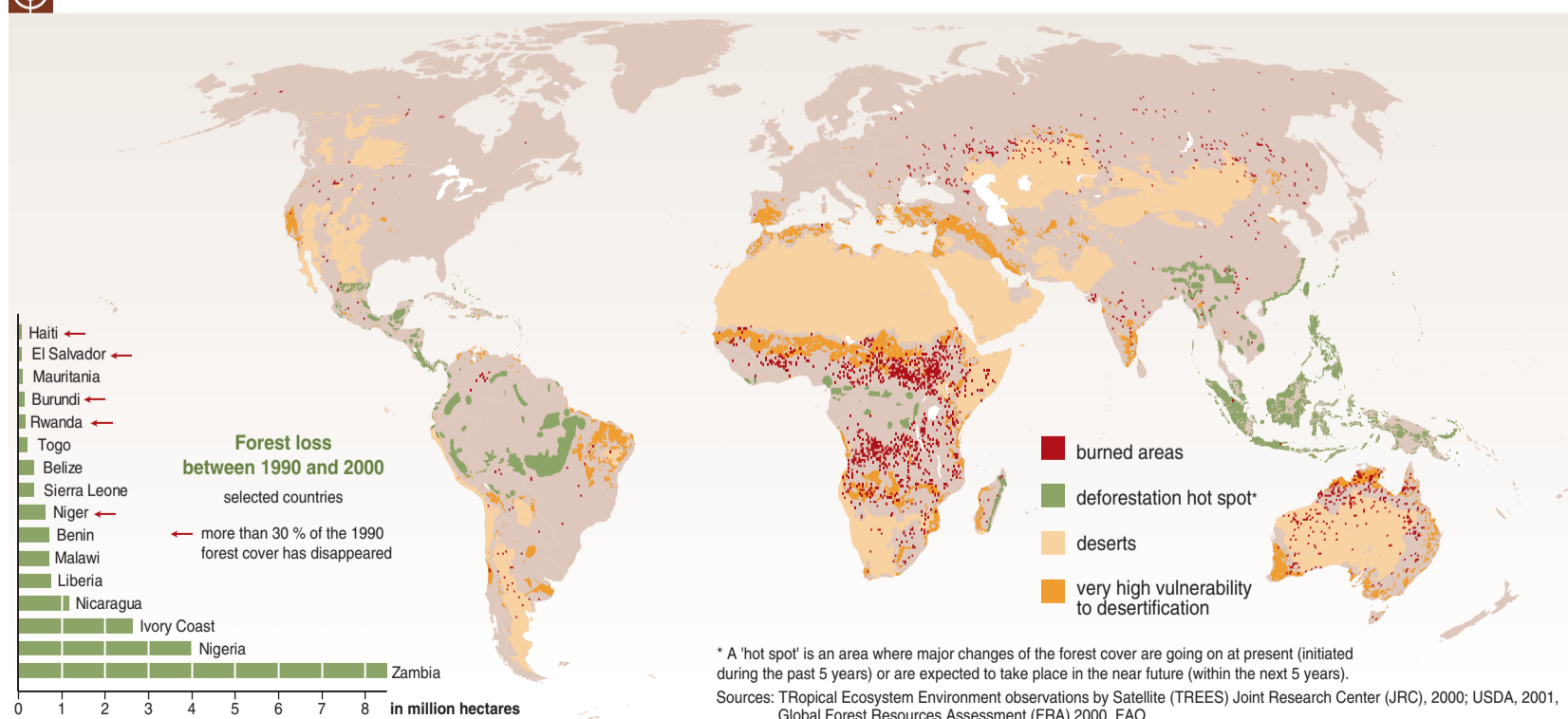


Agriculture as well as fishing need a healthy environment. Countries whose economy depends mostly on these resources will probably take many years to recover if the basis of their production is damaged.

Tourism is equally dependent on an intact environment for its prosperity. It doesn't have to be as devastating an event as the recent tsunamis that literally washed away large parts of the tourism industry all around the Indian Ocean. A country's economy depending heavily on tourism can already suffer from an oil spill, such as on the Atlantic coast of Spain and France where the number of visitors is reduced for years in reaction to the sinking of the tanker Prestige.

Through complex linkages of the globalised economy damage to industrialised countries can happen indirectly, as was the case after the 1999 earthquake in Taiwan where the Californian production line was interrupted because the supply of components from Taiwan had ceased.

BARREN lands



Deforestation is well known for aggravating erosion. Bare soil has no protection against heavy rain, washing away immediately. On hillsides, it readily turns into mudslides leaving people very little time to seek refuge and cutting deep ravines into the earth. And where deforested land was turned into cultivated fields, the soil is likely to be overused and exploited through intensive use of fertiliser.

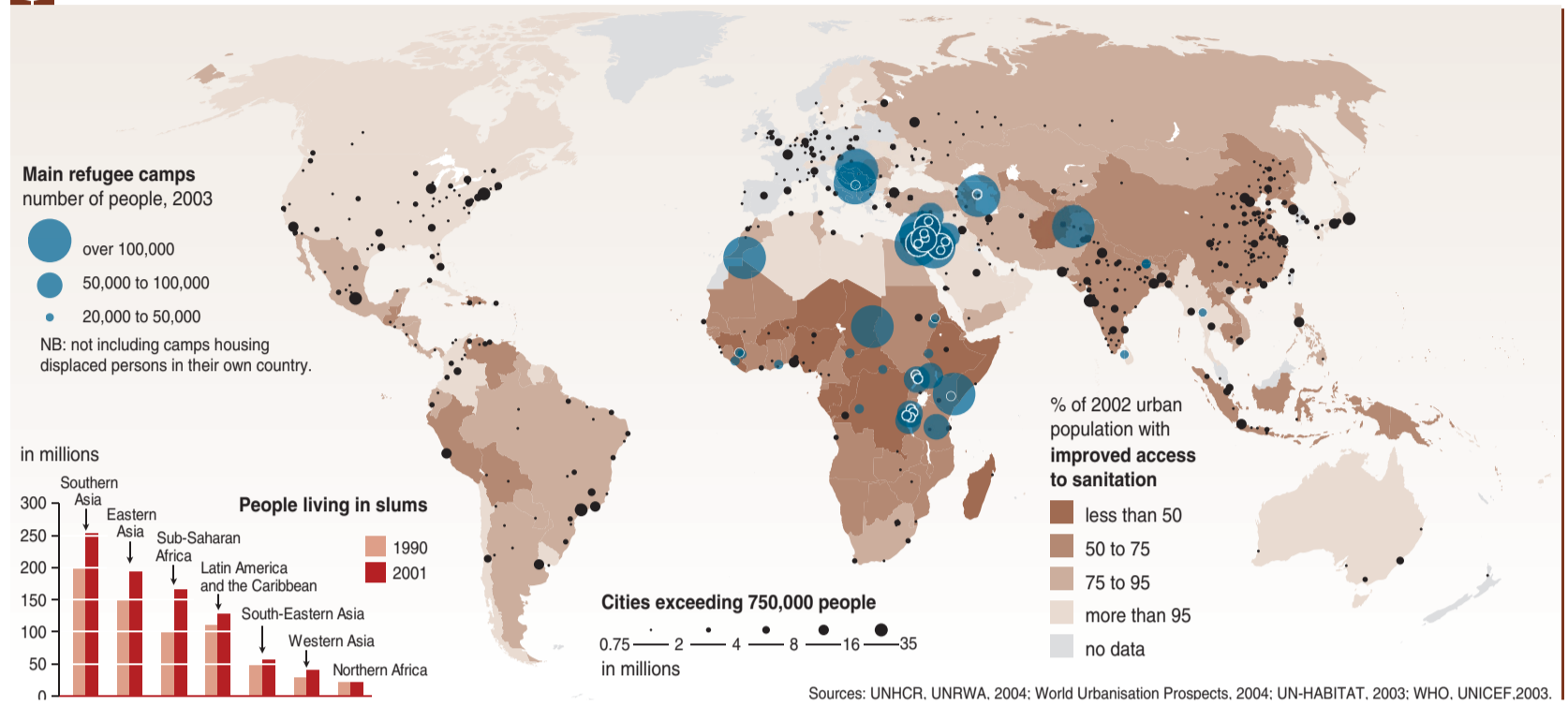
Forest fires in particular increase CO₂ emissions, and reducing forest coverage reduces capacity to absorb CO₂ emitted by various human activities. CO₂ is a key contributor to climate change, and scientists mostly agree that climate change will lead to an increased risk for disasters.

Most of the Earth's population lives on the coast, with a grandstand view of sea-borne natural disasters – and an immense vulnerability to all hazards that come from the sea. The population around the Indian Ocean faced the deadly waves following the strongest earthquake in forty years without a warning.

In the face of any calamity we instinctively take refuge under a roof. This is little use against a chemical or nuclear accident, but for many there is no other resort. The number of people currently living in shanty towns is rising in all the big cities of the developing world, where urban growth is generally uncontrolled. The map shows how small the proportion of city dwellers with improved access to sanitation in many places is, giving an idea of the number and location of people living in precarious conditions.

It is very difficult to estimate homelessness in the world, but refugee figures are available, their numbers increasing with each new conflict.

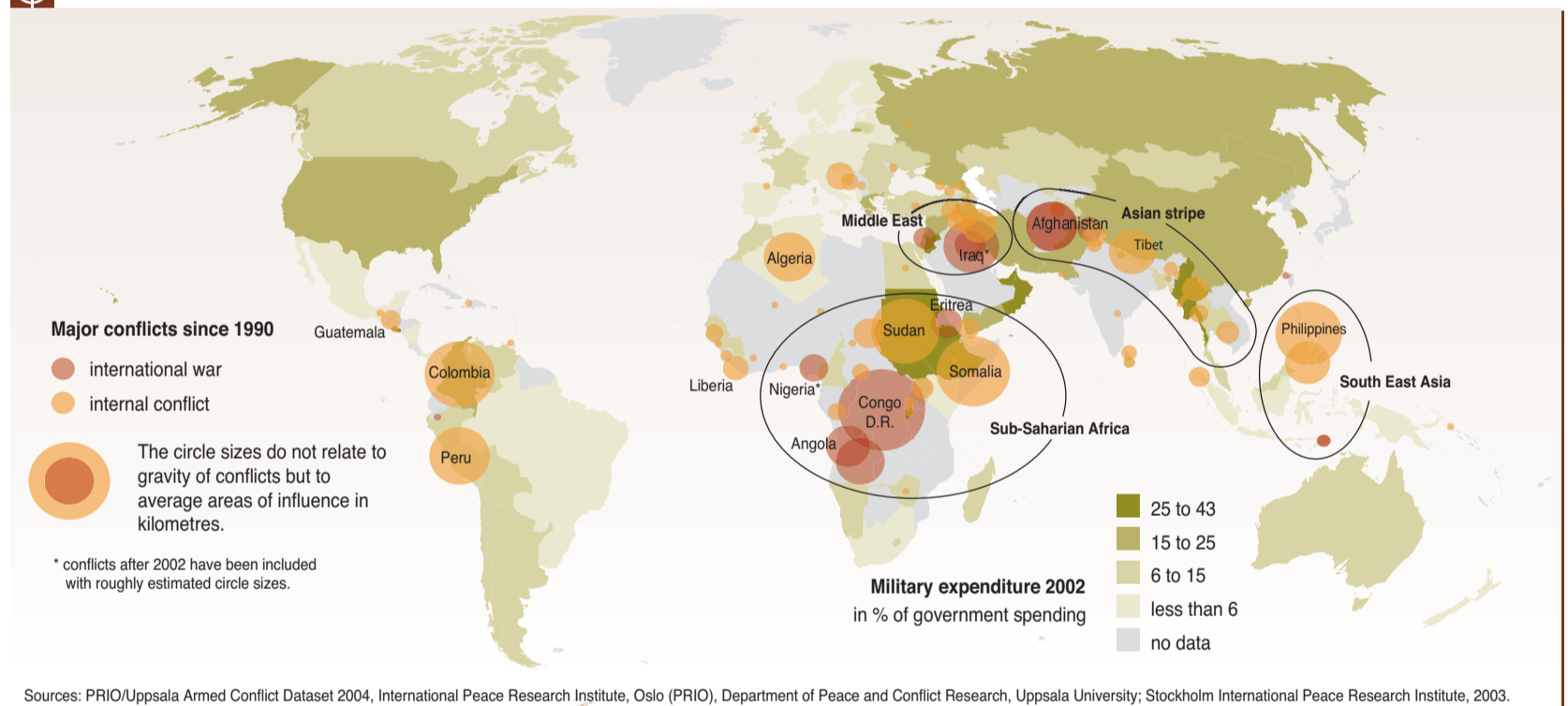
NO shelter



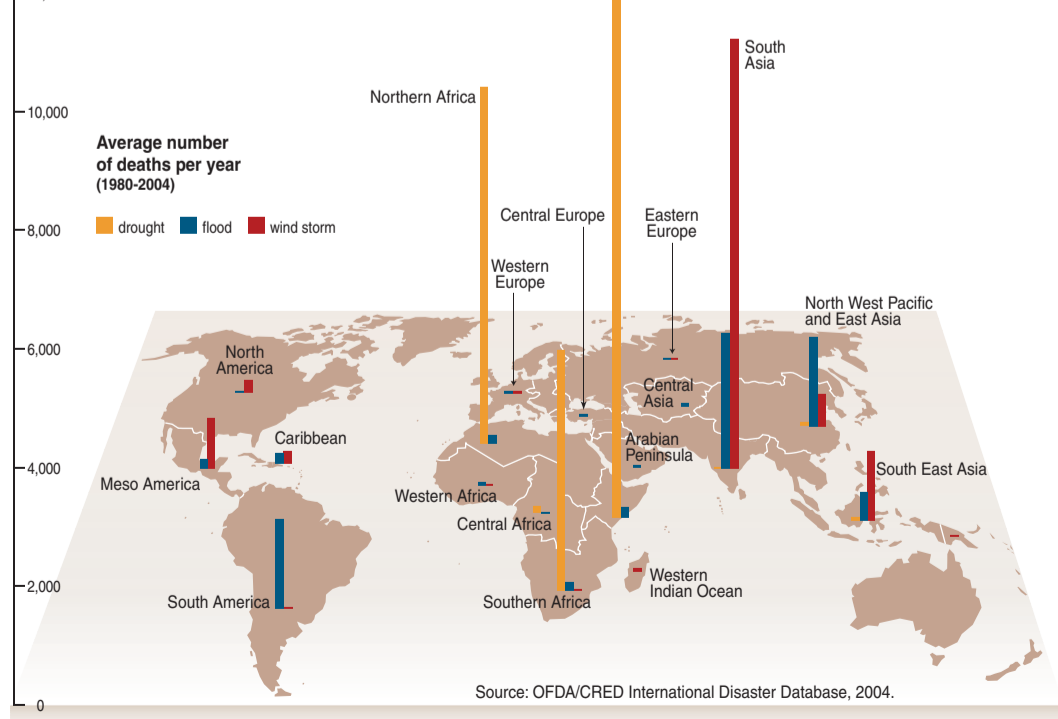
For people in countries at war or subject to economic embargos many goods are scarce, food and water constituting the most crucial shortages. But they also have to deal regularly with death and injury. In such countries disaster prevention may well not be a priority.

The PRIO database was developed by the International Peace Research Institute in Oslo and the Uppsala University. Its aim is to provide a basis for a better understanding of the geographical extension of conflicts. For more information on the PRIO database and the calculation method contact the International Peace Research Institute in Oslo.

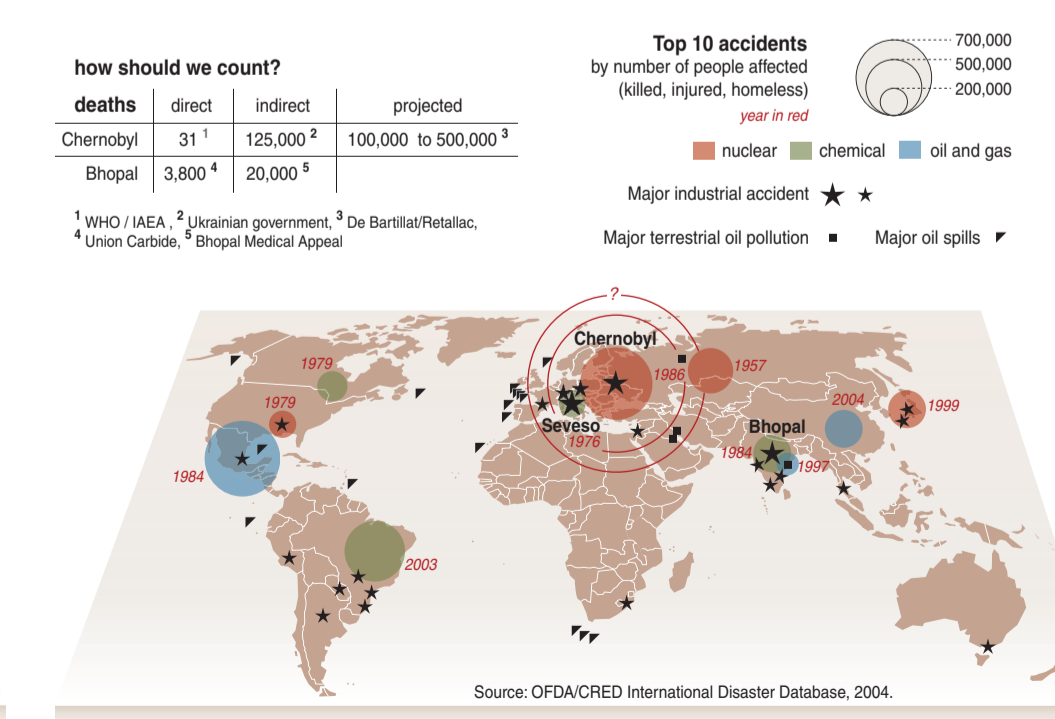
CRUSHED by war



NATURAL disasters



The two-headed threat



In 1998, when Bangladesh was hit by the worst floods recorded in the 20th century, nearly 75% of the country was inundated for more than 50 days. (UNICEF)

Too late?

An early warning is “timely information allowing authorities and decision-makers to take appropriate actions to either avoid a hazardous event or process becoming a disaster or to reduce the future extent and number of impacts on human population, vital infrastructures and/or ecosystems.”

An early warning system could have saved the lives of many of the more than hundred thousand coastal inhabitants and tourists that were taken by surprise when the deadly tidal waves ravaged the coastline around the Indian Ocean. The technology for a tsunami warning system is available, and in many cases there is a considerable amount of time between the event triggering the deadly waves and the moment they reach the shore. However, it would be too simplistic to blame the governments of the affected states for a lack of preparedness. It is quite understandable that the very costly system wasn't a priority in developing countries burdened with much more pressing needs, considering the chance of such an event is one in at least 50 years. Early warning information can be generated by sophisticated data-gathering

networks demanding high-tech instruments, or by simple observation of changes in physical circumstances. Either way the most timely warning is no help if it fails to trigger action. All too often researchers see their warnings go unheeded. There are several reasons why scientific evidence is disregarded and the implementation of proposed solutions delayed, notably politicians' exclusive focus on short-term election issues, opposing interests of powerful firms, and the inadequate institutional and financial capacity. Many governments still fail to understand the benefits of investing more in risk management, prevention and early warning.

The following pages present a mixture of articles that emphasise the need to listen to our modern Cassandras.

It may be interesting to compare these articles, which lay most of the blame for the lack of response on governments, with the article on the back page. There, Tim Radford highlights researchers' responsibility for delivering their message. It has a significant influence on how the audience responds to the content of the message.

Overfishing: how many Dead Seas?

Gregory Giuliani

Fishing activities have various negative impacts on marine ecosystems. The greatest cause for concern is the rapid depletion of fish population due to extensive commercial fishing. In 2002 72% of the world's marine fish stocks were being harvested faster than they can reproduce. Bycatch – the harvest of fish or shellfish other than the species for which the fishing gear was set – accounts for a quarter of the total catch (27m tonnes in 2003) and much of it is lost.

For many scientists overfishing now ranks as one of the greatest impacts of human activity on oceans. It increases the vulnerability of ocean ecosystems and contributes to the decline of other elements of the marine food-chain, including birds and mammals. The record for total fisheries production (captured and farmed) was around 100m tonnes and was recorded in 2000. But the apparent glut conceals a serious decrease in the productivity of many fish species.

The fishing industry, ranging from subsistence fishers to large-scale mechanised fishing vessels, employs directly or indirectly some 200 million people worldwide. As an economic sector it is a crucial factor in the development of many countries. But fish depletion also threatens food security. In Asia alone more than a billion people depend on fish and seafood as their major source of animal protein. The UN Educational, Scientific and Cultural Organisation (UNESCO) warns that fish, long regarded as the “poor man's protein”, is diminishing globally due to increasing market demand and overfishing.

Modern fishing technology is elaborate. Some trawlers are 170 metres long and can engulf catches equivalent in volume to 12

jumbo jets. Drift-nets may exceed 60 km in length. Fishing vessels stay at sea for several months and often prepare the catch for market distribution at sea. For bottom trawling powerful ships drag heavily weighed nets across the ocean floor, destroying the natural habitat. Each year they harvest an area twice the size of the continental United States! Sonars, aerial monitoring systems and satellite platforms help to locate fish schools and follow them more easily.

Bycatch may include low-value species but also large amounts of young or undersized

fish of valuable commercial species. Almost 25% of all harvested fish never reach the market. Bottom trawling is particularly indiscriminate. For example, up to 95% of the take in halibut trawling can be bycatch, including various endangered or overfished species.

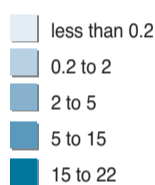
Although some countries have adopted fleet reduction programmes, most fishing nations have acknowledged that overcapacity is a serious problem. The FAO estimates that the world fishing fleet numbered about 3.8m vessels in 1995 of which

nearly 1.2m included storage space. The fact that fishing capacity reduction has often been achieved by relocating vessels in other countries' fisheries or in high seas' fisheries is of serious concern, as it does not contribute to a global reduction in fishing capacity. Significant reductions in fishing capacity in highly populous and least-developed countries are not likely to occur due to increasing social pressure. At the same time the best way to reduce bycatch would be to lower the total fishing effort as much as possible, and develop selective technologies, better regulations

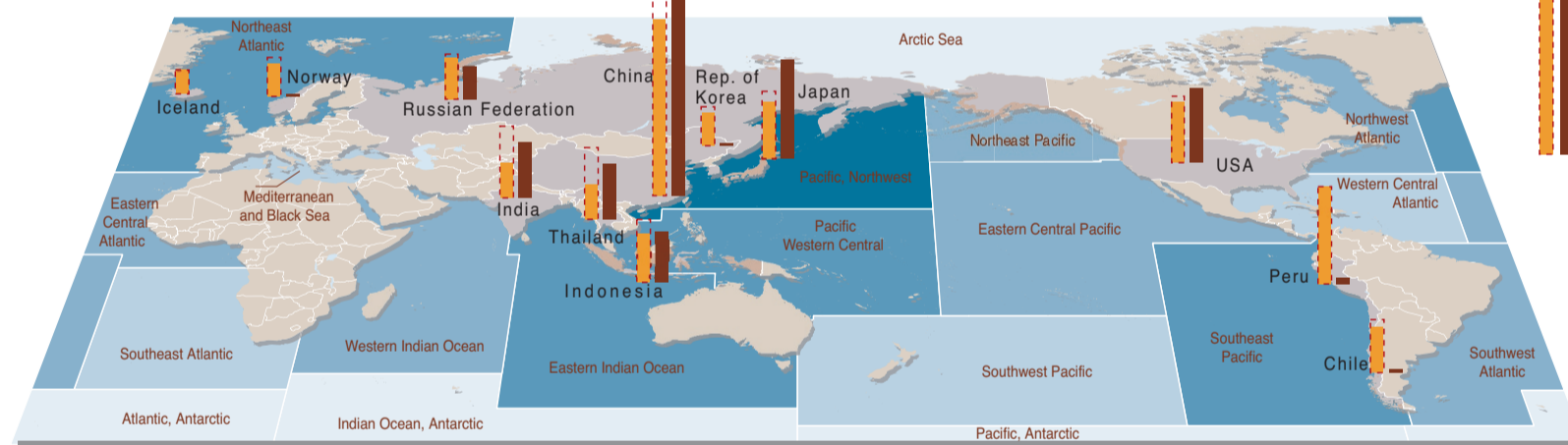
and stronger enforcement. So far only eight countries have imposed a total or partial ban on bottom trawling (New Zealand, Indonesia, Philippines, Scotland, Italy [Sicily only], Kenya, Seychelles and Greece). In all studies conducted in these countries it was found that pressure on fish resources had been alleviated and stock recovery had occurred.

Gregory Giuliani is a master of environmental sciences specialised in GIS and remote sensing. He works on early warning issues and the GEO project at UNEP/GRID-Europe.

Total fish catch by marine area, 2002 in million tonnes

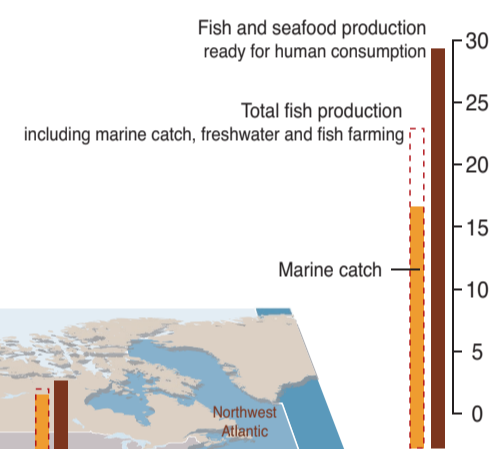


Source: FAO, 2004.
Cartography: Stéphane Kluser, UNEP/GRID-Europe



Fish catch and production

Fish production in 2001 Top 12 countries, in million tonnes



Good bugs under threat

Stéphane Kluser and Pascal Peduzzi

When Albert Einstein said “if the bee became extinct, man would only survive a few years beyond it”, was he forecasting our current problems? Bee populations are decreasing. French beekeepers say a pesticide has killed about 90bn of their insects over the last 10 years. In 2000 a census by France's Ministry of Agriculture revealed that 46% of the bee exploitations were lost between 1988 and 2000. France has had to start importing honey. Numerous scientific studies confirm the responsibility of agricultural pesticides. Products containing Imidacloprid or Fipronil were introduced in the mid-1990s. They are marketed under various names including Gaucho in some 70 countries worldwide and are mainly used on sunflower and maize, but also barley, wheat and sugar beet. The scientific community suspects that coating seeds with regular or systemic insecticide, which is absorbed by the root and migrates through every part of the plant including pollen and nectar, poses a potential threat for pollinators such as honey bees and other insects. A study by Bonmatin (1) revealed that pesticides, including the ones mentioned above, cause bees to lose their sense of direction. This is the goal for insects harmful to the crops, but should be avoided for “good bugs”.

But there is more at stake than the missing honey. The honey bee is the most effective pollinator in western Europe and North America. One-third of the United States food supply depends on pollinating activity, and bees take care of 85% of pollination. If bees become extinct, production of such vital crops as maize will be threatened.

In addition to the effect on insects, other studies revealed the high toxicity of Imidacloprid and associated inert ingredients for cats, fish, rats, rabbits, birds and earthworms (2), demonstrating that the insecticide has a much broader impact.

Although chemical pesticides can be an effective way of controlling an occasional pest outbreak, no one should be encouraged to rely on pesticides as a regular application. Pest problems should be carefully identified and communities encouraged to select products that have the least impact on human health and the environment. Some pesticide residues can be washed off the surface of fruit and vegetables, but there is a limit to how much just water can achieve. Systemic varieties enter the flesh of the crop and thus cannot be removed by washing or peeling.

When chemical pesticides, such as DDT, were first introduced in the 1940s, farmers saw them as a miracle solution with the promise of complete control over pests. But within a couple of decades problems started to emerge. The most important one is the environmental damage done by chemicals that are both toxic and persistent. Twenty-five years after an almost total ban on its use, DDT can still be found in the tissue of animals, even in the most remote areas.

As for pesticide production, people all over the world recently commemorated the 20th anniversary of the Bhopal tragedy. There, a cloud of toxic gas escaped from a chemical plant, killing at least 15,000 people. The inhabitants of Bhopal continue to suffer from the long-term effects of the exposure to the gas. The plant, where the accident happened, produced pesticides.

Stéphane Kluser is an environmental scientist specialising in GIS and remote sensing. He works as an information consultant for UNEP/DEWA/GRID-Europe.

1. Bonmatin, J.M., P.A. Marchand, R. Charvet, M.E. Colin, (1994): Fate of systemic insecticides in fields (Imidacloprid and Fipronil) and risks for pollinators, in First European Conference of Apidology, Udine 19-23 September 2004.
2. Cox, C., (2001), Imidacloprid, Insecticide factsheet, Journal of Pesticide Reform, Vol. 21, N°1, <http://www.pesticide.org/imidacloprid.pdf>.

The Montreal Protocol success story

The Montreal Protocol is an example of the proper response being given to a sharp warning. By phasing out certain chemicals this international treaty preserved the stratospheric ozone layer that absorbs harmful ultraviolet radiation from the Sun. Since the signature of the protocol in 1987 more than 160 nations have ratified it and 90 substances are now controlled. A veritable technological revolution was unleashed transforming whole industries. The protocol created the first ever global environmental fund to assist developing nations and promoted unprecedented North-South collaboration in the research and dissemination of new technologies which have rendered ozone-depleting substances obsolete. As a result, the presence of chlorofluorocarbons (CFCs) near the ground has decreased by 6% since its peak. Satellite measurements reveal a decline in the rate at which the ozone content of the upper stratosphere is dropping, but the total ozone amount is still falling. As Richard E. Benedick puts it in an article published by the Earth Institute of Columbia University: “The success of the Montreal Protocol stands as a beacon of how science can guide decision-makers to overcome conflicting political and economic interests and reach solutions. The ozone history demonstrates that even in the real world of ambiguity and imperfect knowledge, the international community, with the assistance of science, is capable of undertaking difficult and far-reaching actions for the common good.”

1. Richard E. Benedick was chief US negotiator and a principal architect of the 1987 Montreal Protocol on protecting the ozone layer.

Early warning systems

Maryam Golnaraghi

Every year, disasters caused by weather, climate and water-related hazards impact on communities around the world, leading to loss of human life, destruction of social and economic infrastructure and degradation of already fragile ecosystems. Statistics from the Centre for Research on the Epidemiology of Disasters (CRED) at the university of Leuven, Belgium, reveal that from 1992-2001, about 90% of natural disasters were meteorological or hydrological in origin; the resulting economic losses were estimated at \$446bn, or about 65% of all damage caused by natural disasters.

It seems likely that worse things are in store. According to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), climate change could result in more severe and more frequent natural hazards in the future.

Natural disaster risk management is of particular importance to the World Meteorological Organisation (WMO), which operates the global infrastructure for observation, research, monitoring, detection, forecasting, early warning and exchange of information related to natural hazards. Alongside educational and capacity-building services they provide backbone capabilities to enable national meteorological and hydrological services (NMHS), particularly in developing countries, to work at the frontline to meet national needs for hazard information. While the disaster statistics of the last decade are sobering, it is important to realise that loss of life and property would have been even higher without preventive services.

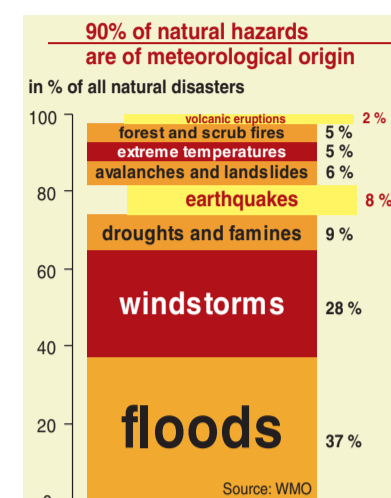
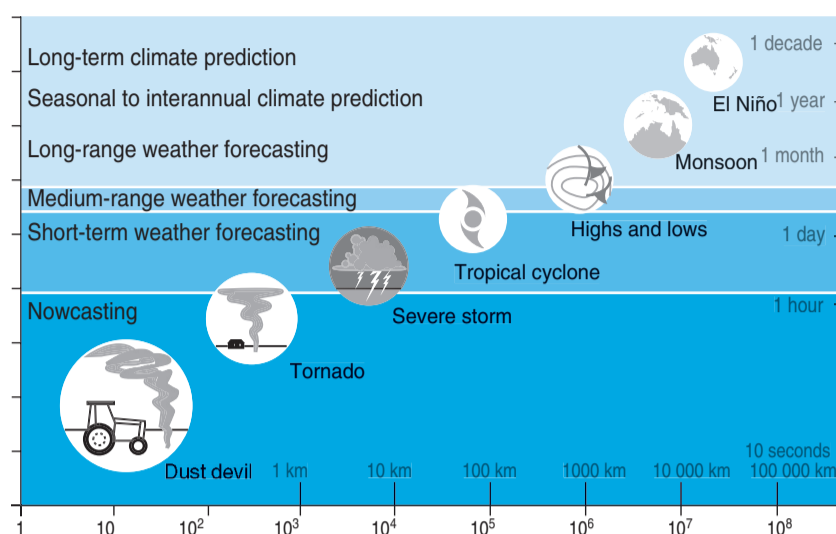
One of the most important areas to be addressed is the need to help nations understand the benefits of shifting more investments from post-disaster recovery to risk management and prevention. Many countries, particularly the least developed, need to put greater emphasis on the various steps involved in proactive prevention.

One of the most effective measures for disaster preparedness is a well-functioning early warning system that delivers accurate information dependably and on-time.

WMO's programmes related to monitoring the atmosphere, oceans and rivers provide crucial time-sequenced information that underpins forecasts and warnings of hydrometeorological hazards. The global network of Regional Specialised Meteorological Centres and World Data Centres provides critical data, analysis and forecasts enabling NMHSs to issue early warnings and guidelines for various natural hazards such as tornadoes, winter storms, tropical cyclones, cold and heat waves, floods and droughts.

For example, WMO's global network proved highly effective in 2004, during one of the most intense hurricane seasons in the Atlantic and Caribbean. Atmospheric data collected via instruments on-site and in space were transmitted to the US National Hurricane Centre, where forecasts and hurricane advisories were developed round the clock. These advisories were transmitted via the Global Telecommunication System, facsimile and the internet at three to six-hour intervals to NMHSs in countries at risk. National forecasters used the hurricane advisories to produce specific hurricane warnings, which were dispatched immediately to newspapers, radio and television stations, emergency services and other users. Thanks to this information, many lives were spared through timely evacuation. The challenge is to ensure that all countries, particularly the least developed, have the systems, infrastructure, human capacity and organizational structures to develop and use early warning systems to reduce risks of natural disasters.

Looking beyond short-term early warnings for specific events, WMO is working on the development of new products that provide information on the state of the climate and natural hazards with longer lead-times. When there is evidence of a developing El Niño-Southern Oscillation



(ENSO) condition, WMO coordinates a global scientific consensus, involving a collaborative process to review best available evidence and predictions. The outcome is an El Niño Update, a unified global statement on the expected evolution of ENSO for the months ahead, which is issued to national meteorological and hydrological services and the world at large.

Regional Climate Outlook Forums (RCOFs) are regularly held in regions affected by ENSO and a degree of know-how has developed for forecasting ENSO impacts. In Africa, three regional centres catalyse and coordinate the climate forums. The Drought Monitoring Centre (DMC) in Harare, Zimbabwe, the Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC) in Kenya, and the African Centre of Meteorological Applications for Development (ACMAD) in Niger, develop and disseminate climate outlooks, particularly related to drought monitoring and drought alerts, to each of the NMHSs, and arrange for interactive discussions and interpretations with representatives in the disaster risk management community and other sectors.

There is considerable need for sector-specific climate information and early warning systems to be developed. Examples

of such activities are WMO collaboration with the World Health Organization (WHO) to develop Heat-health Warning Systems for coping with deadly heat waves and malaria; and work with the UN Food and Agriculture Organization (FAO) on monitoring and developing early warnings of locust swarms.

NMHSs use various formal and informal mechanisms, from traditional approaches to more advanced technologies, to disseminate information to authorities and the general public, particularly the public at risk. While in some countries, the national centres rely on public broadcasting systems – via the internet, television and radio – in others sirens, balloons, flags and beacons are most effective in warning communities that are remote or do not have access to the latest technology. However, this information is only effective if there is a corresponding capacity to respond to the information through prevention, preparedness and response activities at the national and community levels.

Efficient international and national satellite-based data-distribution systems provide timely and reliable access to weather, water and climate data. Two examples among many others are the Emergency Managers Weather Information Network (EMWIN) operated by the

National Weather Service of the United States and the satellite-based telecommunications system operated by the China Meteorological Administration.

Beyond these activities, the premise of WMO research is to develop seamless end-to-end operational systems for early warning of natural hazards from next-hour to climate change timescales. Research programmes are extending the range of skilful forecasts to timescales of use in decision-making. WMO's international research programme on weather and new climate strategy over the next 10 years aims to speed up improvements in the accuracy of one-day to two-week high-impact weather forecasts, and to develop prediction capabilities at longer lead-times.

However, while technical and scientific capabilities are advancing year-to-year, there is a need for stronger, more coordinated activities among government leaders, risk managers in both the public and private sectors, organizations at the national, regional and international level and the scientific community, to develop capabilities to support proactive strategies for natural disaster risk reduction.

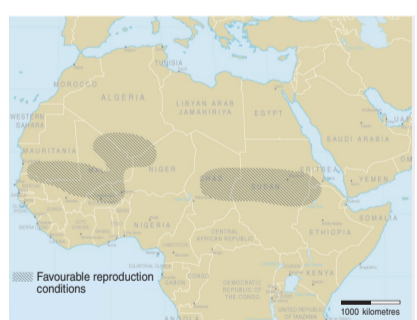
Dr. Maryam Golnaraghi is the Chief of the Disaster Prevention and Mitigation Programme of the World Meteorological Organisation in Geneva.

Threat of bad bugs: can we avoid desert locust crises?

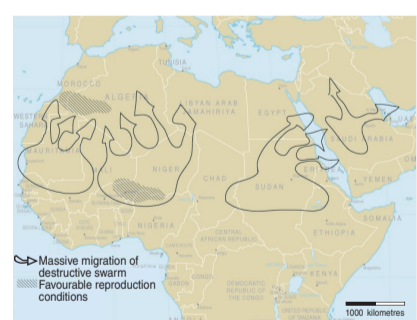
Michel Lecoq

Locust invasions are a major threat to the agriculture, pasture, food security and social stability of rural populations occupying a very large area from Western Africa to Northern India. Large amounts of chemicals are being used to check this plague, at considerable risk to the environment and public health. As a hazard locusts depend on the wind and rain to travel.

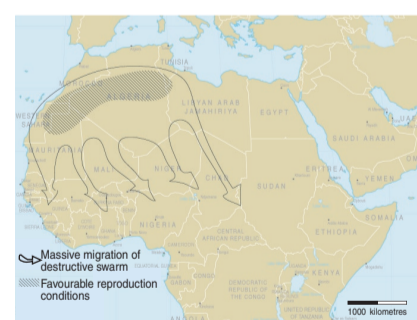
West African countries and the Maghreb recently had to cope with a dramatic invasion. In summer 2003 highly favourable rains over the whole Sahel area caused widespread outbreaks. Locusts quickly changed from the solitary phase - inoffensive and confined to the Saharan zone - to the gregarious phase characterised by hopper bands and destructive swarms. All the affected countries have specific national units to survey and control the insect, but the ones in the Sahel are recent arrivals and are chronically short of resources. They reacted immediately but lacked adequate funding. In October 2003 affected countries and the FAO launched an appeal for donors but the international community only responded several months later. By then the invasion was in full swing. The funds required to prevent damage to vegetation rose from \$10m to \$50m, and ultimately \$100m.



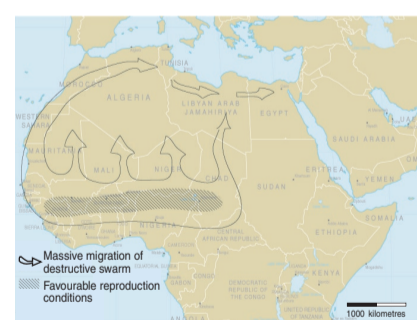
July - September 2003
Exceptional rains favour locust reproduction. Lack of funding for preventive intervention in the Sahel.



October 2003 - February 2004
Situation aggravated and start of migration.



March - July 2004
Massive reproduction in the Maghreb, limited reproduction in the Red Sea region. Invasion into the Sahel. Gregarious populations eradicated on the coast of the Red Sea.



August - November 2004
Monsoon creates favourable conditions for reproduction in West Africa. Massive and early migration of swarms born in the Sahel towards the Maghreb and eastward towards Egypt, Lebanon and Cyprus.

Early chemical treatment would have sufficed for countries in the Sahel and only cost \$1m. The recurrent costs of prevention only add up to a few percent of emergency assistance for curative control. By the end of 2004, nearly 8m hectares had been treated with insecticides... without stopping the invasion.

Since the 1960s efficient control practices have proved successful. Before then, locust invasions were almost continuous and could last for many years. Early treatment and control techniques, as well as preventive strategies have clearly reduced the length of invasions. In 45 years only two

invasions (1987-89 and the current invasion) could not be stopped at an early stage. Preventive control is recognised as the only reasonable global strategy. It involves regular surveys of outbreak areas (where invasions originate) and early control operations against the first hopper bands and swarms, when they are still of limited size and a long way from crop areas. This strategy, recommended by the Desert Locust Control Committee and FAO, proposes a permanent national capacity for survey and control. It also requires coordination at a regional level, and information centralisation and data analysis under the aegis of the FAO's Locust Group.

The 1987-89 invasion highlighted the need to strengthen the preventive system. It was launched in 1994 as the Desert Locust component of FAO's EMPRES programme, of which the top priority was to reinforce early-warning and response capacity for locust control at a national level and develop regional cooperation. EMPRES was implemented in 1997 in countries around the Red Sea, an area where many past invasions have originated and considered a high priority. Unfortunately for West Africa and the Maghreb it proved impossible to find the necessary funds in time and the programme has so far only been partly implemented.

The current crisis once again pinpoints the shortcomings in preventive control in Western Africa. National survey and control capability needs to be rebuilt. But real emergency plans are also required, backed by an international trust fund. Furthermore we need an efficient governing body associating affected countries and donors. This is the only way to insure the long-term sustainability of preventive strategy.

Michel Lecoq is a researcher at the Centre for Agricultural Research for Developing Countries (CIRAD) at Montpellier University.

Be prepared!

Being prepared for a disaster substantially reduces the risk of casualties. In many cases it is only after a major disaster that people begin to understand the need for better preparedness. But they are an opportunity to learn from past mistakes. With hindsight it is always easy to see what could have been done to reduce impacts. And if we look carefully at our environment, listen to the experiences of older generations and take advice from specialists, we can map out the risks and devise ways to become less vulnerable to the hazards threatening our lives.

Here we may see how authorities adjusted their preparedness and response systems after a disaster, in India after Bhopal and in France after Toulouse.

If risk reduction is to reach the most vulnerable we must start with community-based projects. At a local level disaster preparedness mainly focuses on teaching people how to react in an emergency and developing emergency plans. Their success depends to a large extent on how successfully such plans are communicated to people.

Toulouse disaster prompts changes in French risk management

Olivier Salvi and Nicolas Dechy

A terrible explosion of ammonium nitrate, causing 30 fatalities and an estimated 10,000 injuries, occurred on 21 September 2001 at the AZF plant in Toulouse operated by a Total subsidiary. The plant was located in the suburbs of the city and the accident caused widespread damage on and off-site, at an estimated cost of €1.5bn. Investigators (corporate and judicial) have not yet reached agreement on the origins of the accident. But with several enquiries, nationwide debate and a special parliamentary committee, risk management has learned some new lessons. Some are reflected in a new law on prevention of technological and natural risks.

The management of environmental protection and risk prevention is evolving. This is clearly the result of the growth of the information society and better informed public opinion worldwide, coupled with more widespread concern for these issues. Following a string of major industrial disasters our "risk society" is increasingly wary of the role of experts in assessing risks and the ability of science to provide definite answers. Following the Seveso accident in 1976, the European Union adopted the Seveso Directive on process industries in 1982. The Seveso II Directive (96/82/CE) followed in 1996,

initiating changes in risk management at a national level. The ISO/IEC standard 73 was adopted at the same time. It describes risk management as a decision-making process based on risk assessment. To prevent major accident hazards we must keep assessment and control of potential accidents in their own context.

The AZF plant produced mainly ammonium nitrate, ammonium nitrate-based fertilisers and other chemicals including chlorinated compounds. The explosion occurred in a warehouse where some 400 tonnes of off-spec materials were being stored. France's National Institute of Industrial Environment and Risks (Ineris) estimated the explosion's TNT equivalent mass between 20 tonnes and 40 tonnes¹. The plant was located on the outskirts of a city of 750,000 people. The accident consequently caused very serious destruction, damaging some 27,000 dwellings². Estimates issued by national and local authorities indicate that 10,000 people were injured (physically). A further 14,000 people applied for medical treatment for acute post-traumatic stress in the months following the explosion³.

The Toulouse disaster prompted nationwide debate, leading to a new law to improve risk management (2003-699). It introduced a significant change to the prevention of tech-

nological risks. The second part of the law reflected lessons learned from recent floods and natural disasters (flooding caused by the Somme, Gard and Hérault rivers).

The disasters at Enschede and Toulouse reminded Europe that the control-based Seveso II directive (in particular its Safety Management System requirement) was not enough to prevent major accidents turning into disasters. Moreover the trend for major accidents recorded in the European Commission's MARS database (EC, 2002) indicates an annual EU average of roughly 30 to 40 major accidents (1995-1999).

Controlling major accident hazards by reducing on-site risks does not in itself promote sustainable development in industry or urbanisation. Land-use planning (LUP) is required too. France's new law encourages local authorities to contribute to framing and implementing Technology Risk Prevention Plans (PPRT) putting a long-term perspective on urban development around hazardous plants. It also gives local councillors a stake in the risk prevention decision-making process, instituting Local Committees for Information and Dialogue (CLIC). Public opinion thus becomes involved in decision-making, the aim being to make choices more acceptable to local stakeholders.

The key issue is how to deal with the existing situation without increasing risks. Each time industry encroaches on an LUP perimeter it will be liable for compensation. In the vicinity of Seveso sites PPRTs will define no-go or reduced access zones. Additional protection (better windows, etc.) is required on dwellings inside a larger perimeter. There is also scope for financial incentives to encourage people to accept voluntary dispossession orders. The relevant firms and local and national government will share costs. To avoid the delays that followed recent disasters, compensation will be streamlined, with insurance companies being obliged to pay victims for any damage, prior to negotiating compensation directly with their industrial counterparts.

Another important lesson reflected in the new law is the need to make allowance for poor management of subcontractors and in particular the breakdown in communication between employees of the main company and subcontractors. The law seeks to monitor subcontracting on Seveso sites.

When framing the new law the competent authorities drew on Ineris' longstanding involvement in risk management and its contribution to one of the Toulouse enquiries. It also used recent results of Euro-

pean and French research projects. Several enquiries provided a wealth of analytical data and proposals which also contributed to framing the law. It addresses a number of issues – public information; public, employee and subcontractor involvement in the decision-making process; new rules for land use planning; improved financial compensation for victims – complementing the Seveso II Directive. There was no question of changing the application of the Seveso II Directive in France. On the contrary the aim was to make it stronger. Some lessons (white paper, changes in Seveso II directive) have also been learnt at a European level.

Olivier Salvi and Nicolas Dechy are researchers at France's National Institute of Industrial Environment and Risks (Ineris).

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3. Lapierre-Duval et al 2004.

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Indigenous knowledge in natural disaster reduction in Africa

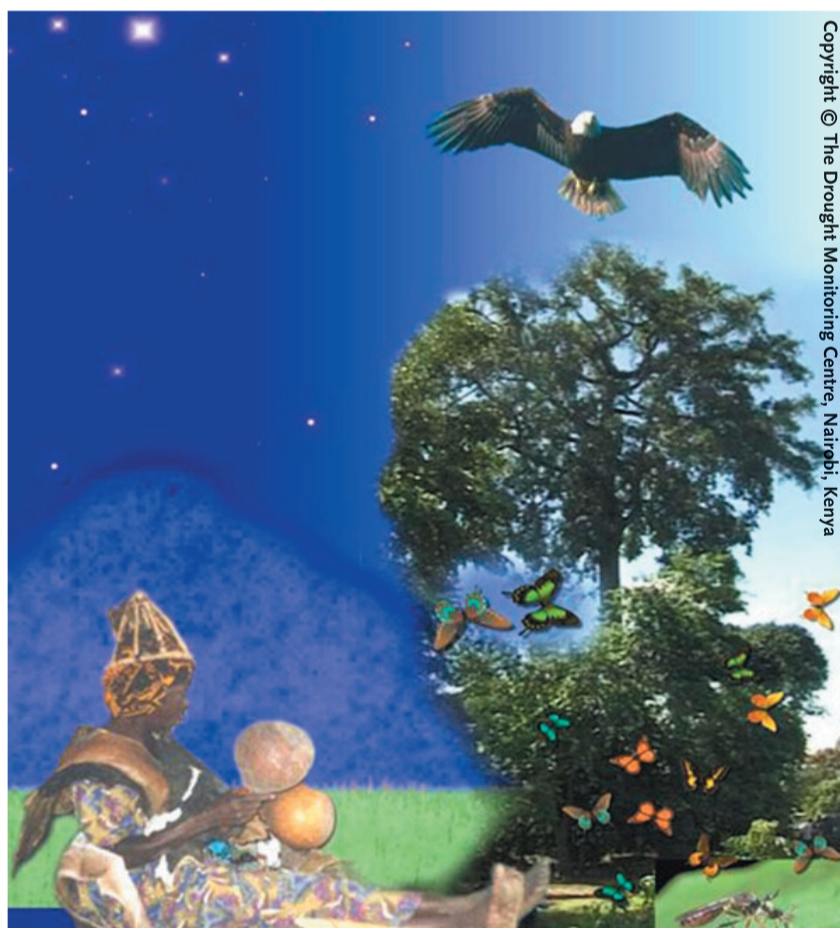
James Kamara

In Africa, local communities had well-developed traditional indigenous knowledge systems for environmental management and coping strategies, making them more resilient to environmental change. This knowledge had, and still has, a high degree of acceptability amongst the majority of populations in which it has been preserved. These communities can easily identify with this knowledge and it facilitates their understanding of certain modern scientific concepts for environmental management including disaster prevention, preparedness, response and mitigation.

Indigenous knowledge is a precious national resource that can facilitate the process of disaster prevention, preparedness and response in cost-effective, participatory and sustainable ways. Hence a blend of approaches and methods from science and technology and from traditional knowledge opens avenues towards better disaster prevention, preparedness, response and mitigation.

Globally, there is increasing acknowledgement of the relevance of indigenous knowledge as an invaluable and under-used knowledge reservoir, which presents developing countries, particularly Africa, with a powerful asset in environmental conservation and natural disaster management. Specifically, from time immemorial, natural disaster management in Africa has been deeply rooted in local communities which apply and use indigenous knowledge to master and monitor climate and other natural systems and establish early warning indicators for their own benefit and future generations.

In the traditional African worldview, environmental resources (land, water, animals and plants) are not just production factors with economic significance but also have their place within the sanctity of nature¹. Certain places have a special spiritual significance and are used as



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locations for rituals and sacrifices, for example, sacred grooves, shrines, mountains and rivers. These locations are quite often patches of high biodiversity which are well conserved and protected by the community. For the traditional people of Northern Ghana, gods, spirits, shrines, ritual crops and animals, food items and cash crops are all inter-related².

Indigenous knowledge is therefore an essential element in the development process and the livelihoods of many local communities. A major challenge that African countries continue to face is how to reconcile indigenous knowledge and modern science without substituting each other, respecting the two sets of

values, and building on their respective strengths³. Recent studies in Kenya on the application and use of traditional knowledge in environmental conservation and natural disaster management cited examples of areas where such knowledge is still prevalent and harnessed⁴.

Regarding land-use conservation, shifting cultivation was a traditional practice in which land was never over used or repeatedly cultivated season after season and year after year. Land was left to rest and covered again with plants and leaves to enable it to accumulate vegetable manure. Mixed crop cultivation practice enables leguminous crops to restore nitrogen in the soil for other food plants.

Knowledge of when to expect long or short rainy seasons enables the farmers to plan appropriately which crop is suited for a particular season. Traditional indigenous knowledge terminologies of types of soil and their reaction to water enables the people to use each type of soil appropriately by planting the correct crops.

As for coping with changes in the weather, traditional indigenous knowledge of storm routes and wind patterns enables people to design their disaster management long in advance by constructing types of shelter, wind break structures, walls, and homestead fences appropriately. A hydrological disaster is obviously unmanageable when it starts. Similarly, knowledge of local rain corridors enables them to prepare for storms. Knowing the colour of clouds that may carry hailstones enables people to run for cover. Knowing that prolonged drought is followed by storm, thunder and lightning during the first few rains enables people to prepare or expect a disaster. A change in birds' cries or the onset of their mating period indicates a change of season.

Similar application and use of indigenous knowledge for disaster management is also prevalent in Swaziland. Floods can be predicted from the height of birds' nests near rivers. Moth numbers can predict drought. The position of the sun and the cry of a specific bird on trees near rivers may predict onset of the rainy season for farming. The presence of certain plant species (for example, *Ascolepis capensis*) indicates a low water table⁵.

These examples underscore the importance of harnessing indigenous knowledge not only as a precious national resource but also as a vital element in environmental conservation and natural disaster prevention, preparedness and response.

However, despite the prevalent application and use of indigenous knowledge by local communities, it has not been

harnessed to fit into the current scientific framework for environmental conservation and natural disaster management in Africa. As a result, there is a general lack of information and understanding of the need to integrate or mainstream indigenous knowledge into scientific knowledge systems for sustainable development in the continent. To achieve this integration would require a blend of approaches and methods from science and technology and from indigenous knowledge.

Recently UNEP initiated a project in Kenya, Tanzania, South Africa and Swaziland to harness and promote the use of indigenous knowledge in environmental conservation and natural disaster management through training and access to and exchange of information. The information collected and analysed through the project is expected to enhance understanding of the need to integrate indigenous knowledge in development processes for poverty and disaster risk reduction as well as in fostering involvement of all constituents including the local communities. The project should be seen as part of a new interest in traditional African knowledge systems which are still prevalent despite the numerous interruptions by development interventionists. It is hoped that the project will be replicated in more countries in Africa and other regions of the world.

James Kamara is Acting Chief of the Disaster Management Branch of UNEP's Division of Environmental Policy Implementation.

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2. op cit
3. R. Rengalakshmi, Linking Traditional and Scientific Knowledge Systems on Climate Prediction and Utilization.
4. A.B.C. Ocholla Ayayo, Application and Use of Indigenous Knowledge in Natural Resources Conservation and Hydrological Disaster Management in Nyanza, Kenya.
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Disaster management in India

K. C. Gupta

After independence India began a process of rapid industrialisation. It inevitably lacked some framework conditions, such as an understanding of the risks of chemical hazards. Implementation of safety procedures, including regulatory approaches, soon followed and institutions such as the National Safety Council (NSCI) were created. There was much to do.

The Bhopal disaster (1984) did much to focus more attention on the need for a holistic approach to technology disaster management, and the role of ordinary people in emergencies. The government took several important measures, with major legislative changes and stronger institutional mechanisms. It set up Crisis Groups at central, state, district and local levels. NSCI took the APELL process as a model, promoting awareness and training projects covering both hazardous materials transport and fixed installations.

India is also vulnerable to natural disasters. While well-established mechanisms for response, relief and rehabilitation were in place, major events such as the Orissa super-cyclone (1999) and the Bhuj earthquake (2001) emphasised the need for a comprehensive approach to mitigation and prevention, for natural and man-made disasters.

NSCI adopted several goals based on the APELL procedures: creating or raising public awareness of possible hazards within a community; stimulating development of co-operative plans to respond to any emergency that might occur; and encouraging accident prevention.

Implementation in this vast country followed a two-track approach of development of awareness at the national level, and in-depth implementation in selected high-risk industrial areas (HRIA – see map). We needed to gain first hand experience through pilot projects in important areas.

A national Advisory Committee and Technical Core Group was set up for periodical review, guidance and technical consultation. In 2002 the first national APELL Centre opened at NSCI headquarters in Mumbai. It was the first centre of this sort in the world.



The first projects started in 1992 in six HRIAs, also drawing on international collaboration from UNEP, USAID and WEC. In 2004 an APELL sub-centre opened in Haldia (see map). A manual on cyclone emergency preparedness was prepared.

Transport issues were becoming urgent and a major new programme was based on UNEP's TransAPELL. A training module and seminars were developed for traffic police. A HAZMAT emergency van started work on a trial basis in Patalganga-Rsayani, and a broad-based programme for transporters was launched.

Several lessons may be learnt from this process. Widespread industrial development in a country like India requires comprehensive replication of the programme at local level. Sub-centres are essential, with replication programmes involving local partners. Practical experience at local level has facilitated – and has in turn been facilitated by – national legislation such as the law setting up crisis groups and safety management in general. Crisis groups at district and local level require training and support

tools (best practice, case studies, etc.) so there is an ongoing role for training organisations such as NSCI and its offshoots like NAC. Finally, the programme has pinpointed the need to treat transport as a priority issue, linking various locations in the hazardous materials chain across the country.

The experience has also aroused much interest abroad, notably in China, South Africa, Jordan and Brazil, underlining the need to share experience internationally.

Emergency prevention and preparedness is a complex issue, and industrialising countries need to address the matter as an integral part of a larger sustainable development agenda. Experience in countries such as India can do much to streamline the process elsewhere, with growing pressures to better address disaster issues.

K. C. Gupta is the Director of the National APELL Centre and Director General of the National Safety Council of India (NSCI).

Mangrove planting saves lives in Vietnam

Press release

Vietnam is one of the most typhoon-lashed nations in Asia. Every year, an average of four sea-born typhoons and many more storms wreak havoc on this low-lying country. In what may seem a curious pursuit for a humanitarian organisation, the Vietnam Red Cross (VNRC) has been planting and protecting mangrove forests in northern Vietnam since 1994.

The reason for its commitment to mangrove protection, which has included planting nearly 12,000 hectares of trees and defending them from shrimp farmers who want to hack them down, is a simple one: mangroves protect Vietnam's coastal inhabitants from the ravages of typhoons and storms. These submerged, coastal forests act as buffers against the sea, reducing potentially devastating 1.5 metre waves into harmless, centimetre-high ripples. The mangroves planted by the VNRC protect 110 kilometres of the 3,000-kilometre sea dyke system that runs up and down Vietnam's coastline. With financial support from the

Japanese and Danish Red Cross, it is planting four different species, which reach a height of 1.5 metre after three years.

The benefits are staggering. In financial terms alone, the mangrove programme proves that disaster preparedness pays. The planning and protection of 12,000 hectares of mangroves has cost around \$1.1m, but has helped reduce the cost of dyke maintenance by \$7.3m per year. In lives spared, one need only look to the dividend reaped during typhoon Wukong in October 2000. This typhoon pummeled three northern provinces, but caused no damage to the dykes behind regenerated mangroves and no deaths inland from these dykes. In the past waves would breach the coastal dykes and flood the land of poor coastal families.

As well as the lives, possessions and property saved from floods, the VNRC estimates that the livelihoods of 7,750 families have benefited from the replanting and protection of the mangrove forests. Family members can now earn

additional income selling the crabs, shrimps and molluscs which mangrove forests harbour – as well as supplementing their diet.

Over the last 50 years shrimp farming, coastal development and chemical defoliants dropped during the Vietnam war have severely damaged mangrove forests. But their regeneration is crucial. As sea temperatures and levels rise, more severe typhoons and storm surges can be expected. This could be disastrous for the inhabitants of Vietnam's east-facing coastline. This risk has spurred the Red Cross to continue investment in mangrove regeneration, despite continued threats from coastal shrimp farmers and developers. It is just as well. Those who live inland from sea dykes are a little less at the mercy of typhoons and storms now. And they hope to keep it that way.

Press release issued by the International Federation of the Red Cross Red Crescent Societies in June 2002, the text is an excerpt from the IFRC's World Disasters Report 2002 – Focus on reducing risk.

The toxic cloud that struck Bhopal 20 years ago provoked the immediate death of 7000 persons. Since then, another 15,000 persons died from diseases related to that accident. Today more than 100,000 persons suffer from chronic diseases. (Amnesty International 2004)

APELL – Awareness and preparedness for emergencies at local level

A community based programme for disaster preparedness. Fritz Balkau

Local communities often lack the reflexes to take effective action when disaster strikes. If we could reach out to communities before disasters and inform them of what to do 'just in case', then the impacts could be dramatically reduced.

Following some major accidents in the 1980s, UNEP worked with an international consortium to develop a community process 'Awareness and Preparedness for Emergencies at Local Level', generally known as 'APELL'. This identifies and creates awareness of risks in a community, initiates measures for risk reduction, and fosters preparedness for the population at large.

APELL achieves its aims through community participation in emergency planning, via a structured dialogue between representatives of the source of the hazard (e.g. a land-owner), local authorities (the emergency services, e.g. fire and/or police) and community leaders (who inform their constituencies). This dialogue is achieved through a 'Co-ordinating Group' which reviews the hazard situation and then proposes some measures to address the risks. The outcome is an emergency plan to which the community has provided substantial input and which is understood by ordinary citizens. Being prepared also leads naturally to action to prevent accidents—ie. risk reduction.

Community involvement in disaster planning has been used successfully in many places worldwide. France, India and the USA, for example, have regulations to ensure that communities are consulted about disaster risks, and school education in Argentina includes emergency preparedness. Some major companies now have a more open approach to local communities. But further promotion and implementation are needed in many countries and activity sectors.

Success factors for community participation include:

- A neutral facilitator to bring the various social partners together
- Transparency in hazard information
- Regular rehearsal of the contingency plan, and community participation in rescue drills
- A governmental framework for community information and coordination of rescue services

Some of the situations where the process has been successfully employed are shown in the brochure APELL Worldwide. <http://www.uneptie.org/pc/apell/publications/apell-brochures.htm>

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Sao Sebastiao practising emergency procedures

Ruth Coutto

Communities are often unprepared when disaster strikes, and heavy losses may occur. But communities need to practise contingency plans regularly to develop the right reflexes. In an emergency there is no time to find and consult instruction manuals. Experience has also shown that many people's spontaneous reaction is misguided.

It is also important for emergency services to have practical experience of how people behave in an emergency, and how to deal with the impulsive reactions of those involved in an accident.

The city of Sao Sebastiao, in Brazil, has introduced an annual emergency practice drill for the entire community.

Sao Sebastiao is one of the nation's biggest ports, handling approximately 50% of Brazil's crude oil. Over the years urban development has encroached on the big Almirante Barroso terminal operated by Petrobras, the national oil company. Any uncontrolled accidents there would affect thousands of people.

In the late 1990s the mayor of Sao Sebastiao decided it was crucial to raise public awareness of potential hazards and increase overall safety. The APELL process (see article below) seemed to offer a workable model and he worked with Petrobras to have the process implemented locally.

In 2001 a municipal decree established an "Alert Day", with a full-scale drill being held every year on the third Saturday of October. The first drill was held the same year. In 2003 nearly 900 people played an active part in the Alert Day. The drill is followed by various celebrations and social events to promote community solidarity and drum up support for such training.

The local drills raise people's awareness of the hazards and risks to which they are exposed and show them how to react to potential accidents. They involve schools and students, using teachers who have received training in evacuation procedures and who can discuss the various aspects of disasters. The day before the drill a series of disaster-mitigation events are organised. Community-based programmes make allowance for local culture.

The city of Sao Sebastiao intends to continue this exercise in the future, convinced that a fully aware, well informed and properly trained population is the best guarantee of safety and a successful response to emergencies.

Ruth Coutto is a consultant in industrial risk assessment currently working for UNESCO.

1. More information on the Sao Sebastiao case study including audiovisuals and written explanations can be found at <http://www.uneptie.org/pc/apell/events/apellmeeting.html>.

When major disasters strike there is no shortage of relief agencies on the scene providing all sorts of assistance. Relief is the most prominent step in disaster management and, at first sight, also the most rewarding. Which explains why it is most attractive to donors. Relief and development agencies have vast experience of disaster response, but they are only just beginning to learn what risk-reduction means. It is still early days but it is becoming increasingly unusual to discuss relief without mentioning that risk reduction should really come first.

The emergency phase of a relief operation aims to provide life-saving assistance. Shelter, water, food and basic healthcare are the immediate needs. Soon after, alongside reconstruction, often in the most practical sense of the term as we may see from the work of "emergency architects", comes rehabilitation. This is where UNEP steps in to ensure that disaster rehabilitation includes environmental management components from an early stage on, the aim being to make it an integral part of any disaster risk reduction strategy.

Afghanistan on the brink of natural disaster

Francis Caas, Yoko Hagiwara and David Jensen

Plagued by natural disasters and conflicts

Afghanistan is prone to natural disasters. Nature's destructive patterns routinely affect and wreak havoc on the central Asian nation and its people. Earthquakes are frequent in the northern parts of the country and often trigger devastating landslides. Flooding and mudslides are common, particularly in the spring when snow starts melting. Extreme winter conditions and avalanches are also a recurrent feature in the mountainous areas that make up approximately 63% of the country. In the last six years Afghanistan has also been suffering a prolonged drought, which affects over 6 million Afghans mainly in the southern and eastern regions.

Other common hazards include agricultural pests, such as caterpillars and locusts, and dust and sandstorms. All in all it is estimated that natural disasters have killed more than 19,000 people and affected about 7.5 million Afghans since the early 1980s.

While Afghanistan has been adversely affected by natural hazards for centuries, the wars and civil conflicts that have plagued the country for more than 20 years, combined with increased environmental degradation and mismanagement, have heightened its vulnerability to damage wrought by natural hazards.

Far away memories

It is difficult today to imagine, when looking at Afghanistan's often arid and barren landscapes, that many of them were once covered by woodland and were home to rich flora and fauna. Emperor Babur, the founder of the Mughal Dynasty who captured Kabul in 1504 and had a keen eye for natural beauty, records in his memoirs the rich biodiversity of Afghanistan, home

to animals such as cheetahs, tigers and wild asses. Until the middle of the 20th century Afghanistan had much more extensive forest and plant cover than today. This included high-alpine flora, montane coniferous and mixed forests, open dry woodlands with juniper, pistachio and almond trees, semi-desert scrub and marshlands. Today most of the country's forest cover has already disappeared or soon will. This is due to a combination of factors, among them, uncontrolled overgrazing, unsustainable agricultural practices, heavy logging for cooking, building and heating purposes and intensive timber cutting for both commercial reasons and to fund military activities. Armed conflicts have also taken their toll on the country's forests. Trees have been cut not only for fuel but also to make it harder for competing armies and rebel bands to hide and ambush one another.

When a UNEP team visited Afghanistan in 2002 to conduct a post-conflict environmental assessment, it was overwhelmed by the level of deforestation it found. Not a single tree was left standing in many areas of the Badghis and Takhar provinces, which boasted complete forest cover only three decades before. At the majority of sites visited, UNEP observed vast expanses of bare or eroding soil where local livelihoods were devastated, and both the frequency and intensity of floods were reported to have increased threefold. Local rivers have consequently suffered heavy erosion and expansion. The width of the Cheshmanduzuk River near Qala-i-Nau, for instance, has increased from 50 metres to more than 250 metres, wiping out fertile farmland and villages in the process.

Reducing vulnerability, increasing sustainability

While it is not possible to completely prevent or avoid natural disasters, the level of suffering and vulnerability of the affected people can and must be

reduced as far as possible. This can be achieved through proper awareness and preparedness of the population and authorities, by setting up early warning instruments, impact mitigation and rapid response mechanisms, and by using local knowledge and management practices to develop mitigation programmes. The severity of certain natural disasters can also be reduced through proper and adequate management of natural resources.

In Afghanistan the rapid loss of forest and plant cover over the last 25 years has accelerated soil erosion and land degradation, creating in turn ideal conditions for landslides, flash floods and extreme flooding events. Landmines have made the situation even worse. We may never know the total number, but Afghanistan is thought to be one of the most heavily mined countries in the world, with an estimated 10m to 15m landmines still on the ground. In 2002 the UNEP team had first-hand experience of how flooding and landmines can combine to deadly effect. Near the village of Farkhar in Takhar province, a swollen river burst its banks and washed across an active mine field. It swept thousands of mines downstream, creating untold dangers for unsuspecting villagers and laying a swathe of mines across local roads and fields, ending barely five metres from a local school.

In its report "Living with Risk", the UN International Strategy for Disaster Reduction (ISDR) lists economic, social, physical and environmental factors as largely affecting a country's level of vulnerability to natural disasters. In Afghanistan 23 years of war have also contributed to the near total collapse of local and national government structures in charge of managing natural resources, adding to its already high vulnerability. Before the outbreak of the war, many communities had developed, in collaboration with the authorities, ways

and means of allocating resources and ensuring their sustainable use. With the breakdown of government and community structures, Afghanistan's use of resources spun out of control, leading to a "tragedy of the commons" scenario with widespread environmental degradation and heightened vulnerability to natural hazards. It is consequently crucial to rebuild and reinforce environmental governance structures.

Poverty is the real killer

Afghanistan is one of the poorest countries in the world. According to the Afghanistan Information Management Service (AIMS), the country's "high level of poverty, lack of livelihood and income generating opportunities, chronic health problems, and poor state of the infrastructure all add to the burden of natural disasters on the people of Afghanistan". UNDP, in its report "Reducing Disaster Risk", states very clearly that death rates are far higher in poor countries than in wealthier nations, even if the incidence and intensity of disaster is equal. "The real killer is poverty not the forces of nature: only 11% of the people exposed to natural hazards live in poor countries, but they account for more than 53% of the total number of recorded deaths", says the report.

In short, the lack of effective environmental management and the extensive environmental damage and degradation have made Afghanistan and its people extremely vulnerable to natural disasters. Afghans are not only helpless when confronted with nature's hazards. They also have to cope, day after day, with a host of environmental hazards, ranging from polluted streams and disease-laden sewage systems to diesel-filled urban air and other environmental hotspots. While natural disasters tend to highlight the plight of the people and bring it to international attention, the environmental problems facing Afghanistan run much deeper and are very closely linked to structural issues,

such as poverty, lack of capacity and control over resources. Consequently, while emergency strategies need to be put in place to respond to natural disasters, longer-term environmental restoration and rehabilitation policies also need to be devised to address the country's environmental woes and put it on a sustainable development path. An important part of this process will be integrating local ecological knowledge and management practices into land-use plans and restoration programmes, and in ensuring active participation of communities in decisions that affect them.

What does the future hold?

To ensure on-going reconstruction of the country takes environmental issues into account, UNEP is now in the process of consolidating the environmental management capacity of the Afghan Ministry of Irrigation, Water Resources and Environment. With \$5.4m funding from the European Commission, the government of Finland and the Global Environmental Facility, UNEP will be spending the next three years training ministry staff, providing basic equipment and developing structures and policies for natural resources management, rehabilitation and sustainable use. The pioneering programme¹, the first for UNEP, operates an office in Kabul with five international and 10 national staff.

It has high hopes that improved environmental management in Afghanistan will lead not only to sustainable livelihoods, but also to reduced risks from natural disasters. If both goals can be achieved, Afghanistan could become a model of success for other countries to follow.

Francis Caas and Yoko Hagiwara are programme officers at UNEP's Post-Conflict Assessment Unit in Geneva. David Jensen is Afghanistan Project Coordinator at the same unit.

1. The programme's latest progress report can be downloaded from <http://postconflict.unep.ch>.

Environmental reconstruction of conflict and disaster areas

Francis Caas, Yoko Hagiwara and David Jensen

Scale of Environmental Impacts

The scale of environmental impacts caused by a conflict largely depends on the duration of combat and the state of industrial development in the country. The conflict in Afghanistan lasted approximately 23 years, causing a complete collapse of national and local government. The resulting environmental degradation was mainly caused by extreme poverty and the breakdown of government. Wide scale impacts to the forests, water, soil and wildlife reduced the productive capacity of the countryside, and undermined both food security and the sustainable human livelihoods. If left unaddressed the environmental problems will undermine the reconstruction process and lead to further instability as people fight for scarce resources. Solutions to environmental problems in Afghanistan begin by building the basic capacity for environmental management, resolving land tenure disputes and then progressing towards field-based restoration programmes and the development of sustainable livelihoods. Successful restoration will take decades to complete

and will require sustained assistance from the international community.

Recent conflicts in Serbia and Montenegro (former Federal Republic of Yugoslavia - FRY, 1999) contrast markedly with Afghanistan. In both countries, the conflicts lasted for only a few months, and the primary environmental impacts were largely caused by direct bomb damage to industrial facilities, and the subsequent release of toxic chemicals. In such cases the vulnerabilities created were acute risks to human health from the contamination of air, soil, groundwater and locally produced food. Addressing these problems and reducing risks mainly involves technical solutions that can be implemented in several months to years. The UNEP programme to clean-up environmental hotspots in Serbia and Montenegro is a good example of successful risk reduction after a technology disaster caused by a conflict.

Conflicts and clean-up

During the 1999 conflict in the FRY the intensity of air strikes, the targeting of industrial and military facilities, and dramatic television pictures combined to fuel claims that an environmental disaster

had occurred with massive pollution of air, land and water. In the meantime NATO was emphasising its policy of selective, precision targeting and denying reports of an environmental crisis. As is generally the case in times of war, it became hard to separate fact from rumour and propaganda. UNEP and the UN-HABITAT programme initiated a neutral, independent, scientific assessment of the environmental situation in Serbia and Montenegro.

They carried out a field assessment between July and October 1999 involving extensive field missions and desk study. Their findings were published in October 1999 in "The Kosovo Conflict - Consequences for the Environment and Human Settlements". This report concluded that the conflict had not caused a widespread environmental disaster, but that more localised impacts - combined in some cases with a long-term legacy of poor environmental management - were cause for concern. In particular the environmental situation at four hotspot locations in Serbia (Bor, Kragujevac, Novi Sad and Pancevo) was so severe that urgent clean-up action was recommended on humanitarian grounds. The list of toxic chemicals that were leaching

into groundwater and contaminating soil and air was long and included ethylene dichloride (EDC), dioxins, mercury, and polychlorinated biphenyls (PCBs).

Through a combination of fundraising efforts, rigorous project prioritisation and thorough technical preparation, UNEP was able to implement 16 works projects at the four hotspot sites for a total cost of \$12.5m. In addition, other international partners provided bilateral support for a further six projects, meaning that 22 clean-up projects in all were able to go ahead.

At the oil refinery in Novi Sad, UNEP worked in close cooperation with Novi Sad Waterworks making an immediate start on construction of a hydraulic barrier to prevent the migration of contaminated groundwater from the refinery area towards drinking-water wells. At the Pancevo petrochemical plant, UNEP and other partners installed the necessary equipment at the vinyl chloride monomer (VCM) plant to recover and treat approximately 400 tonnes of EDC that had spilled from storage tanks damaged during the conflict. At the Zastava car factory in Kragujevac, the UNEP Clean-up Programme, working with the Kraguje-

vac University's Institute of Chemistry, removed and disposed of a total of 135 tonnes of hazardous waste resulting from the clean-up work.

All of these projects have improved the environmental situation and significantly reduced risks to human health and well-being at the four hotspot sites. While the main focus of the UNEP Programme has been the physical work needed to mitigate environmental problems and associated health risks, institutional strengthening and capacity building has helped local and national institutions better to assess environmental vulnerabilities and manage risks.

Case by case solutions

UNEP's experience in Serbia and Montenegro, Afghanistan and now other countries including Iraq and Liberia highlights the need for environmental assistance to be part of the post-disaster reconstruction agenda. While immediate assistance should address urgent environmental and health risks, environmental rehabilitation and institution building should be an elementary part of the efforts to repair infrastructure and lay the foundations for environmental governance.

Equipping communities with safer technology for non-engineered construction

The photograph shows an improvised shaketable demonstration in Kabul by an expert from UNCRD Disaster Management Planning's Hyogo office. Among others, the office promotes safer building practices in developing countries using a community-based approach. High human casualties in earthquakes are often due to the collapse of traditional adobe and masonry houses built informally by homeowners. There are many such dwellings in seismically active parts of the world. Through training and confidence-building measures targeting local builders, technology transfer through pilot demonstrations and simple engineering guidelines, the UNCRD programme fosters technological awareness among homeowners and builders, and collaborates with local government to facilitate the application of construction guidelines.

The Hyogo office was set up in Kobe, where the Great Hanshin-Awaji earthquake claimed some 6,000 lives in 1995. It promotes effective disaster mitigation, focusing on three key factors: self-help, cooperation, and education.



Bridging the gap between human and environmental disasters

Roy Brooke

Was the Bhopal chemical plant accident an environmental or a humanitarian disaster? What about the Mount Pinatubo volcanic eruption, which had far-reaching consequences for the environment as well as a severe impact on local people? And any other disaster, which regardless of its origins, affects either people, the environment, or both? Too often, disasters get labelled as being one or the other without considering their consequences in a holistic and integrated fashion.

This compartmentalisation is reflected in how the disaster management community often responds to disasters. Many organisations are capable of providing humanitarian relief, but few have the mandate and experience to respond to environmental disasters and integrated response capacity is rare. At the international level, the Office for the Coordination of Humanitarian Affairs (OCHA) and UNEP founded the Joint UNEP/OCHA Environment Unit in 1994 to address this.

Effects cross over; response should too

Very often, natural disasters bring harm to people and simultaneously change the environment. As such, important volcanic eruptions may produce combined negative results: human victims, destruction of natural habitat, heavy atmospheric pollution leading to climate change. Large-scale floods and landslides may equally well damage soil and crops, affect important ecological areas, kill people.

On the other hand, technological or industrial accidents may have devastating effects on both population and the environment. Toxic spills from dumping sites and obsolete dams pollute rivers, kill aquatic life and pose serious threats to human health. Fires at pesticide storage facilities may lead to serious environmental damage and have negative effects on humans. Chemical pollution is dangerous both to people and other elements of the environment. That is why various man-made accidents, such as explosions, fires, toxic leakages and pollution, are normally called by the single name "environmental emergencies". However, the application of this term would depend on the general approach to interaction between humanity and the environment.

Take the well-known Bhopal accident, which is usually referred to as a serious environmental emergency. In fact, it turned out to be a human tragedy, when a poisonous gas escaped from chemical plant, killed thousands of people and left many more blind. Toxic gas disappeared relatively quickly leaving no other damage. In this case, if human beings and the environment are taken separately, this industrial accident should be called a humanitarian disaster than an environmental emergency.

Oil spills, especially large-scale events, such as the Amoco Cadiz, Exxon Valdez

and the Russian Komi spill, represent environmental emergencies that may badly affect nature without direct harm to human beings. In this case, economic activities may be disrupted but human life is not normally at risk. Special classes of truly complex environmental emergencies such as the Chernobyl nuclear disaster or the Gulf conflict, and a combination of natural and technological emergencies also exist.

Although there are certain differences in this great variety of disasters, from a practical point of view the causes of various emergencies are irrelevant. The fact is that all of them have negative impacts on various elements of the environment and can have devastating primary or secondary humanitarian impacts. This common point is important for practical assistance in case of different types of emergencies.

Traditionally international emergency assistance has evolved as purely humanitarian assistance. Assistance concentrated exclusively on human beings and its main task was to provide relief to the affected population by bringing food, drinking water, clothes and medicine. But industrialisation in many parts of the world, especially in developing countries, and the inevitable accidents, have increased the environmental awareness of the international community and led to the development of international environmental assistance.

Gaps recognised, solutions sought

However, up to now only two particular types of disasters have been covered by international arrangements: the International Atomic Energy Agency (IAEA) may provide assistance in the event of nuclear accidents; and the International Maritime Organisation (IMO) takes responsibility for marine oil pollution from vessels. Many other kinds of environmental emergencies in developing countries, including industrial and chemical accidents, have remained without consistent assistance.

OCHA and UNEP sought to address this situation, considering two pragmatic aspects: the fact that human populations and the environment are closely interlinked and should be considered and treated as one single structure; and the availability of basic international mecha-

nisms for traditional humanitarian relief that could be used for the provision of environmental assistance.

The idea was that "by helping people we assist the environment, and by assisting the environment we help people". Indeed, some simplistic examples can be given. If an affected population receives enough international food assistance, they will not continue poaching; if they get appropriate fuel, they will stop cutting down trees.

On the other hand, when environmental assistance is provided – for instance in response to a chemical spill – it may save both aquatic organisms and human life. It means that international humanitarian and environmental assistance are as closely intertwined as man and the environment in general. These processes should therefore go hand in hand and be further developed as a single operation.

Moreover in many cases the practical form of international response would be the same in either type of emergency. A breaking dam containing toxic sludge must be repaired in any instance, whether it poses a threat to fish, people, or both. A harmful oil spill must be cleaned up, regardless of its exclusively environmental impact, provided the cleanup does not cause more ecological damage than the oil. Appropriate measures should be taken with regard to an accident at a chemical plant, in spite of its impact on humans only.

Now affected countries know exactly where to turn to in case of various emergencies, including environmental ones. Potential donor countries quickly receive all available information on disasters, which helps them to determine precisely what is needed in specific situations, taking into account assistance provided by difference sources. This speeds up the reaction of the international community and focuses it on the most immediate needs. Unified Humanitarian-Environmental International Assistance is now coordinated and better provided to those in need.

Roy Brooke is programme officer at the Joint UNEP/OCHA Environment Unit.

The Joint UNEP/OCHA Environment Unit

Following major industrial accidents (Bhopal 1984, Schweizerhalle 1986, Tchernobyl 1986), the international community realised that the emergency response to industrial accidents (and negative consequences of natural disasters) often require specialised expertise at very short notice. UNEP and the UN Office for the Coordination of Humanitarian Affairs (OCHA) responded by establishing the Joint UNEP/OCHA Environment Unit.

The Joint UNEP/OCHA Environment Unit serves as the integrated United Nations emergency response mechanism to activate and provide international assistance to governments facing environmental emergencies. The role of the Joint Unit is to rapidly mobilise and coordinate emergency assistance and response resources to countries affected by environmental emergencies and natural disasters with significant environmental impacts.

<http://ochaonline.un.org/ochaunep>

Architects contributing to post-disaster recovery and prevention

Architectes de l'Urgence

With increasingly frequent and violent natural disasters there is growing realisation that architects too can contribute to post-disaster recovery and preventing recurrent damage. Architectes de l'Urgence (AU) was formed after flooding of the Somme basin of France in 2001. Oddly architects are all too often notably absent in humanitarian emergency teams, despite the fact that their structural, planning and environmental know-how is generally essential. In some cases they are the only technicians capable of striking a balance between technical and natural factors. AU has also observed that very little funding is allocated to reconstruction. Some \$250 was allocated for rebuilding each dwelling in Afghanistan in 2002, with only \$234 earmarked for equivalent work in Bangladesh in 2004.

AU has worked in various countries hit by natural or technology disasters reaching from the Maghreb (Algeria, Morocco), France and Eastern Europe, to Turkey, Iran, Afghanistan and, most recently, Bangladesh. The scope of its work ranges from floods and earthquake to technology disasters.

Following the earthquake in Afghanistan in March 2002, centring on the Nahrin district – 90% of the town itself was destroyed – several AU specialists joined a team organising reconstruction of 5,000 dwellings for victims. It became clear during their stay that there was an urgent need to train people to work in the building trade. With the chronic instability that has dogged the country since the Soviet invasion in 1979 many architects, for instance, have moved abroad or changed jobs.

In early 2003 AU received a French government grant for a mission to remedy this situation. It opened its first workshop in July 2004 at the Architecture Department of Kabul University. The current priority is to prepare local architects for cooperation with NGOs and for work on the major development projects the government is about to launch.

Following the disastrous flooding in Bangladesh and part of India in July 2004 an AU team took part in a UNDP mission to Dhaka to assess damage and propose counter-measures. This led to a project to design and build, in partnership with local people and contractors, a series of prototypes, capable of withstanding subsequent disasters.

Designs must take account of practical, technical, cultural and religious factors to ensure structures are acceptable. Preparatory work includes studies of traditional structures, techniques and materials. Apart from being understood and accepted by the community, the buildings must also integrate well with the environment.

We have selected several technical solutions. The first is mounted on piles and represents a traditional response to wetland occupation, with living quarters located above the high water mark. Although there is disagreement about the widespread feasibility of this solution in Bangladesh, it is well suited to certain situations and technically quite

straightforward. However cultural factors, notably people's relationship with the ground, may hinder acceptance.

Another solution is to build a raised platform of packed earth covering about 150 sq m. This is likely to be better accepted by Bangladeshis, who are used to living close to the ground. Given the availability of water, even in the dry season, and the small amount of land not used for urban development, this solution offers a common sense answer to environmental constraints. Unfortunately it cannot be used on all types of terrain. The height of the platform required in some places may also make it too costly. Moreover it is hard to predict how building such platforms would affect the surroundings.

A third possibility is to build floating houses, as is common practice in Vietnam. As the structures are moored this technique can only be used in areas where the water level rises, or falls, gradually. Another approach would be to design homes that only float during flooding.

As well as designing new buildings to cope with changing climatic conditions, there are several more conservative solutions which only involve adapting existing structures. An extra floor may for instance be added to dwellings to act as a refuge. Flooding in many villages rises to as much as two metres, making the ground floor quite unusable. A refuge on the spot would limit the number of displaced persons. The extra floor could also be used to store everyday necessities, personal effects and reserves of food and drinking water. A simpler variation on this idea would be to adapt roofs, already a frequent refuge during floods, the better to accommodate temporary use.

Another addition, familiar to European families living near hazardous facilities, might be a safe room. In its most limited form it could simply be a box containing essentials such as drinking water, food, personal effects and cooking implements. It would have to be made with locally produced materials, but perhaps involving composite construction techniques.

The last point is perhaps the most important and is not even directly related to building. Odd as it may seem in a frequently flooded country the most acute problem is securing drinking water. And it is too late to distribute water purifying systems once flooding occurs. Thought needs to be given to designing a simple way of collecting rainwater falling on dwellings, for use during crises and perhaps all year round too. It would solve at least one major health problem that arises after each flood.

None of these suggestions claims to be a ready-made solution. In the spirit of sustainable development we are sure that a satisfactory solution will consist of many small responses that have been properly understood and accepted at a local level. As floods will unfortunately recur only the people on the ground can find the key to the problem. We must contribute to raising awareness and understanding of risks.

Architectes de l'Urgence is a French NGO founded in 2001.

Translated by Harry Forster.

An increasing number of business and industrial associations are involved in programmes to prevent and prepare for disasters, as well as reducing the associated risks. In the "forum" on the following pages we give the floor to some of them. Such private-sector initiatives are much needed, but they often only start after internal – "we cannot afford this" – and external struggles – "this is primarily a job for governments". So

private companies taking responsibility for disaster reduction are still seen as pioneers. There are a host of opportunities but we need to recognise the limitations too.

UNEP's APELL programme has been in the forefront of initiating relevant associations and proposing concrete action to improve a company or town's preparedness arrangements.



Every day, Philippine gold miners pass several posters that remind them to work safely, a visible component in the effort of prevention at the Lepanto Mines in Luzon, Philippines.

(The miners queue for a full body search to prevent them from smuggling out gold as they leave for home at the end of their work day.)

NB: The Lepanto Consolidated Mining Company (LCMCo) is not a member of the ICMM.

REUTERS/Fernando Zapata Jr DL PHILIPPINES MANKAYAN Photo by STRINGER/PHILIPPINES. 23/06/2002

APELL and the mining and metals industry

Andrew Parsons

Leading mining and metals companies are committed to continuous improvement of their sustainable development performance. Strengthening, advancing and promoting comprehensive safety and emergency measures is crucial to this commitment.

Mines and mineral processing and metal fabricating facilities are large and complex operations that involve workers and interact with neighbouring communities and the environment in similarly multifaceted ways. Notwithstanding the ongoing design and application of measures to ensure these interactions are positive and safe, the mining and metals industry recognises that none of its operations can ever be completely free of risk. Similarly, the industry acknowledges that if an accident were to occur, it could affect the environment and communities beyond the boundaries of the operation.

In the event of an accident, communities can be affected by direct exposure, or psychologically by fear of unknown impacts. Both real impacts and fears can be significantly lessened if local communities and emergency services are adequately informed of potential risks and briefed on how to respond. More importantly and beyond one-way communication,

if an emergency response plan is to be successful, neighbouring communities, regional emergency services and site operators need to work collaboratively to design the necessary steps and their application. Recent, well publicised accidents have shown there is considerable scope for improving performance.

The International Council on Mining and Metals (ICMM), the representative body for many of the world's leading mining and metals companies and associations, is working in partnership with UNEP to promote the adoption of good practices in the awareness, preparedness and response to emergencies in this sector, as set out in the Awareness and Preparedness for Emergencies at Local Level (APELL) process. UNEP developed APELL in partnership with industry associations, communities and governments to provide a structured process for including communities in the development and implementation of emergency response plans.

In 2001 the International Council on Metals and the Environment – ICMM's predecessor – and UNEP co-published "APELL for Mining". For the first time it provided guidance on the application of APELL in the mining sector. The current collaboration between ICMM and UNEP will extend this work by contributing

more detailed guidance and practical experience through case studies.

The overall aim is to help companies and neighbouring communities prepare for and respond to the risks associated with mining and metals facilities, transportation of chemicals and other products to and from these facilities, natural disasters, and other hazards.

ICMM and UNEP will be publishing a compilation of case studies, "Involving the Neighbours in Emergency Planning", in mid-2005.

The publication will help companies develop appropriate local emergency management plans that are consistent with local, regional, national and international regulatory requirements. In addition, it will provide companies with examples of good practice and lessons learnt which demonstrate the practical application of engaging and involving communities in emergency preparedness. Finally, it will seek to broaden understanding of what companies need to do, in partnership with local emergency response services and the community, in the event of an emergency or disaster.

Andrew Parsons is Director of Environment, Health and Safety Programme at the International Council on Mining and Metals (ICMM).

Involve business in disaster reduction!

John Reed

Disasters, natural or man-made, are of course extremely disruptive to business. Learning to cope with disaster has been painful for business. Many small businesses never recover from the effects of disaster, even if insured, and the insurance business, especially re-insurance, fears that several major disasters in short succession could be disastrous to itself.

Disaster management in the corporate/business sector is seen as both a humanitarian and a business activity. A community depends on local business, and especially in poor countries the effects of disasters can be long-lasting. Looking at the broad picture, business sees disaster management as a strategy to protect a nation's potential for growth.

In practical terms this means adequate measures to protect both business and the community. Clearly this is a viewpoint that government can share.

However, on the positive side, business has had a great deal of experience in mitigating their effects. The business sector has much to offer to government and other stakeholders, at national and local level, in their management. An enormous potential is there. What is needed is improved coordination between business, government and others.

Business can provide both emergency help and long-term assistance. In an emergency the business sector can deliver such essentials as technical manpower and goods. At present these services are largely untapped. Looking at the long-term, busi-

ness now has well-developed, mature approaches to environmental management. Its systematic approach to such matters can be applied to disaster management.

Local authorities need to provide a framework for unleashing the full potential of the business sector. Policies that contribute to safer industry are obviously an incentive for business to be more involved in disaster management. Business should be invited to participate in policy decisions affecting national and regional land use. Developments in upland areas, for example, can affect flood control. Flooding is often a consequence of the impacts of unsustainable agricultural and forestry management practices.

John Reed is environment correspondent for the International Chamber of Commerce (ICC) in Geneva.

Preventing chemical disasters

Mara Caboara

The chemical industry has been at the forefront of disaster prevention. Industrial disasters on the scale of Seveso and Bhopal prompted chemical firms to rethink their response to accidents, and, more generally, how they do business.

In 1987 the global chemical industry launched a voluntary initiative, Responsible Care, committing chemical companies to achieve continuous improvements in environmental, health and safety performance beyond levels required by local and international regulations. A fundamental element of Responsible Care is open communication with governments and international and local organisations, including disaster prevention and emergency response.

Chemical companies are working to prevent chemical accidents and reduce their impact. Global and regional networks are a crucial part of this strategy. In Europe the International Chemical Environment (ICE) network of emergency professionals provides information, practical help and equipment to the competent emergency authorities to cope with chemical incidents.

In the United States the Chemical Transportation Emergency Centre (CHEMTREC) operates a public-service hotline for fire fighters, law enforcement, and other emergency agencies, providing data and assistance for incidents involving chemicals and hazardous materials.

The chemical industry, in countries such as Japan, Mexico, Canada, China and Thailand, has also set up emergency networks. Every major region and country has developed and adapted its own system, following ICE and CHEMTREC guidelines.

Chemical companies are complementing emergency networks with their own schemes and systems. For example, most global chemical companies provide their deliveries with safety data sheets, emergency procedures and emergency labels, usually under the supervision of national technical agencies.

Companies may also offer direct assistance and support to disaster victims, by funding recovery activities, helping implement conservation and emergency-preparedness plans, and offering medical care to victims and their families.

These are only a few examples of disaster prevention and management practices in the chemical sector, over and above concerted action by chemical industry networks. Our experience at association and company-level has led us to formulate our own recommendations on how best to use international resources in disaster prevention and remediation, and how public-private partnerships may reduce impacts.

We must create a portfolio of disaster reduction actions, compiling best practice and lessons learned from previous disasters, and a catalogue of technologies for disaster reduction. The chemical industry should share well-developed codes, translated into several languages and adapted to the different environments in which we operate.

We should also do more to integrate environmental emergency preparedness and response activities into strategies and sustainable development programmes. In particular we must identify specific activities, to implement relevant provisions of the 2002 Johannesburg Plan of Implementation, and conform more closely with the Millennium declaration and its goals.

Discussion of emergency prevention, preparedness and response issues involving the competent authorities, private sector and general public must develop. We should assess the effectiveness of existing public-private partnerships. Would the World Conference on Disaster Reduction, for instance, be an appropriate venue to create new partnerships, and if so, how should partnerships differ from existing ones?

Lastly we must develop and enhance early-warning systems, still the most critical aspect of risk reduction. We need to create suitable technical instruments, constantly monitored and improved by networks of professionals. The lack of suitable early-warning systems is the key obstacle to prevention, allowing accidents to develop into fully-fledged disasters.

Mara Caboara is the manager of the International Council of Chemical Associations.

Knowledge management and education for disaster reduction

Badaoui Rouhban

Knowledge management and education can help communities in hazard-prone areas to gain a better grasp of the ways to cope with risks. Knowledge and innovation, education, formal and informal, are closely linked to disaster-reduction efforts. Disasters can strike at any time and it is the magnitude of the related impacts that will reflect the level of preparedness and “education” of the exposed country and community. It is now widely agreed that achieving disaster-resilience is essentially a process of using knowledge and of learning at all levels.

Advancement, transfer and sharing of knowledge are key foundations for disaster risk management. When it comes to living with risk, we must embrace education in all its forms, from drills involv-

ing disaster simulations in primary and secondary schools to advanced university and post-graduate studies. We must also capitalise on traditional local knowledge about hazards. Nor can there be sustainable development without education in disaster reduction.

Education for disaster reduction and human security should not be a one-off affair, but rather a continuing process, offering individuals lessons in coping with hazards not just once but several times throughout their lives. Furthermore education and raising awareness of disaster risks must respond to society’s changing needs and focus on empowering individuals throughout their lives. Educating all sectors of society on disaster reduction actions that are based on application of sound scientific, engineering, and cultural principles to create sustainable

systems therefore constitutes a long-term UNESCO goal.

UNESCO is well placed to address the challenge of mainstreaming knowledge applications and education in disaster prevention and preparedness into the broader agenda of education for sustainable development. Through its international coordination role in the forthcoming UN Decade of Education for Sustainable Development (2005-2014) and drawing upon its experience of intersectoral programming, UNESCO will promote and support efforts to ensure that disaster education is integrated into international action to create a safer world. Indeed, multidisciplinary approaches should be fully embedded in the International Strategy for Disaster Reduction.

Dr. Badaoui Rouhban heads the Section for Disaster Reduction of the Natural Sciences Sector at UNESCO.



“Namazu to kaname-ishi” (Namazu and the foundation stone). Fires rage and the earth shakes while a tired-looking Ebisu – filling in for the Kashima Deity who is out of town to attend a meeting in Izumo – dozes. And what else is going on? For one thing, money (large gold coins) is falling from the burning city.

The person on the left is the thunder deity. He seems to be engaging in a peculiar pastime of the less sophisticated Edoites – extreme farting, or “thunder farting.” The object of this new sport was to make more noise than your opponents. What might look like excrement are actually small drums, which emphasize the “thunder” element.

The guy on horseback at right is the Kashima deity, rushing back from his meeting (with other major deities – they have a convention every year) in Izumo. So, the Kashima deity is out of town, his temporary replacement, the likeable but less diligent deity Ebisu, is sleeping on the job, and the thunder deity, who should be working, is off at the Ryōgoku Bridge literally farting around. And these incompetent deities have allowed a major disaster to unfold in the form of a fire-ravaged, post-earthquake Edo.

For more pictures about disaster-causing gods and fish see <http://www3.la.psu.edu/textbooks/172/graphics/ch8/10.htm>.

Infrastructure: a key issue for disaster reduction

Peter Boswell

The physical infrastructure sector is an important part of most economies. Urban and industrial infrastructure is planned, approved, built and operated according to elaborate rules, standards and criteria established by clients and regulatory authorities. Ensuring that such infrastructure is safe is a major issue for governments and industry. Vital community infrastructure must go on working after natural and other disasters to ensure rapid recovery can occur. Some infrastructure such as emergency response teams, hospitals and waste treatment and disposal facilities are there to deal with the consequences of disasters.

Consulting engineers are largely responsible for designing, planning and manag-

ing infrastructure and the profession has huge potential to contribute to disaster reduction and recovery. As the industry’s global voice, the International Federation of Consulting Engineers (FIDIC) speaks for more than 1m professionals in 44,000 firms worldwide.

One of FIDIC’s roles is to develop the capacity of private sector consultants to maximise their contribution to disaster reduction. It is advising member associations to actively participate in development of national best-practice guidelines and procedures.

The most visible part of disaster management is the response phase, which starts with immediate search and rescue, where engineers are trained in survival skills. Then follows a safety evaluation of criti-

cal infrastructure such as hospitals and dams before extending to transport and service utilities. Several national industry associations have developed preparedness mechanisms for infrastructure facilities with which member firms already have links. In this way key organizations have timely access to engineers familiar with their operations.

The next response phase is evaluation of building safety, generally carried out in partnership with local authorities. This may be followed by the fast-track procurement of remedial infrastructure such as rebuilt dams and temporary roads and bridges.

Wider mechanisms for preparedness, response and recovery depend on extending this partnership to other

stakeholders. Normal development and zoning plans increasingly recognise the importance of non-traditional stakeholders. Consulting engineers help to define how these stakeholders are incorporated into plans.

International, national and local registers of professionals and firms that have demonstrated disaster-prevention and response capacity and skills help to build effective partnerships. Some registers cover safety evaluation and fast-track procurement of critical infrastructure such as potable water supplies, telecommunications systems and airstrips.

In the longer term, risk reduction strategies are needed to take a systematic approach to disaster avoidance. These incorporate elements such as risk identifi-

cation, assessment, monitoring and early warning for emerging risks such as climate change, deforestation and soil degradation, and from development patterns and urbanization. Future investments must take these aspects more systematically into the core planning process, and consulting engineers are key players in the design and delivery of more ‘sustainable’ infrastructure. Reduction strategies are rendered operational through land use planning, use of construction codes, adoption of environmental management systems in ongoing operation, and increasingly, using project sustainability criteria that advance progress towards millennium goals.

Peter Boswell is the General Manager of the International Federation of Consulting Engineers (FIDIC), Geneva, Switzerland.

Cyanide Management Code

Norm Greenwald

Toxic chemical spills and accidents are a controversial issue with the general public and emergency services. Modern gold-mining processes use cyanide solutions to extract the precious metal from ore. It is then discarded in large ponds or “tailings dams”. The toxicity of cyanide is well known, and although industrial use of this substance has caused relatively few fatalities, public concern is running high. Following a number of spills during transport and from tailings dams in the 1990s, the mining industry started a review of safety procedures for cyanide usage.

Following another highly publicised accidental release of large amounts of cyanide and tailings from the Baia Mare gold mine in Romania in January 2000, the industry committed itself to framing an International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold (referred to as the Code). Under the auspices of UNEP and the International Council on Metals and the

Environment, a multi-stakeholder steering committee convened, representing the gold mining industry, governments, non-governmental organizations, the workforce, cyanide producers and financial institutions. This committee devoted almost two years to drafting an international voluntary programme for safe management of cyanide in gold mining.

The Code is an emergency management instrument that covers the whole life cycle. It addresses risk prevention, safe operations, emergency preparedness and possible responses to accidents. It sets comprehensive performance goals: manufacture of cyanide for use in the gold industry; cyanide transport to mines; cyanide handling and usage in gold production; decommissioning of cyanide facilities at mines and financial guarantees; workforce health and safety; emergency responses; workforce training; and public awareness of cyanide use in mining.

Companies voluntarily commit to the Code, but purchasers and users must

only deal with cyanide producers and transporters using safe procedures. Third-party auditors will assess operations for compliance every three years. Auditors must meet criteria for experience, expertise and conflict of interest and use a published audit protocol. Summary audit results will be posted on the internet for review by interested stakeholders and the public. The International Cyanide Management Institute (ICMI), a non-profit organization, monitors Code implementation.

Preparing, then implementing the Code proved an innovative process, involving community and government representatives as well as industry. Its comprehensive reach, spanning the entire life cycle, from production and use to disposal, will make accidents a less common occurrence in the future and make mitigation easier.

Norm Greenwald is the manager of the International Cyanide Management Code.

1. www.cyanidecode.com.

Training local authorities

Julia Fredriksson

Injuries are a serious problem for the health of any population. Cooperation between Russia and Sweden promotes accident preparedness at the local level with the focus on reducing the number of accidents and injuries. The threats facing rescue personnel in emergency operations have changed in recent years too. They are still the first on the accident scene and play an important part in saving lives and helping the injured people, but as well as being heroes they often become victims. There is a need to improve the capability and knowledge of rescue personnel in order to minimize secondary incidents.

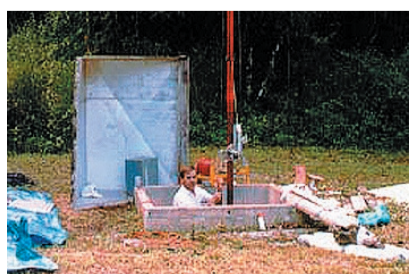
The UNEP/APELL cooperation programme in the North West Region of Russia is addressing several scenarios, now or in the future: a severe traffic accident in the countryside; emission of toxic gas (chlorine) from an industrial plant; a natural disaster caused by a severe snowstorm and an ammonia spill as a result of a transport collision; floods

involving various damage scenarios, and petro-chemical and pipeline risks.

One of the results of the APELL programme is the start of a network linking competent authorities, not only at government level, but also local-level in the North West Region of Russia and in Nordic countries. They have pooled risk assessment know-how and experience and introduced adequate prevention and preparedness measures to guarantee effective cooperation and response in an emergency.

The goal is to continue cross-border cooperation, developing and enhancing the ability to prevent accidents and improving risk communication with the general public through better information and a greater awareness of risks and countermeasures. Collaboration will contribute to achieve safe and secure communities in the North West region of Russia.

Dr. Julia Fredriksson is a Senior Executive Officer at the EU and International Affairs Department of the Swedish Rescue Services Agency.



GUMO – Guam, Marianas Islands



YSS – Yuzhno Sakhalinsk, Russia



WMQ – Urumqi, China



ERM – Erimo, Japan



LSA – Lhasa, Tibet

Tokyo has a 70% chance of being struck by a tremor of 7.0 or higher in the next 30 years, with a quake of 6.9 expected to kill as many as 13,000 people. More than 800,000 buildings would be destroyed and 6.5m people would have trouble returning home. (Japanese government study quoted by AFP, 14 Dec 2004)

Every day more than 300 oil tankers cruise the Mediterranean and every day some 2,600 tonnes of oil are spilled there. The deliberate, illegal discharge of oil and fuel during washing of tanks or ballast-water exchange operations is a regular practice among oil tankers, cargo ships and cruise liners. The transport sector is consequently a good example to highlight the risks of industrial activity.

Finance and insurance institutions deal with risks in a different context. Innovative solutions to diversify financial risks might sometimes seem cynical to outsiders, but they are also attempts to alleviate the burden of those who cannot afford to insure their possessions.

Financing the risk from natural disaster

Anselm Smolka

The loss data on great natural disasters in the last decades show a dramatic increase in catastrophe losses. A decade comparison since 1960 is shown in the table below. The reasons for this development are manifold and encompass the increase in world population and the simultaneous concentration of people and values in large conurbations, the development of highly exposed regions and the high vulnerability of modern societies and technologies, and finally changes in the natural environment like global warming and the related regional effects. As the underlying factors for the observed

loss trend remain unchanged, a further increase in losses from natural disasters is inevitable.

Coping with these future loss burdens represents a formidable challenge which requires the cooperation of all parties involved – potentially affected private persons and industries, the financial sector and the state in public-private partnerships. Turning to the role to be played by insurance within the context of natural disaster management, we can distinguish between the insured persons or entities; primary insurers; reinsurers; capital markets and banks; governments and public authorities.

Each of these parties has its own tasks and responsibilities in managing the risk arising from natural disasters. Beyond the pure financing of losses, which is a reaction after the event, much more effort than hitherto has to be invested in a proactive strategy, i.e. in reducing and preventing future losses. Such a strategy is not only a matter of financial resources, but also a result of good and foresighted planning and of coordination at all levels, from private households and industrial companies to public institutions and authorities. As far as risk financing is concerned, reinsurers are usually the main risk carriers in the field of natural disaster losses, because they can achieve a worldwide balance of risk over time and regions. In recent years attempts have been made to supplement the capacity provided by traditional reinsurance by tapping into the resources of the capital market. The main function of the capital market is to secure capacity for top-rank losses by what is called alternative risk transfer, or ART instruments like Cat bonds. It is worth mentioning that the large majority of ART programs have so far been placed for highly developed countries. The complexity of the programmes, investor attitudes and also the usually high price seem to require mature insurance markets. The successful placement of an unrated (!) Cat bond for the Taiwan Residential Earthquake Insurance Pool, however, may be seen as a sign of hope for increasing business opportunities in this field.

The main task of the state lies in the field of risk management and risk reduction by: designing and enforcing land use and building regulations; securing the serviceability of critical facilities and infrastructure; developing emergency plans which precisely define the responsibilities and the coordination of the authorities involved; and granting tax exemption for catastrophe reserves of private insurers.

What can be done by insurance to promote proactive loss prevention and reduction? Competition and a short-term financial perspective in the insurance sector do not create a favorable environment for actively promoting prevention and mitigation measures, as the time scale for a possible positive outcome tends to be long. However, there are promising developments like the community classification scheme of the insurance-sponsored Institute of Home and Business Safety (IHBS) in the US where communities are classified according to code compliance. This classification is reflected in the insurance conditions. Generally, taking risk mitigation measures can and should be rewarded by more attractive insurance conditions like discounts on rates or lower deductibles. Vice-versa, the insureds' participation in losses, in the form of deductibles and/or coinsurance, serves as a powerful incentive for taking mitigation measures. Linking the availability of disaster protection, be it state or private bank loans, or insurance payments, to the observance of building regulations can provide an efficient mechanism for code enforcement and thus forms a key element of proactive risk management.

The foregoing discussion has identified several levers for mitigating losses from natural disasters. The components are there, the challenge is to knit them together into a secure and tight network of risk reduction measures. At present, there are various holes in this network. Filling one of the most important gaps – the lack of insurance penetration – is the intention behind the creation of disaster insurance pools. Typically, only 10% or less of disaster losses are covered by insurance in the less developed world. The Turkish Catastrophe Insurance Pool (TCIP) can be considered as a model case which has already served as a catalyst for the establishment of similar pools in Tai-

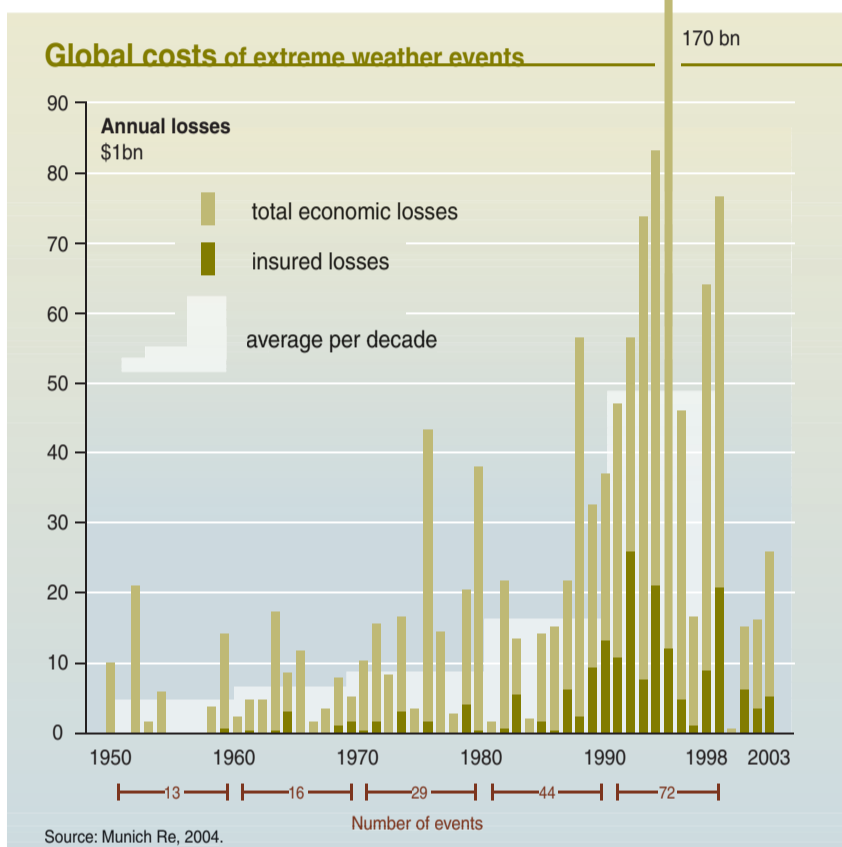
wan and very recently in Algeria, or for the conception of pool solutions in several other countries. Essential elements of the TCIP are:

- mandatory scheme
- no post-disaster loans to affected parties without insurance
- 2% deductible
- coverage up to \$35,000 loss limit
- rating scheme graded according to hazard zone and risk type
- complete risk transfer to global reinsurance market in the starting phase

The scheme covers dwellings and small commercial risks, whereas larger commercial and industrial risks and high-value residential buildings are covered by the private market.

None of the above is within the reach of a large part of the world's population, namely the poor. Beyond the regulatory context mentioned above the state is often expected to serve as a reinsurer of last resort for very rare, extraordinary losses on the one hand and uninsurable risks like dwellings of the poor on the other hand. Whereas the first role will continue to apply in the future, this is not necessarily true for the second one. Microinsurance schemes, which first started in life insurance, now find counterparts in property insurance. Markets in Southeast Asia seem to be particularly innovative and adventurous in this field, and companies like ASA in Bangladesh or BRI in Indonesia already have more than 2m customers insured under microinsurance schemes, which may illustrate the potential of this new avenue to produce better protection for the poor.

Dr. Anselm Smolka is Head of Geophysical and Hydrological Risks in the Geo Risks Research Department of Munich Reinsurance Company.



Hunger insurance – looking for alternatives to aid programmes

Tobias Gasser

Last autumn leading insurance groups, humanitarian organisations and government policymakers gathered at The Swiss Re Centre for Global Dialogue in Zurich for an international conference on "Solidarity and Opportunity: The Potential of Insurance for Disaster Risk Management in Developing Countries".

The conference was organised under the aegis of the ProVention Consortium, founded by the World Bank. This is a global coalition of international reinsurance companies such as Munich Re and Swiss Re, Lloyds, the Red Cross and Red Crescent Societies, the UN World Food Programme (WFP), the World Bank, as well as foreign ministries and other NGOs. The aim of the conference was to involve the private sector in disaster reduction and reconstruction.

The world's humanitarian organisations are facing slow growth or stagnation of available aid and consequently unable to keep up with demand for help. Major disasters tend to occur at irregular frequencies, with each event upsetting aid budgets.

The World Bank and the WFP are working together to present an "innovative solution". In a recent article in Germany's Tageszeitung, James T. Morris, Executive Director of the WFP, says that "high-performance financial instruments such as weather derivatives and catastrophe bonds" are being used

to create a risk management system to "protect populations at risk from losses incurred through weather-related damage", in short, a form of hunger insurance for the world's poorest.

Morris says that such financial market instruments would have a fundamental impact. The risk of a disaster would no longer have to be borne by the families concerned, but by humanitarian organisations.

Richard Wilcox, special programme director at the WFP, explains that the WFP and the World Bank plan to start with a pilot project in Ethiopia. Another drought like the one seen in 1984 would require aid in excess of \$2.6bn. "Even at the highest levels, funds pledged for humanitarian aid are unreliable and come too late," says Wilcox. The WFP now plans to start talks with reinsurers, using a rainfall index as a basis for insuring Ethiopia's harvest for 2006 with a catastrophe bond and a reinsurance policy.

Speaking to Switzerland's Wochenzeitung, Jürg Trüb, head of Swiss Re's weather desk, compares hunger insurance with similar solutions in energy. "When the winter turns out to be warmer than usual, and energy companies sell less power, they come to us to help make up for the shortfall." The difference with hunger insurance is that it covers changes in precipitation levels instead of temperatures. Trüb sees a number of conditions that would have to be met before Swiss Re could move into hunger insurance.

One of these is the existence of reliable precipitation measurement data. Also, local supervisory bodies would have to approve this type of insurance. Interested parties would have to be prepared to pay commercial rates, and a certain volume of transactions would be necessary to make the market worthwhile.

Bruno Kopp is an independent insurance broker in Basel, specialising in the hard-to-insure market. His company, Risk Management Service, offers insurance products for businesses affected by war or political instability. Kopp is all in favour of the idea of hunger insurance. The major problem he sees, however, is the likelihood of a claim. "If the cat bond is drawn upon regularly, then nobody will invest in it anymore. What investors want is a bond that is never actually used," he explains.

Ralph Läubli, fund manager for alternative investments at Bank Leu, a private Swiss bank, finds the WFP's idea an interesting proposition and is prepared to include a "hunger bond" in his portfolio. The fact that the WFP bond poses a higher-than-average risk among catastrophe bonds is not a problem. But he does think it must be offset with a higher risk premium. It is here that charities are sceptical. "Who's going to pay for this?" asks Bruno Gurtner, a financial markets specialist with the Swiss Coalition of Development Organisations. "If the public sector pays for it, this is a socialisation of costs." Such a model could only work if private sponsors see a financial interest.

Gurtner sees hunger insurance as an example of a public-private partnership involving private enterprise and the state. But, much as for other similar projects, he wonders "how much sense they make and how they can really make a difference to developing countries". However he is glad international organisations are making an effort to speed up the rate at which they use available aid funds. Another alternative to insurance, he empha-

sises, would be for states to release aid money more promptly to international organisations. He believes such bodies should also have greater flexibility in the use of funds.

Tobias Gasser is an independent journalist in Bern, Switzerland and regular contributor to the weekly Wochenzeitung, which originally published this article on 21 October 2004.

Translated by Avril Wright.

Swiss Re and the typhoons

Insurance companies use cat bonds to cover their accumulated risks, shifting these onto the capital market. If an insurance company wants to set aside provisions for a catastrophe, it raises the money by issuing a bond on the capital market. Investors receive an annual rate of interest, in line with the money market rate and 1% to 2% higher than a comparable corporate bond. Such bonds mature in one to 10 years. If the disaster occurs during this period, investors lose all or part of their money.

The Leu Prima Cat Bond fund, which combines a number of different cat bonds, offers an investment opportunity related to earthquakes and hurricanes hitting the US, storms in Europe, earthquakes in Monaco and typhoons in Japan.

As Läubli (see article beside) explains, it takes some time to actually get a payout. The demand for cat bonds remains strong, despite the devastation caused by Hurricanes Charley, Frances, Ivan and Jeanne last summer. The risk of the bond not being paid back is one in 100 years. One of the world's leading issuers of catastrophe bonds is Swiss reinsurance giant Swiss Re. Some \$4.3bn are invested in cat bonds worldwide.

A cool summer means lower beer sales, so breweries insure themselves against bad weather. The magic word here is weather derivatives. By buying an option that pays up if temperatures fall, a brewery can make up for its loss in sales. If the summer turns out to be hot, plenty of beer will be drunk: all the brewery loses is its premium. Thus, the higher the likelihood of cool weather, the more the brewery has to pay for this option.

Banks and insurance companies issue weather derivatives to diversify into economic sectors not correlated with the traditional credit risks.

Preparedness and response to pollution at sea

Patricia Charlebois

The environmental and economic impacts from large-scale oil spills can be staggering with the cost of response, recovery and restoration running into millions, even billions, of dollars for a single incident. Spills such as the Exxon Valdez (US, 1989), Sea Empress (UK, 1996), Erika (France, 1999) and Prestige (Spain, 2002) (see opposite) have highlighted the devastating impacts of such incidents.

The International Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (OPRC 90), provides a framework designed to facilitate international co-operation in preparing for and responding to a major oil pollution incident and to encourage States to prepare by developing emergency response structures.

The International Maritime Organization (IMO) is a specialist UN agency with a global mandate for safeguarding life at sea and protecting the marine environment from pollution caused by shipping. IMO acts as the secretariat to OPRC 90 and has identified responsibilities for promoting and assisting preparedness and capacity-building, facilitating and co-ordinating international assistance, if needed, during emergencies.

Although oil spills remain the largest threat due to the volumes transported, chemicals or "hazardous and noxious substances" (HNS) are receiving increased attention as they generally represent a higher degree of hazard than petroleum products, not only to the marine environment, but also to human health. In 2000, realising the growing threat from the carriage of HNS by sea, IMO adopted the HNS Protocol. The OPRC/HNS Protocol 2000 provides the same basic framework for co-operation and mutual assistance as the OPRC Convention. Though still in its infancy, and as yet not in force, IMO continues to encourage States sign the protocol and develop their capacity to respond to chemical spills in the marine environment.

Patricia Charlebois is Technical Officer for Oil Pollution Preparedness, Response and Cooperation at the International Maritime Organisation IMO.

The Prestige: business interests at odds with safety concerns

Thomas Höfer

On 13 November 2002, in stormy weather, the 26 year old tanker Prestige, sailing with a Lebanese crew under Bahaman flag from the Baltic to Asia, sustained hull damage. The tanker was carrying 77,000 tonnes of heavy fuel oil. It began taking on water and started to drift towards the coast of Galicia. The Spanish authorities ordered the Prestige to leave Spanish waters and head beyond the 120-mile territorial limit. Once the ship had been pushed out onto the high seas, the Portuguese government sent a warship to prevent it from entering its waters.

After five days of towing operations, 130 miles from the coastline of Spain and Portugal, the tanker split in half and sank. The two parts of the wreck now lie at a depth of 3,5 kilometres more than 200 kilometres off the coast.

The Prestige spilled 64,000 tonnes of oil, 60% more than initially estimated. The resulting pollution is thought to have killed 300,000 seabirds. It will take between two and 10 years for the affected ecosystems and resources to recover.

Damage to fishing and related economic sectors, tourism, and the natural heritage along 3,000 kilometres of coastline polluted by the spill may cost approximately €5bn (€1bn confirmed by the Spanish Government two years after the disaster), with society at large paying almost the full amount. It has directly affected some 30,000 people in fishing and shellfish.

It is believed that a Greek shipping dynasty is behind the registered owner of the Prestige in Liberia, the Mare Shipping Incorporation, which only operates this tanker. It bought it in 2000. The transport itself was chartered by a Russian-owned Swiss company. Such situations, covering "hidden" interests under the flag and registration of some convenient administration, have become typical during the last few decades.

Experts from the US Bureau of Shipping had ordered dock work after finding cracks in the ship's hull. Welding was carried out in China, and the ship was subsequently inspected three times in two years in China, Dubai and Saint Petersburg respectively.

European ship-owners control 34% of the world's fleet, but the majority of their ships are registered under flags of convenience, offering lower fees, less restrictive laws and access to low-wage crews. Although corporate globalisation is not a risk in itself, tanker law cannot be effectively enforced under such conditions.

People living on the coasts of shipping routes and relying on the natural environment pay the real price of spills. For the fishermen, the Spanish authorities opened national funds and defined monthly income compensation. Credits totalling €100m were offered. If an oil tanker causes pollution, then compensation is available from the ship's insurance and the International Oil Pollution Compensation (IOPC) Fund. According to Lloyd's press office, there is a likelihood of compensation amounting to about €7m for the ship, another €10m to €12m for the cargo and €20m to €25m for pollution damage liability paid by a Protection and Insurance Club. Over and above that, coverage based on the International Convention on Civil Liability for Oil Pollution Damage, the 'Fund Convention', is limited to about €180m. Compensation is intended for economic loss and clean-up costs. After the loss of the Erika, the IOPC fund limits were raised by 50%, but this measure only came into force on 1 November 2003. Any claimants will have to assess damages to shellfish grounds, marketing efforts and the travel trade over a period of years. Heavy fuel oil will stay in the area as floating tar for a while. International oil, insurance and salvage-related institutions studied the costs of oil spills outside US waters in the 1990s. While there is no clear relationship between spill volume and costs, the type of oil is crucial: light oil dissipates in rough seas, while heavy fuel oil stays in the marine environment and travels long distances. This was the case with the Prestige. A further impact on costs relates to repeated cleaning, and maintenance of the clean-up team and equipment. The type of coast and tide is an important factor too. Poor management and over-reacting to media pressure, rather than trained decisions by qualified engineers, can escalate costs. All in all, the Prestige spill is well placed to become one of the most expensive oil spills outside the USA.

The tanker Prestige was a single-hulled vessel. Less than 50% of the world's oil tanker fleet – some 2,000 ships exceeding 80,000 tonnes – have single hulls. Double hulls are designed to contain the load after non-severe collisions. In 2001, after the Erika spill, nations represented on the International Maritime Organization (IMO) Marine Environmental Protection Committee decided to introduce a basic rule for taking single-hulled oil tankers out of service: single hull tankers with certain anti-pollution standards could continue operating until 2015 or until they completed 25 years' service, whichever came first. On the basis of these rules ships like the Prestige will have to be decommissioned over the next few years.

The wreck of the Prestige and its aftermath highlight the anarchic character of the shipping industry. This situation suits major corporations as it helps them avoid regulations and taxes. It is a further example of the conflict between basic safety and pollution concerns and a system based on profit and national considerations.

Major oil spills will recur as long as society continues to depend on petroleum and petroleum products to sustain its day-to-day activities. Oil tankers transport some 1,800m tonnes of crude oil around the world by sea each year. In most cases, the petroleum cargo is transported and delivered safely and securely to its destination without incident due to good preventive measures and instruments introduced over the years.

However, another problem is associated with the transports themselves. Every day ships empty some 2,600 tonnes of oil into the Mediterranean. The deliberate, illegal discharge of oil and fuel during washing of tanks or ballast-water exchange operations is a regular practice among oil tankers, cargo ships and cruise liners. In one year this adds up to the equivalent of 15 Prestiges. More attention needs to be paid to these creeping catastrophes as well.

The editorial team assembled this article, drawing largely on "Tanker Safety and Coastal Environment: Prestige, Erika, and what else?" by Dr. Thomas Höfer, an article first published by Environmental Science and Pollution Research (ESPR – 10 [1] 2003).

Transport risks at Compañía Minera Antamina, Peru

Steven D. Botts

Big mines require large quantities of fuel to operate and chemicals for mineral processing. In mountain areas, strict precautions are needed to ensure safe transport of such substances along steep, winding roads. Past transport accidents caused spillage of cyanide, mercury and other chemicals, prompting public outcry and strong media reactions. Safe transport of materials has become a priority for mining companies.

High in the Andean mountains in Peru, Compañía Minera Antamina, together with other nearby mines, has introduced a Safe Road Transportation initiative as an integral part of a wider company programme addressing the environment, health, safety and social responsibility.

A specialised contractor monitors the transportation units of all companies and provides support if an emergency occurs along the route. Hazardous materials trucks travel in convoy, escorted by vehicles that carry equipment to deal with any incident. All drivers and supervisors are trained to respond to an emergency. The trucks are inspected for tire tread depth, number of retreadings, daily scheduled preventive maintenance, first-aid kits, and equipment to control spills. All transporters are

certified, and the route has been evaluated by experts who examine any bridge crossings, proximity of homes and villages, areas with stray animals, sharp turns with steep gradients, etc. Trucks and containers display UN substance codes and hazard identification.

The programme includes outreach to roadside communities based on the international APELL process. Communities receive education in first-aid treatment, how to recognize hazardous materials, and basic actions in case of accident. The communities have a positive attitude towards this training.

Outreach to government organisations has also started to achieve progress. An important achievement is the creation of an APELL Committee that helps representatives of government and industry build up their mutual capabilities in safety and emergency management.

Incidents along the extended transport route from the coast to mines are decreasing in frequency and gravity. In 2004 there were only four minor incidents, causing neither physical injury nor environmental damage, and only minor damage to property. But safety management never sleeps, and constant vigilance is required to push performance ever closer to our common goal of zero accidents.

Steven D. Botts is Vice-President of Compañía Minera Antamina, Peru and responsible for Environment, Health, Safety and Community Relations.



Hazardous material transport risk management in Canada

Wayne Bissett

Canada's transport system must cope with many risk factors: long distances, routes through varying climates with 30°C temperatures in summer down to -40°C in winter, even ice roads across frozen northern lakes.

On 10 November 1979 a freight train derailed just outside of Toronto. The ensuing explosion, propane fires and release of chlorine led to the evacuation of more than 200,000 residents. The accident caused the federal government to pass the Transportation of Dangerous Goods Act (TDGA) to improve management systems and infrastructure. Subsequent federal and regional legislation introduced requirements on notifications and permits, placards, particular containment measures, emergency response plans, incident reports and training. The UN Transport of Dangerous Goods Code is a basic part of national regulatory requirements and Canada is an active member of the UN Committee of Experts on Transport of Dangerous Goods.

Transport Canada operates the Canadian Transport Emergency Centre (CANUTEC), which maintains an extensive scientific databank on chemicals manufactured, stored and transported in Canada (1). CANUTEC handles some 30,000 telephone calls a year, about 1,000 of which involve an emergency report. Staff work directly with emergency teams to provide immediate advice.

The Canadian Chemical Producers' Association has been operating a Transportation Emergency Assistance Plan since 1974, to provide emergency response personnel and equipment to incidents involving their members' products as well as other events. Many of our larger municipalities have established dangerous goods routes to avoid the most populated areas.

All of these measures combine to reduce the risk of mishaps in the transport of dangerous goods and minimise any damage when they do occur.

Wayne Bissett is a retired Chief of Emergency Preparedness and Response, Environment Canada.

1. The Emergency Response Guidebook is available in English, French and Spanish at http://www.tc.gc.ca/canutec/erg_gmu/erg2000_menu.htm

It's the way you tell them

Tim Radford

In a democratic society, there is an obligation on scientists to explain their research. Unfortunately, there is no corresponding obligation on the taxpayers to listen. So scientists who believe their work is important have a further obligation to say so, clearly, and in as near to vernacular speech as possible. Such an approach was once loftily dismissed, at least in British universities, as "popularisation". All I can say is that being popular is a lot more enjoyable than being unpopular. Scientists and engineers prefer the cold language of technical fact and statistical probability, secured from accusations of error by protective caveats. This - like the language of lawyers that goes into the small print of contracts - is exactly the language the rest of the human race has difficulty listening to. So there is an immediate problem: of one group which apparently chooses not to be understood, addressing an audience that would on the whole prefer not to hear; the effectively mute, speaking to the selectively deaf.

However scientists and engineers concerned with natural disaster have compelling reasons for speaking clearly, vividly and in the vernacular: for them, simple words can and do, literally, save lives. There is no point in issuing judgements about potential catastrophe in academic language. The kind of language used in university common rooms and in scientific papers tends to suppress understanding, rather than promote it. For example: Moses did not challenge Pharaoh with a warning about the consequences of the continued detention of one particular subject ethnic population. And he certainly did not say that this non-release could provoke a demonstrable and conceivably unpopular ecological reaction that could result in some kind of algal manifestation in the main river

basin, with unforeseen outcomes for Nilotic flora and fauna, not excluding vital consumer services. Instead, in the words of the Authorised Version (1611) of the Bible, Moses "lifted up the rod and smote the waters that were in the river, in the sight of Pharaoh, and in the sight of his servants, and all the waters that were in the river were turned to blood. And the fish that was in the river died, and the river stank, and the Egyptians could not drink of the water of the river, and there was blood throughout all the land of Egypt."

It could hardly have been clearer. Even then, Pharaoh failed to take the hint, so that yet more awful consequences followed. And there should be a lesson in that, too: authorities usually need to hear warnings several times before they react, and even then, they may not react in time. In the course of the last 15 years, governments and authorities the world over have been warned loudly and repeatedly that global warming could be accompanied by a greater risk of severe weather-related events: floods, heatwaves, ice storms, typhoons and droughts. Notoriously, some nations have still to take these warnings seriously; at least seriously enough to subscribe to united global action. The warnings have not stopped. In a paper in the US journal *Science*, Britain's own chief scientist described global warming as potentially a greater threat worldwide than international terrorism. This year, in *Nature*, other scientists have warned that global warming could result in the loss of up to a million vulnerable plants and animals. These two bits of research did get a lot of play in newspapers, and in their different ways provoked unpromising reactions. But these were only two in a torrent of research papers. Here are three that preceded them. These three papers tell what should by now be a familiar story in a new way. One was a review article about the Commonwealth

and sea level rise, in a journal called *The Round Table*. The Commonwealth has 54 members, and the review starts from the premise that by mid century, it may have only 51 members: the Maldives and Tuvalu are already at risk of complete submersion. Most of Kiribati and The Bahamas are just four metres above sea level. Meanwhile by 2050, crop yields are expected to fall by up to 20% in Mozambique, Tanzania, Uganda, Namibia and Botswana. Sea level rise could hit up to 50 million people in Africa. Another 50 million will be affected along the coastlines of India, Pakistan and Bangladesh. Crop yields could decline by up to 40% in Pakistan. Yet a third 50 million are likely to find the sea lapping at their feet in Malaysia and the Indonesian archipelago. In all these places, malaria, schistosomiasis, leishmaniasis and dengue fever are also expected to increase.

So far, so clear. That is disaster in the making. Why is it happening? There is a clue in a paper in the Royal Society Proceedings B, by two marine scientists who compared humans with 31 non-human species in measures of biomass consumption, energy consumption and carbon dioxide production. In almost every case, humans consumed more of whatever there was to consume than other creatures - one exception was mackerel in the north-west Atlantic, where other fish and seabirds matched us - and this "more" wasn't just a bit more, or significantly more. Sometimes it was 100 times more, or 1,000 times "In this paper, we report tests of the hypothesis that the human species is ecologically normal," the authors say. And then comes the punchline. "We reject the hypothesis for almost all the cases we tested."

A glimpse of the scale of this human abnormality lies in our energy use. A researcher at the University of Utah last year worked out the true cost of a gallon

of gasoline. That is, how much foliage had to grow in the Carboniferous to produce the tiny fraction that might get trapped in swamps or fall to the riverbeds and somehow end up as oil that could be refined as petrol 250 million years later. His answer, published in *Climate Change*: one gallon of petrol equals 98 tons of foliage, or 196,000 lbs of fern and cycad and algae and conifer. He translated that into modern agriculture. "Can you imagine loading 40 acres worth of wheat - stalks, roots and all - into the tank of your car or SUV every 20 miles?" he asked.

I love all this stuff. Each report is a new way of telling a story that must be told again and again. There are other, older, bits of global accounting. One geologist has calculated that - in terms of clay for bricks, gravel for roads, limestone for pavements, gypsum for plaster, lime for cement and so on - roughly six tons of soil is shifted every year for every human being on Earth. That adds up to 36bn tons. Since the calculated flow of silt down the world's rivers is put at 24bn tons, that means that humanity is now the greatest earth-moving force on Earth. After hearing such figures you do begin to wonder what a sustainable world would look like, or a safe one? How do we get there?

The answer for all of us is, a bit at a time. Start anywhere. Just start. If all you can do is warn, or explain, keep on warning, or explaining, but do so in clear and urgent language.

And always remember that a start is not the same as progress. The International Decade for Natural Disaster Reduction was a success, in a way but the success was limited. The number of deaths per year in natural disasters had fallen by the end of the decade. But at the end of the decade there were more disasters each year than there had been at the beginning, affecting greater

numbers of people, at greater economic costs. This does not mean the decade was a failure. It simply means that each hour of the decade saw another 10,000 people on the planet, each about to make an ecological footprint of more than a hectare, most of them crowding into cities that could barely support them, and certainly could not house them securely. You know that, I know that. But do governments? And if not, why not?

That is the second great communication problem: governments have a way of not listening, or rather listening very selectively, usually to those people prepared to supply the messages that governments prefer to hear.

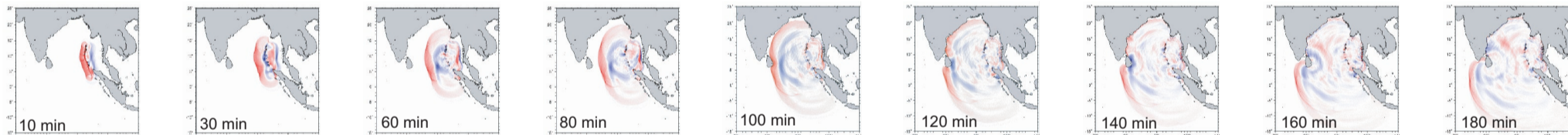
That is why I no longer think it is enough to get the story right; you must get the story read as well. Machiavelli pointed out several centuries ago that you cannot ever tell a prince, a tyrant, or an oligarch something that he does not wish to hear. In a democracy, you are free to tell a prime minister or a president what you believe to be the truth. But even that is not easy. I give you another memorable line from George W. Bush. When asked how he got his information he replied

"The best way to get the news is from objective sources. And the most objective sources I have are people on my staff."

Politicians listen to voters. In a democracy, when you address an issue, you really have to address everyone. That includes the people who cannot read, or if they can read, cannot afford to buy books. These most of all, because of course, these are the people most at risk from natural disaster. So it isn't just what you have to tell that matters, it's the way you tell them.

Tim Radford is Science Editor of *The Guardian*.

South Asia Tsunami, December 26 2004: Propagation through time



Data sources: International Coordination Group for the Tsunami Warning System in the Pacific, <http://ioc.unesco.org/tsu/>

More maps at http://www.grid.unep.ch/s_asia_tsunami/support/products/

Environmental management is risk reduction – UNEP's role in emergencies

As the environmental agency of the United Nations, UNEP assesses global environmental conditions and identifies potential environmental problems in order to propose ways to address the complex effects of environmental change on sustainable development.

Partnering with governments, private sector and local communities, science and interest groups as well as with other UN organizations, UNEP provides its environmental expertise to predict, and help in preventing and reducing the impacts of disasters as well as assist in determining environmental needs for recovery and rehabilitation.

Primary components in UNEP's efforts to ensure environmental security include:

- "Early Warning and Assessment" provides scientific and timely data on environmental change and develops vulnerability assessments, predictive information services as well as modern of preparedness strategies including Global Environment Outlook (GEO).
- The "Joint UNEP-OCHA Environmental Unit" provides environmental assessments of disasters and environmental response services.
- The "Awareness and Preparedness for Emergencies at Local Level" (APELL) programme works with the different actors involved in potential environmental emergencies related to industrial activities.
- "Transfer of Best Practices on Environmental Management and Technologies for Disaster Prevention and Response" strengthens the capabilities of countries in need.
- "Environmental Policy and Law Development" supports the use of effective legal tools, international agreements and strengthens national environmental authorities and their capacity to prevent and reduce environmental emergencies and their effects.

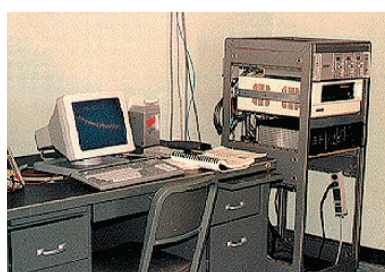
Building on its current strengths, UNEP will reinforce its efforts to ensure that in the future the importance of environmental aspects of emergencies is understood and that the imperatives of prevention and preparedness are fully recognised as critical to human and environmental security. In the concrete case of the recent tsunami tragedy in South Asia, UNEP established a South-Asia Disaster Task Force. Whilst the focus of the UN efforts is still to save lives, we must already look at how to minimise the underlying risks and plan for the recovery. Along with UN colleagues, UNEP is doing its utmost to help the countries affected and is working in close collaboration with OCHA and the respective UN country teams as well as the national environmental authorities to identify the urgent environmental needs, assist in mobilising environmental assistance and provide expertise to the environmental recovery activities.



HOPE – Hope Point, South Georgia Island



DGR1 – Domenigoni Valley Reservoir



GSC2 – Goldston, California

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