Environmental threats to security

> We want the islands of Tuvalu, our nation, to exist permanently forever and not to be submerged underwater merely due to the selfishness and greed of the industrialized world.
>
> Saufatu Sopoanga, Prime Minister of Tuvalu, at the 2002 World Summit on Sustainable Development (Sopoanga 2002)

Security threats emanating from the 'environment' present humanity with three key political dilemmas:

1   The threats are usually less clear-cut and direct than the other types of threat considered in this study. They are, as Prins describes, 'threats without enemies' (Prins 2002: 107). The threat posed by issues such as global warming and ozone depletion may be profound but they are, in the main, still perceived as longer-term creeping emergencies rather than imminent disasters.
2   Countering the threats is usually costly and requires a significant compromising of economic interests.
3   The threats can often only be countered by globally coordinated political action.

The scale of the human security threat posed by environmental change is difficult to quantify but it is undoubtedly significant and, to a large extent, avoidable given the political will. Probably the most 'securitized' issues of environmental change, at different times over the past 40 years, have been resource scarcity due to population growth, ozone depletion and global warming. The fact that the first of these 'crises' never really materialized and the second was partially averted by reasonably effective global political action has served to reinforce the notion that contemporary threats posed by environmental change, such as global warming, are potential rather than actual threats and perhaps exaggerated. As a result, despite gradually becoming more of a feature on the global political agenda, environmental issues have tended not to be placed towards the top of the international political 'intray' of most governments.

However, while it is true to suggest that the chief threats posed by global warming are potential ones which could yet be averted, it is also increasingly apparent that future threats can only be averted by immediate action and that some of the human security impacts are already being felt throughout the world. When UK government Chief Scientist David King announced in a 2004 guest editorial for the journal *The Scientist* that climate change represented a bigger threat than terrorism, he attracted considerable media attention and embarrassed his employers for mounting such a thinly veiled attack on their US allies (King 2004). Even allowing for the lack of certainty in ascribing any given death to global warming, there can be very little doubt that King was stating an obvious truth. The World Health Organization suggests that around 150,000 deaths a year since the early 1970s can be attributed to the gradual rise in temperatures across the world (McMichael *et al*. 2004). Even if this is taken to be a wild exaggeration, it must still dwarf the death-toll attributable to terrorism. Indeed, even if we take global warming out of the equation, it has been estimated that between a quarter and a third of all deaths in the world by disease have environmental causes, such as air and water pollution

(Smith *et al*. 1999: 573). Environmental threats, thus, are not just theoretical future scenarios of apocalypse, they are a 'clear and present danger'.

Some domestic political systems have evolved to a position where the first and second of the aforementioned dilemmas can be overcome. Pressure group advocacy and government learning have gradually led to long-termist policies being developed mitigating against threats to both human and non-human state residents. Environmental policies in Western Europe and North America have seen economic interests compromised to limit uncertain threats posed to human health and to wildlife. The third dilemma is, of course, beyond governments acting in isolation but is slowly coming to be addressed by an evolving global epistemic community and polity. Transnational pressure groups and scientific communities are simultaneously pushing governments to rethink the first and second dilemmas and to provide the means for achieving the third. Central to this process is the slow but inexorable realization by governments that environmental threats are 'real' and the 'national interest' may not always serve their citizens' interests. Political dilemmas can always be resolved when this is understood. The three dilemmas presented here are not, in fact, unique to environmental politics. For most states very similar compromises have been made in the name of military security, since military threats are usually not immediate and require great expense and international diplomatic cooperation to deter. Global, rather than state, political action is necessary for the enhancement of human security in all of the issues considered in this study but it is most crucial in the realm of environmental security.

The rise of environmental issues in global politics

Global environmental politics is a relatively 'new' dimension of International Relations, and of politics in general, but this is not to say that problems of environmental change are in any way new. The extinction of certain species of animals due to human recklessness (for example, the Dodo) and the diminution of woodland areas through over-exploitation are centuries-old phenomena. Ecologism emerged as a science in the nineteenth century, bringing recognition of natural systemic phenomena such as food chains, the carbon cycle and evolution, and an understanding of humanity's place within the environment. George Perkins Marsh's *Man and Nature* in 1864 is widely regarded as the first book to use empirical data to prove the effect of human activity on woodlands and waterways (Marsh 1965). Policies to conserve nature, and pressure groups campaigning for conservation, began to emerge in the USA and Western European states in the latter part of the nineteenth century. Yellowstone became the USA's first National Park in 1872 and the British Royal Society for the Protection of Birds (RSPB) became the world's first conservation pressure group (and later the first international pressure group when it extended its membership to countries of the British Empire).

The origins of international policy on an issue of environmental change can be traced back as far as 1889 and an international convention to prevent the spread of the disease *phylloxera* in grapes. This and other agreements such as the 1902 Convention on the Protection of Birds Useful to Agriculture (the first international instrument on animal conservation) were, however, motivated by economic rather

than environmental concerns. Wine and internationally traded food were at issue rather than the flora and fauna. At this stage the more abstract value of conservation for reasons of aesthetics or empathy with animals beginning to be witnessed in the politics of North America and Western Europe could not find its way on to the international political agenda, dominated by issues of military and economic security (and particularly the former).

The 1960s saw a significant rise in prominence of environmental issues in North America and Western Europe and the emergence of environmental politics, beyond purely economic concerns, on the international political agenda. A major factor in this was the publication of Rachel Carson's hugely influential pollution polemic *Silent Spring* in 1962 (see Box 6.1). *Silent Spring* most notably highlighted the effects of the insecticide dichlorodiphenyltrichloroethane (DDT) on wild animals, vegetation and rivers, and quickly influenced US insecticide policy on conservation grounds. The book also, however, considered the implications for human health of indiscriminate insecticide use and this aspect began the process of forcing environmental change on to the global political agenda and securitizing some of the many issues in this area. In the wake of *Silent Spring* new political concerns began to be voiced, such as the effects of *acid rain* (rainwater polluted by industrial emissions), and older issues such as oil pollution by tankers were given far more prominence.[1]

Heightened concern with the human health effects of pollution and other forms of environmental change at the global level was confirmed by the convening by the UN of the 1972 Conference on the Human Environment (UNCHE) at Stockholm. The Conference was boycotted by the USSR and its Eastern Bloc allies but attended by representatives of 113 states. The Stockholm Conference did not directly produce a new body of international law but had a catalytic effect in identifying some key principles which challenged the conventions of state sovereignty and in putting environmental change permanently on the agenda of international politics. 'Principle 21' confirmed that states retained full sovereign authority over resources located in their own territory but charged them with the responsibility to exploit them with regard to the effect of this on the environment of other states. The parties to the Conference also agreed to acknowledge the concept of a 'common heritage of mankind' whereby resources located outside of territorial borders (such as minerals on the deep-sea bed) should be considered as belonging to the international community collectively, rather than being subject to a 'finders keepers/losers weepers' approach to their ownership. Stockholm did have a direct institutional legacy, with the creation of the United Nations Environment Programme (UNEP) giving a degree of permanence to the policy area on the international stage. Overall, the Conference's most significant legacy was in putting environmental questions firmly on the political agenda by prompting many governments to create new ministers and departments of the environment, and greatly deepening and widening a global network of environmental pressure groups.

Although Stockholm did not securitize environmental change and put it at the top of an international political agenda still, in spite of détente, dominated by the Cold War and impending global recession, some 'high politics' was witnessed at the Conference. Swedish Prime Minister Olaf Palme used the event to denounce the use of herbicides in war as 'ecocide'. Palme made no explicit reference to the recent

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Box 6.1 Rachel Carson

Rachel Carson, correctly, is widely fêted as having launched environmentalism as a political ideology in the early 1960s with her hugely influential magnum opus *Silent Spring*. The title of the book forewarns of a future world without the songs of birds and is best remembered for highlighting the harmful effects of DDT on wildlife. The book also, however, pioneered awareness of the human health repercussions associated with the use of DDT and other chemicals.

 Born in Pennsylvania in 1907, Carson became a marine biologist in an age when women scientists were extremely rare. Her determination to succeed against the odds saw her publish *Silent Spring* in 1962 despite a long-standing fight with cancer and attempts to block its publication by a hostile chemical industry. The book had been serialized in the *New Yorker* magazine prior to its release and caused such interest that chemical companies began fearing a consumer backlash against their products and mounted vitriolic attacks on the scientific authenticity of the work. The attacks failed to prevent the book from becoming a major success commercially and politically, both in the USA and across the developed world. Carson succumbed to cancer just two years after the release of her book, a disease the causes of which she had done so much to increase the understanding. She was at least able to witness before her death the beginning of legislation being passed to curb the use of polluting chemicals and the birth of a new political era.

American use of the infamous jungle defoliant *Agent Orange* in Vietnam, but the implied criticism caused grave offence to the Nixon Administration, who responded by withdrawing the US ambassador from Stockholm. Full diplomatic relations between the two countries were suspended for over a year (January 1973 to May 1974).

 By the 1970s the appreciation by the international community of two key factors help explain the rise to prominence of an issue area which so challenged the traditional logic of international relations.

Pollution does not respect frontiers

Acid rain became a contentious issue in the 1960s not just because of the emergence of evidence that rainwater could become contaminated and that this could contaminate groundwater and threaten wildlife, but also because it was a problem in some states that could not be resolved by that state's government. Sulphur dioxide and other emissions from the burning of fossil fuels which accumulate in the Earth's atmosphere can return to the surface as precipitation, hundreds of miles from where they departed as fumes. Hence countries particularly faced with this problem, such as Sweden, Norway and Canada, which were at the forefront of the greening of

governments that was occurring at the time, found that they could not resolve the problem since the root of it lay in other sovereign states. This form of transboundary pollution most graphically demonstrated the need for international cooperation to resolve certain environmental issues, which was already obvious in the case of states sharing rivers and other forms of water.

In 1979 the Long Range Transboundary Air Pollution Agreement was signed up to by the USA, Canada and most Western European states, establishing cuts across the board in sulphur dioxide and other industrial emissions. That it took so long to reach what was a modest agreement between such friendly states is testimony to the challenges presented by environmental problems to those traditional determinants of government policy: sovereignty, self-sufficiency, the national interest and economic growth. The 1970s also saw the rise of international cooperation on curbing pollution between states sharing common stretches of water. UNEP oversaw the birth of a series of 'Regional Sea Programmes', such as the Mediterranean Action Plan and North Sea Convention, while many regimes already in operation for riparians, such as the world's oldest international organization, the Rhine Commission, began to take on environmental as well as navigational dimensions.

The idea of a global commons

More radical than the utilitarian notion that neighbouring states who shared a problem should work together to resolve it was the idea which emerged in the late 1960s that sovereign control over the common 'goods' of water, air and natural resources was unsustainable. In 1968 the ecologist Garret Hardin used as a parable a warning first aired in the nineteenth century by the economist William Foster-Lloyd on the finite quality of shared resources, known as the 'Tragedy of the Commons'. Foster-Lloyd described how the traditional English village green was endangered due to overgrazing by cattle conventionally open to all villagers. As the practice had gone on for centuries it was assumed that it always could but it had emerged that an increase in the number of cattle above an optimum level could erode the land and ruin the common resource for all. Hardin argued that the village green was analogous to global commons such as clean air, fresh water and high seas fish stocks, endangered by states continuing to exploit or pollute them while oblivious to the fact that the cumulative effect of this would eventually be their ruin or depletion (Hardin 1968).

The Tragedy of the Commons concept became influential in the early 1970s with concerns that the economic security of the developed world could be imperilled by the Earth as a whole exceeding its 'carrying capacity'. One manifestation of this was the rise of international political action on population control (see Chapter 4), and another was the popularization of the 'limits to growth' thesis which argued that increases in industrial production and economic growth in developed countries would have to be checked. Two very different solutions to the Tragedy of the Commons parable can be found. First, you could have informed collective management to regulate use of the village green for the benefit of all. Second, you could abandon the idea of common land and divide the green up into individual holdings in the expectation that each plot holder would graze sustainably, as it would be in their

own interests to do so since the costs could not be externalized as before. At the global level both types of solutions are evident in the development in the 1970s of international law for a 'commons' already subject to many centuries of contention, the high seas. The 'Common Heritage of Mankind' principle agreed to at Stockholm crystallized ten years later as part of the Third UN Conference on the Law of the Sea (UNCLOS III) with the agreement that deep seabed minerals would be the property of the International Seabed Authority. This form of collective management to sustain collective goods may be contrasted with the encroachment on the tradition of the 'freedom of the seas' by the huge growth of waters claimed by states in the legitimization at UNCLOS III of 200-mile 'Exclusive Economic Zones (EEZs)'. Although EEZs, on the one hand, could easily be accounted for by a conventional Realist analysis of coastal states maximizing their power, the rationale offered for their creation was that fish stocks and other resources would be utilized more sustainably if under sovereign jurisdiction rather than subject to a 'free-for-all'.

The gradual appreciation of three other challenges posed by environmental change questions to conventional state-to-state relations since the mid-1980s has elevated this realm of international politics to a higher diplomatic level and securitized some of the issues.

Localised environmental problems can become global problems

Although transboundary pollution and the management of the global commons were, by the 1980s, firmly on the international political agenda, the majority of the harmful effects of environmental change seemed only to be felt locally and as such were of little concern to the international community. Domestic legislation in the developed world had banned the use of notoriously polluting chemicals such as DDT and curbed the excesses of industrial emissions and waste disposal, leading to visible improvements in animal conservation and better standards of human health. However, the emergence of evidence that seemingly remote problems, experienced primarily in LDCs, had wider repercussions served to bring a number of new environmental issues to global political prominence.

Deforestation, seen for a number of years as a problem for forest-dwelling wildlife and humans, was cast in a new light by the discovery of the 'carbon-sink effect', the fact that trees absorb atmospheric carbon dioxide. Carbon dioxide in the atmosphere above a certain level is poisonous to man and at a lesser level contributes to global warming. It has been estimated that the loss of trees in the world contributes more to global warming than the much-trumpeted impact of transport (Stern 2006). The realization that the net loss of tropical rainforest could, ultimately, harm North American and European urban residents as well as Amazonian Amerindians helped bring this issue to the global political agenda. Similarly, seemingly localized 'Tragedy of the Commons' issues such as desertification have repercussions beyond the most directly affected peoples since the world food supply will be influenced by the removal of once-fertile land from production. The increased economic globalization of the world can bring external environmental problems into the domestic arena. Harmful organochlorine insecticides may have been virtually

eliminated in developed countries by the 1980s but their continued use, promoted by Northern MNCs deprived of a domestic market, was seeing them return to their places of origin in imported foodstuffs.

Some environmental problems are global in scale

The securitization of certain environmental issues on the global stage has tended to occur when full realization dawns among governments that the problem is genuinely global in scale. Deforestation and desertification have not been securitized because, ultimately, they are still perceived by many as localized problems with some wider implications. By contrast, it is widely accepted that ozone depletion and global warming are not problems that governments can protect their citizens from by domestic legislation or by regional political cooperation with like-minded neighbouring states. In addition, these are not problems caused by LDCs that are being exported northward. They are problems that are principally caused by northern democracies with potentially dire consequences for the whole world, or 'global security' in its full sense.

Environmental issues are inseparable from global economic issues

The vast majority of environmental problems are related in some way to the processes of economic development and growth, which have dominated how governments frame their policies both domestically and in the global marketplace. Industrialization and urbanization, the classic ingredients of development, put increased strain on a country's resources, while changing its pattern of land use and altering nature's own 'balance of power'. Increased industrial and agricultural production invariably brings more pollution as well as more raw materials, food and wealth. The fundamental paradox of how to reconcile economic security with environmental concerns was apparent at Stockholm but was shelved through the desire to demonstrate solidarity, but, by the 1980s, it could no longer be ignored. By then it had become clear that global environmental policy was being stymied because, although the developed world was coming to terms (albeit partially) with the need to embrace a 'limits to growth' approach, LDCs would not compromise economic security since the stakes were so much higher. As Indian Premier Indira Gandhi announced at Stockholm in 1972, the world should not forget that 'poverty is the worst pollution'.

In an effort to get around this problem, the UN General Assembly in 1987 set up a World Commission on Environment and Development, chaired by Norwegian Prime Minister Brundtland (see Box 7.1). The 'Brundtland Commission' produced a report entitled 'Our Common Future', which identified *sustainable development* as the solution to the economic–environmental paradox, and this soon became the guiding ethos for future global environmental policy. Sustainable development sought to win the backing of LDCs for environmental policy by reassuring them that this would not compromise their political priority of achieving economic

development. The Global North would have to take the lead in implementing costly anti-pollution measures and recognize that the South would need more time to follow suit. To the South this was only fair since the North was responsible for most global pollution and had been able to develop without constraints being put on their industrialization; to many in the North this was the only way to win support from LDCs who would eventually come to be major global polluters also.

Sustainable development is less pessimistic than the 'limits to growth' thesis, which dominated environmental policy thinking in the 1970s, in that it does not consider economic growth to be anathema to avoiding pollution and the depletion of the Earth's resources. Economic growth, even for wealthy states, is fine so long as it is at a level that can be sustained in the long run and not at the cost of degrading the environment. Hence sustainable development tries to speak the language of the 'rational actor' by calling upon governments to be more long-termist in their economic policy. Rapid economic growth today may enrich the present generation but risk impoverishing or endangering future generations if resources are not utilized in a sustainable and responsible manner. Sustainable development is also, however, less optimistic about the future than the approach to the Earth and its resources adopted by a number of thinkers and statesmen. The non-arrival of a demographic doomsday of the sort forecast by Malthus back in the eighteenth century or by the 'Neo-Malthusians' in the 1970s has prompted some 'Cornucopians' to suggest that economic growth need not be restrained at all since technological progress and human ingenuity can be relied upon to surmount future problems. Lomberg's (2001) work *The Sceptical Environmentalist*, for example, attracted great interest (and great derision from ecologists) for questioning whether implementing international policy on global warming made any rational sense. Lomberg did not deny that global warming was a human-caused problem but suggested that it is not as significant a threat as it had been painted and that the expenditure to be allocated to tackling the problem would be better spent on addressing global poverty (Lomberg 2001). Cornucopians and Neo-Mathusian 'limits to growth' advocates still occupy prominent positions in the dialogue on global environmental policy but sustainable development, holding the middle ground, has become the principal guiding ethos of the international regimes that have emerged in the past 20 years.

The Brundlandt Report prompted the UN General Assembly in 1989 to approve a 20-year follow-up conference to Stockholm to flesh out the concept of sustainable development. As the title indicates, the 1992 UN Conference on the Environment and Development (UNCED), held in Rio de Janeiro, recognized the need to couple together the two issue areas and was a much larger and more diverse gathering than in 1972. In all, 170 states were represented, most at some stage by their heads of government, and some 1400 pressure groups were also present at the myriad formal and informal meetings that characterized the Conference. In contrast at Stockholm, 20 years earlier, only two heads of government and 134 pressure groups had attended. Although decision-making authority was reserved for government delegates the pressure groups at Rio played a pivotal role in organizing the event and in the extensive lobbying of the decision-makers.

Among 27 general principles agreed to in the 'Rio Declaration' at the summit were two particularly important breakthroughs. Principle 7 identified the 'common but differentiated responsibilities' of developed and less developed states in

environmental protection, a key aspect of the sustainable development concept. The Global South was part of the process but the North would have to take the lead and incur most of the initial costs. Principle 15 acknowledged the legitimacy of the 'precautionary principle' in developing environmental policy. This strengthens the meaning of sustainable development by proposing that a lack of absolute scientific certainty over the harmful side-effects of some form of economic activity widely believed to be environmentally damaging should not be used as an excuse to continue with it. This was an important agreement because issues of environmental change tend to be complex and subject to some level of scientific disagreement. The danger then is that excuses can readily be found for ignoring environmental demands and the case for continuing to favour unhindered economic growth strategies appear stronger.

Like Stockholm, the Rio Summit did not create international law at a stroke but, unlike Stockholm, it did explicitly set the signatory governments on a legislatory path. 'Agenda 21' of UNCED set out a programme of action for implementing sustainable development across a range of environmental issues. Some 40 chapters, detailing the issues to be regulated and the means of effectively doing so, made up Agenda 21. Issues debated in recent years but not yet subject to conventions, such as deforestation and hazardous waste management, were formally given approval for action. A Commission for Sustainable Development was established to regularly review progress towards establishing and implementing the conventions that were to follow. In addition, a crucial tenet of sustainable development was realized in the creation of a fund subsidized by developed countries, the Global Environmental Facility, upon which LDCs could draw.

The ten-year follow-up to Rio, the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002, represented the third environmental 'mega-conference' but was more low key than its predecessor. It was also noticeably more focused on development rather than the environment. Little progress was made in advancing the agenda on species conservation (biodiversity) established at Rio and, although global warming policy was kept alive, it was not developed in any significant way. New proposals to set a framework for phasing in the use of renewable energy sources and improving LDC access to developed world food markets were side-stepped but some new goals were set. The year 2015 was set as a target date for the realization of two new human security aims: halving the number of people who lack access to clean water and achieving sustainability in global fishing.

The environment and military security

From the 1990s environmental issues have also been given greater attention in foreign policy-making circles through the partially widened security notion that some issues of environmental change should be considered the stuff of high politics, because they can have knock-on military effects. The end of the Cold War, again, was significant in widening the focus of foreign policy-makers to see dangers other than that facing them at the other side of the balance of terror 'seesaw', but the roots of this idea can be traced back to the rise of concerns about securing key economic resources in the 1970s.

The oil crises of 1973–74 and 1979 shook International Relations both practically and academically. The academic dominance of classical Realism, which stressed the uppermost primacy of military power in calculating the 'national interest' by which state foreign policy should be guided, was toppled by a recognition of the importance of economic power in state relations. Neo-Realists, such as Waltz (1979), revamped the old paradigm to accommodate non-military components of power into its framework of analysis based on competitive state-to-state relations. At the same time Pluralists, such as Keohane and Nye (1977), felt vindicated that a more cooperative-based and multi-faceted model of how politics is conducted at the international level was shown to be needed by the rise to prominence of military dwarfs such as Saudi Arabia and Kuwait in the global arena. In the 'real' world of International Relations the 'Carter Doctrine', announced in 1980, made it plain that questions relating to the economic resources of distant states would enter into the calculations of the US national interest by stating that military action to secure oil imports and other economic interests was a possibility.

The rise to high politics of oil pricing prompted greater scrutiny of the importance of threats to the supply of key economic resources to states. The 1970s also saw the rise in concerns that global overpopulation could drain the world's resources (see Chapter 4) and greater recognition that resources could be threatened by environmental degradation as well as through political action. It was not until the 1990s, however, when the agenda of international politics was allowed to broaden, that environmental degradation as a potential state security threat began to achieve prominence in academia and to mould the thinking of foreign policy-makers. Economic statecraft had been revived as an instrument of foreign policy by the oil crises but, interestingly, it was not until the strategic constraints of the Cold War had been lifted that a full manifestation of the Carter Doctrine was put into practice with the US-led action against Iraq in the Gulf War. A just war and long-awaited display of collective security it may have been, but few would dispute that securing oil supplies was a key motivation for the allied forces' action.

Whether one takes a positive (moral) or cynical (wealth maximization) view of the allied action, the Gulf War represented a use of military might to preserve stability rather than counter a direct military threat (apart from the perspective of the Gulf States). In this light a strand of IR enquiry emerged in the new world order era to consider if threats to stability due to environmental degradation were possible and hence something that should be of concern to Realist-minded foreign policy-makers. American academic Homer-Dixon has been at the forefront of this area of study, leading teams of researchers throughout the 1990s in exploring the possibility of causal links between environmentally induced resource depletion and military conflict. His extensive research leads him to claim that links can be shown to exist. 'Environmental scarcities are already contributing to violent conflicts in many parts of the world. These conflicts are probably the early signs of an upsurge of violence in the coming decades that will be induced or aggravated by scarcity' (Homer-Dixon 1994: 6).

Homer-Dixon's research focused on LDCs since his belief was that such states were less likely to adapt to the social effects of environmental degradation than developed countries and thus are more prone to this form of conflict. Hence, Homer-Dixon does not postulate that environmental scarcity leads directly to conflict but that

it can be a root cause of social unrest that can spill over into violent unrest. In line with explanations of famine, environmental scarcity (of, for example, fish or fertile soil) occurs through the interplay of three factors: the supply of resources, the demand for resources, and changes in the distribution of resources. Two phenomena, emerging from changes in the three factors, are identified by Homer-Dixon as the key link between environmental scarcity and social unrest: 'resource capture' and 'ecological marginalization'. Resource capture occurs when elites within a state respond to falls in supply or rises in demand by appropriating more resources for themselves and leave the poorer sections of society to bear the brunt of scarcity. Ecological marginalization is said to occur when population growth and/or changes in access to resources for certain sections of the populus produce migrations which cause the over-exploitation of resources in certain areas (Homer-Dixon 1994: 10–11).

Case studies, undertaken by colleagues of Homer-Dixon to illustrate his thesis, included the Senegal River conflict of 1980 and the civil war in Peru between the government and Shining Path. The Senegal River conflict was considered to be an illustration of how 'resource capture' can lead to conflict. An ethnic conflict between the politically dominant Arabic Mauers and black Mauritanians followed the expropriation of black land by Mauers. This land grab was in response to scarcity resulting from a rise in land prices due to a damming project. Ethnic Senegalese number among the black Mauritanian population and Maures number among the population of neighbouring Senegal, causing the ethnic unrest to become internationalized. In Peru the rise of Shining Path may be attributed more to the 'ecological marginalization' of peasant farmers in the mountainous areas of the country than their ideological conversion to Maoism (Homer-Dixon and Percival 1996).

The spillover of conflict from Mauritania to Senegal led Homer-Dixon to consider that river water is the only renewable resource likely to precipitate inter-state conflict (Homer-Dixon 1994), but his research has generally concluded that environmentally inspired conflict is most likely to be civil rather than inter-national. The weakening of states, however, contributes to regional instability and can still be construed as a security issue for other states, it is contended.

The work of Homer-Dixon, and other prominent US academics such as Kaplan (1994), certainly convinced the US government in the early 1990s that environmental degradation represented a potential source of military insecurity. In 1993 a new government position in the Defense Department was created, the Deputy Under Secretary for Environmental Security, and the Environmental Task Force was set up as part of Washington's intelligence network. The introduction to the 1994 National Security Strategy Document, an annual government statement of foreign policy aims, states that 'an emerging class of transnational environmental issues are increasingly affecting international stability and consequently present new challenges to U.S. strategy' (USA 1994: 1).

Despite its influence on US government thinking the approach of framing environmental scarcity as a military security has not been without its critics. The empirical evidence linking environmental degradation and political conflict is, by Homer-Dixon's own admission, not straightforward, prompting scepticism as to whether other variables are the real causes of conflicts in situations where

environmental scarcity can be demonstrated. Smith, for example, points out that the Senegal River conflict was more about ethnic and class conflict than access to river water (Smith 1994). Levy criticizes the Homer-Dixon-led research on the grounds that the fact that only LDCs are chosen as case studies is a tacit admission that general poverty, rather than environmental change, is the root cause of the conflicts analysed:

> it is difficult to imagine how conflict in any developing country could not involve renewable resources. Developing country elites fight over renewable resources for the same reason that Willy Sutton robbed banks – that's where the money is.

> (Levy 1995: 45)

The environmental scarcity literature focuses on the competition for non-renewable resources as a new, destabilizing trend in post-Cold War International Relations, referred to by Rogers as 'prologue wars' heralding a new era (Rogers 2000: 79). However, just as it can be shown that resource wars are nothing new, neither are conflicts with a non-renewable resources dimension. The 1969 'Football War' between El Salvador and Honduras, despite its linkage to a volatile World Cup qualifying match between the two national sides, echoed the River Senegal dispute in that its main cause was ethnic tension created by migration and its effects on land rights. Even two of the wealthiest and most democratically mature states, Iceland and the UK, had a major diplomatic dispute with a limited military dimension over fishing rights in the 1970s 'Cod Wars'. With regard to the much-vaunted advent of 'water wars', Gleick points out that such conflicts go back 5000 years and lists a number of them, including an ancient 'dambuster' raid by Alexander the Great of Greece against Persia between 355 and 323 BC (Gleick 1994). If the focus is narrowed to domestic upheaval then it is probably fair to suggest that most popular revolutions have had questions relating to access to productive land at their core. Equally, an abundance of resources can be as much a source of contention as much of scarcity. Iraqi oil has made it the foremost international military battleground of recent years and the geological fortune to possess rich diamond reserves has been the political misfortune of countries such as the Congo and Sierra Leone. Of course access to resources causes political upheaval. It was ever thus.

Not only are 'water wars' nothing new, they barely register in an analysis of modern military history. Despite a spate of publications warning of the likelihood of conflicts fought to secure freshwater supplies, particularly in the arid and volatile Middle East (Starr 1991, Bullock and Adel 1993), no war of this kind was fought in the twentieth century and it has played little part in Arab–Israeli hostilities (Libiszewski 1995). There is no evidence that fighting over depleting resources is in any way a distinguishing feature of the contemporary world.

Securing access to resources, it could be argued, is becoming more critical when parts of the world are depleting life-supporting non-renewable resources, such as in the process of desertification, but responsible management and cooperation is a more rational and fruitful political response than conflict. Again, as with problems of famine, the democratic peace thesis leaves room for optimism that we are not entering an era of resource wars. Democracies are forced to confront resource

allocation questions as a matter of course and, increasingly, act on environmental degradation even if no obvious human side-effect is apparent. In addition, democracies (and some non-democracies) long ago came to the conclusion that resources are more easily secured through trade and common management than conflict. Access to fishing beds on the high seas is an issue of great importance in many states and international competition to secure rights remains fierce, but the threat of the global depletion of certain species has prompted unilateral acts such as the Canadian suspension of cod fishing from the 1990s and the EU's unpopular but necessary conservation co-management strategy, the Common Fisheries Policy. There is scope for optimism that resources can be managed by most states in the present state system but the much increased likelihood of scarcity due to global warming could yet see the resource wars scenario become a reality.

Environmental issues themselves as threats to security

Whereas much of the 'environmental security' literature to emerge in the 1990s focused on adding environmental degradation to the list of conventional concerns used to discern the potential military threats emanating from other states, a more profound school of thought arose around the same time arguing for a deepening of the meaning of security to incorporate issues of environmental change. Ullman, in pioneering the re-evaluation of security in 1983, sought to cast the concept in a less statist light by including within its remit the security of individuals imperilled by resource scarcity rather than just tacking on a new category of threats to the security of states (Ullman 1983). By the end of the decade it was not only warming East–West Cold War relations but the apparent actual warming of the Earth that brought environmental threats to security to the fore of international political concern.

In a 1989 article for the conservative and influential journal *Foreign Affairs*, Jessica Mathews, a former member of the US government's National Security Council, followed Ullman's line of reasoning in a more state-centred analysis. In addition to calling for greater consideration of the effects of resource depletion on the political stability of poorer states, Mathews argued that environmental problems with global ramifications, such as ozone depletion, climate change and deforestation, should become issues of state security concern (Mathews 1989).

Environmental threats to human security

Ozone depletion

In 1985 the British Antarctic Survey was able to prove conclusively what had been suspected by scientists for at least a decade, that the Earth's ozone layer had a hole in it. The ozone layer is a protective gaseous shell in the upper atmosphere which absorbs ultraviolet rays from the sun before they reach the Earth's surface. This is a vital service for humanity (and other life forms) since ultraviolet radiation can claim lives in the form of skin cancer and other serious ailments.

The 'clear and present danger' posed by the loss of this defensive shield prompted an unusually rapid international response. Within a few months of the British Antarctic Survey discovery the Vienna Convention on Protection of the Ozone Layer established a framework treaty, fleshed out two years later in the 1987 Montreal Protocol on Substances That Deplete the Ozone Layer. The 1987 Montreal Protocol saw 24 industrialized states bind themselves to an agreement for major cuts in the future use and emission of chlorofluorocarbons (CFCs) and some other chemicals known to be agents of ozone depletion. In the years since 1987 the regime has been strengthened in a series of amendments deepening the cuts to be made by states and widening its application to most of the world. This was achieved by the application of key sustainable development principles agreed on at Rio with LDCs allowed to take a slower track towards phasing out CFCs than the developed states and a Multilateral Fund created to overcome the costs of implementing the agreements. The success of the regime can be witnessed by growing recent evidence that the ozone layer has begun to repair itself (WMO/UNEP 2006).

Global warming

Surely the clearest case of how environmental change can become an issue of security is in the threat posed by global warming. The Earth's average temperature has risen consistently over the past century and it is now almost universally accepted that this is more than a natural development and likely to accelerate if not responded to. The central cause of global warming is an exacerbation of the natural phenomenon of the 'greenhouse effect', caused by increased industrial emissions. Increased releases of carbon dioxide and methane over the years, principally through the burning of fossil fuels, served to exaggerate the natural tendency of the atmosphere to trap a certain amount of infrared sunlight after it is reflected from the Earth's surface. The implications of this are various but include increased desertification and a raising of sea-levels due to the polar ice-caps melting, both carrying significant threats to human life (see Table 6.1).

The Framework Convention on Climate Change emerged two years after Rio and was fleshed out in the Kyoto Protocol of 1997. Most of the world's states committed themselves to cuts in 'greenhouse gases', to be phased in over time and differentiating between developed and less developed states. The costs to developed states of implementing the cuts were significant enough to prompt a rebellion not seen in the ozone regime negotiations. The USA, most notably, broke ranks and failed to ratify the protocol despite signing the framework treaty. The US government has cited the lack of scientific certainty over global warming and concerns over the lesser constraints imposed on LDCs but also, crucially, admitted that the treaty is simply not in the USA's 'national interest' due to economic cost. Although scientific uncertainties inevitably still exist over an issue as complex as climate change a definitive epistemic consensus has emerged from the UN's Intergovernmental Panel on Climate Change since its establishment in 1988. By their fourth report in 2007 this substantial grouping of the world's top climatologists were able to pronounce, in the cautious words of science, that it was between 90 and 95 per cent certain that global warming was caused by human action (IPCC 2007). Despite the

Table 6.1 The ten major security threats posed by global warming

1	More frequent and lengthy heatwaves
2	More frequent droughts
3	Coastal flooding due to sea-level rises
4	Reduced crop yields due to reduced rainfall
5	Spread of tropical diseases North and South
6	Increased rate of water-borne diseases in flooded areas
7	Ocean acidification due to carbon dioxide affecting fish stocks
8	More frequent and stronger riverine flooding in wet seasons due to glaciers melting/reduced water supply in dry season
9	Increased incidences of wildfires
10	More frequent and stronger windstorms

undoubted costs to the US exchequer of implementing Kyoto, which would be far beyond those for any other state, this hard-headed economic calculation is increasingly questionable. The 2006 'Stern Review', compiled by a British economist on behalf of the UK government, calculated the cost of non-action on climate change as amounting to at the very least 5 per cent of global GDP for evermore. Set against this, the costs of effective action to curb climate change would amount to around 1 per cent of global GDP per year (Stern 2006).

Global warming is a global problem in both cause and effect, but the scale of human security threat is not equal across the globe. For low-lying island states the prospect of a rise in the level of the oceans is a human and state security threat of the utmost gravity. For other states the threat is seen as far more remote, both geographically and chronologically, and the urgency to act, which is generally needed for governments to ratify costly environmental agreements, is not there. Indeed, it should be noted that the Stern Review was very much a cost–benefit analysis and, while noting that globally the balance is undoubtedly weighted in favour of the former, it makes clear that some parts of the world could experience net gains from fewer cold-related deaths, and the increased revenue from tourism and improved agricultural fertility. It is also apparent that many of the threats identified in Table 6.1 could be averted by human adaptation to a changing landscape.

The threat posed by global warming, however, is not just a theoretical future scenario. The human cost is already significant and is not just confined to the developing world, where other factors can more easily be employed to explain mortality figures. Since the WHO estimated an annual death-toll of 150,000 due to global warming, the Global North has been rocked by events such as the 2004 heatwaves in Western Europe which killed up to 35,000 people, and Hurricane Katrina the following year, which claimed around 1200 lives and caused an estimated $200-billion-worth of damage in the USA. While proving categorically whether such single events are attributable to global warming is impossible, the changes noted in Table 6.1 are already occurring and this overall trend cannot be put down to chance.

Persistent organic pollutants (POPs)

The 1992 Rio Summit was also the catalyst for significant global political action in the area of human health-threatening atmospheric pollution. UNEP's Governing Council in 1997 endorsed the opinion of the UNCED-born Intergovernmental Forum on Chemical Safety that an international, binding treaty be set up to phase out the production and use of 12 POPs including eight organochlorine pesticides and polychlorinated biphenyl (PCB) (Decision No. 19/13c). The Treaty was signed by 127 governments at a Diplomatic Conference in Stockholm in May 2001, initiating a regime that will continue to consider adding new chemicals to the original 12 through a Review Committee. Born of UNCED, forged by UNEP and long promoted by environmental pressure groups, the POPs regime, on the face of it, appears to represent a triumph of environmentalism. There is little doubt, however, that the primary motivation of the signatories was the alleviation of the suffering of their own nationals by these chemicals rather than concerns for the fates of birds, fish or atmospheric quality. 'This new treaty will protect present and future generations from the cancers, birth defects, and other tragedies caused by POPs' (Buccini 2000).

The production and use of the 12 outlawed chemicals has long ceased in most developed countries but their properties ensure that they remain a domestic hazard to their populations. The listed chemicals are all highly persistent, have a propensity to travel globally in the atmosphere through a continual process of evaporation and deposition, and tend to bioaccumulate in human foodstuffs. Hence, sterility, neural disorders and cancer in peoples of the developed world can be attributed to the use of organochlorines in other parts of the planet. The political significance of this is such that even President George W. Bush, hot on the heels of his government's revocation of the Kyoto Protocol on Climate Change, declared the USA to be a firm supporter of international 'environmental' cooperation on POPs.

Deforestation

An appreciation of the role of forests as carbon sinks gave the problem of the over-exploitation of forests throughout the world a clearer human security dimension and prompted efforts, principally by Northern states, to set up a convention on forests at the Rio Summit. These negotiations failed, resulting only in a weak, non-legally-binding agreement known as *The Forest Principles* which proclaims the virtues of sustainable forestry management but, in effect, gives the green light to states to continue deforesting by asserting that forests are sovereign resources. Effectively regulating deforestation is too much of an economic burden for most prolific 'logging' states to countenance and is not seen as sufficiently threatening to human security to prompt other states to exercise greater leverage on them. Again, however, this attitude is a case of not being able to see the trees for the wood. Deforestation exacerbates global warming and may be seen as a causal factor behind natural disasters such as mudslides down once naturally secure hillsides (see Chapter 8) (Humphreys 2006: 1).

Desertification

Perhaps the clearest manifestation of the 'Tragedy of the Commons' effect in the world over recent years has been the process of desertification, whereby deserts have grown in size at the expense of the fertile lands surrounding them. Once land becomes arid in this way it is effectively lost forever in terms of its productive value and so can have food security implications for the local population and, to a limited extent, humanity at large. Recognition of this fact prompted the 1994 Convention to Combat Desertification which sets out a code of practice for the management of semi-arid lands. The convention was unusual in global environmental politics in that it was prompted by LDCs rather than the industrialized states. It was principally African states, affected by the spread of the Sahara and Kalahari deserts, which championed the inclusion of this issue in Article 21 of the Rio Summit (Chapter 12). The regime has evolved slowly since 1994 and, although it is now virtually global in scope, it lacks any of the legal rigour of its ozone depletion or global warming counterparts. The lack of a clear human security dimension for all states has stunted its development.

Evaluating environmental security

Deudney is a foremost challenger to the inclusion of environmental issues within the remit of security politics. He cites three key arguments for not extending the reach of Security Studies to incorporate issues he, none the less, considers as important political concerns.

1   It is analytically misleading to think of environmental degradation as a national security threat, because the traditional focus of national security – interstate violence – has little in common with either environmental problems or solutions.
2   The effort to harness the emotive power of nationalism to help mobilize environmental awareness and action may prove counterproductive by undermining globalist political stability.
3   Environmental degradation is not very likely to cause interstate wars.

(Deudney 1990: 461)

Deudney's reasoning, unlike that of many critics, is not that of the refusenik military strategist irritated by greens encroaching on his turf but comes from a sincere belief that securitizing the environment undermines rather than enhances the likelihood of finding appropriate political solutions to environmental problems. Point 3 is a direct rebuttal of the Homer-Dixon-led approach of coupling certain environmental issues with military security which, as discussed in the previous section, is open to challenge. Point 2 rightly implies that global problems require global responses rather than relying on individual state calculations of rationality, a standard challenge presented by environmental problems to the traditional statist national interest-based model of how foreign policies should be constructed. The weakness in Deudney's argument, however, comes from a statist bias in another way. Nationalism

is, indeed, an inappropriate political ideology to tackle most environmental problems but who has ever proposed this as a solution to global warming or pollution? Environmental problems are, indeed, fundamentally distinct from the problem of inter-state violence but why does this preclude them from being security concerns? Deudney, in common with most traditionalists, conflates 'security' with 'something that requires a military response by the state' rather than seeing it as a condition which relates to people's lives and which can be acted upon at various political levels. 'Both violence and environmental degradation may kill people and may reduce human well-being, but not all threats to life and property are threats to security' (Deudney 1990: 463). This represents an explicit admission that 'security' can have no meaning other than as a synonym for 'military defence against other states'. Real security needs of people and of the whole planet are excluded by such blinkered logic. The fact that a problem cannot be solved by conventional thinking and means does not indicate that the problem should be ignored but rather that the thinking should be improved and new types of solution sought.

Threats related to the environment confront the inadequacies of conventional state-centred thinking in International Relations most profoundly of all. Dyer argues that global environmental change represents the greatest security challenge to the world because it is 'seen as an externality to the international system, rather than an internal variable which can be addressed in terms of familiar political structures and their supporting social values' (Dyer 2000: 139). Global warming potentially threatens the security of all life on Earth (and the states they inhabit) and it is a threat which does not emanate from any particular state and which cannot be averted by any particular state, regardless of its economic or military capabilities. Dyer refers to this conundrum as a new type of *security dilemma* soluble only by new, global political structures (ibid.). In a similar vein, Myers has termed environmental security 'ultimate security' (Myers 1993).

The failings of individualistic, rather than collective rationality in decision-making in certain problem-solving situations is familiarly portrayed in game-theory analogies such as the 'Prisoner's Dilemma' (Box 6.2). The Prisoner's Dilemma can easily be re-cast as a 'polluter's dilemma' facing states operating in the international system when confronted with certain environmental issues. The question 'to pollute or not to pollute?', when applied to the atmosphere or waters, can yield different 'rational' answers. The economic costs incurred by curbing pollution, allied to the fact that the negative effects of the pollution might be slight or even borne elsewhere, could lead the rationally acting state to favour continuing to pollute, particularly if other states choose to curb pollution and lessen the collective problem. If all states were to take such a selfish stance, however, the results for the polluter may become negative, with 'environmental costs' exceeding the costs of political action. Recent political diplomacy on measures to combat global warming illustrate this dilemma neatly, particularly since the potential costs of failing to think and act collectively are catastrophic.

Box 6.2 The Prisoner's Dilemma

Two prisoners are arrested by police for a minor crime both have committed, but the police are more interested in securing a confession to convict for a more serious offence they are both implicated for but for which there is no proof. The two prisoners are offered a deal by the police while being held in separate cells. Each prisoner is told separately:

1 If they confess to the serious crime they can go free, while the other prisoner gets a three-year sentence.
2 If they both confess they each get a two-year sentence.
3 If they both fail to cooperate they will each be convicted of the minor crime and receive a one-year sentence.

Thus, each prisoner has two options yielding four possible outcomes: freedom and one, two or three years in prison.

The dilemma demonstrates the complexity of rational decision-making when other decision-makers are involved in the process. Simultaneously, the best and worst option is to cooperate with the police. The 'safe' option of staying silent depends on a level of trust in the other prisoner in order to avoid the heavier sentence. According to individual rationality the best choice might be to confess but, if collective rationality is employed, then the best outcome is for both to stay silent.

Conclusion: towards ecological security?

Global political action on environmental change has seen many issues politicized and put on the international agenda but few securitized at the top of that agenda. Myriad international regimes have emerged since the high watermark of environmental governance at Rio in 1992 but global policy today stands in stark contrast to the domestic environmental laws of Western European and North American states which are marked by precautionary consumer standards and non-human conservation measures. Where successful international environmental regimes have emerged it has been where a clear and unambiguous human health threat is apparent.

It is far rarer for the value of environmental protection to be prioritized at the global level than it is at the domestic level. Global politics is such that international agreements, to which governments remain the signatories in spite of the growing role of pressure groups, are still somewhat reliant on a perception of utilitarian gain. Although it is becoming ever more blurred, a 'high politics–low politics' distinction is still evident in international politics. Governments are still prone to taking blinkered decisions informed by economic interest in the face of epistemic consensus and longer-term utilitarian calculations of 'national interest', as witnessed by the USA's stance on global warming.

There is a need for global environmental policy to go beyond knee-jerk reactions to disasters or imminent disasters if it is to properly enhance human (and indeed non-human) security. The evolution of global governance should eventually realize this. Only through the holistic management of environmental threats can the 'Prisoner's Dilemma' scenario be escaped and states be freed up to act in their and their people's real interests rather than being compelled by domestic political constraints to conserve harmful human practices. The European Union's Common Fisheries Policy is hated in its maritime member-states because it stops fisher-men fishing as they have always done but is still a highly necessary system, since it prevents the exhaustion of fish stocks to everyone's detriment. Seeing the bigger picture is difficult in a politically compartmentalized world but it is gradually hap-pening through the growth of a global civil society and epistemic communities persuading governments and citizens that it is in their own interests to think global.

Dalby argues that the key to safeguarding human security in issues such as climate change and resource depletion is to cease framing such problems in the context of 'environmental threats'. Considering human activity as an integral part of the Earth's biosphere, rather than something related to but distinct from 'the environment', is a central tenet of ecologism and its emphasis on giving greater value to non-human life forms, but may be understood also as a means of preserving the human species. Dalby defines security in terms of a referent object which is the global totality: 'the assurance of relatively undisturbed ecological systems in all parts of the biosphere' (Dalby 2002: 106). Thinking in terms of ecological rather than environmental change means that social and economic transformations are not treated as distinct from atmospheric or biological developments in terms of their consequences. Appreciating that human phenomena like urbanization or increasing consumption have effects in the natural world with implications for human security can improve the management of threats. Security threats can be more subtle than the rapid emergence of a hole in the ozone layer and the solutions more complex than switching from the use of CFCs to replacement chemicals. A better appreciation of this complexity could help alleviate these difficulties before they become imminent crises.

Ecologism may be a minority ideology in today's world but most democratic states have political systems that have evolved over time to act in the public interest even where this incurs some individual or commercial cost. US environmental policy is robust enough to restrain business interests for the good of the environment and society even though its government has not always behaved this way on the global stage. There is no reason to suppose that global environmental policy cannot evolve in a similar manner but it needs to do so soon before it is too late.

Key points

- The threat to human security posed by environmental change is mainly an indirect one, by heightening vulnerability to other threats such as disease, or a long-term potential one.
- This lack of imminent threat has limited the development of global

environmental policy much beyond acting against obvious threats such as global warming and ozone depletion.

- The notion that environmental scarcity can prompt military conflicts has attracted much attention in recent years but the case is not proven.
- Tackling many environmental problems necessitates international or global action, exposing the limitations of the sovereign state system as a means of enhancing human security.

Note

1 The 1967 *Torrey Canyon* disaster, when an oil tanker was wrecked and spilled its load off the coast of the Scilly Isles, UK, was particularly influential in stimulating awareness and an international political response to oil pollution.

Recommended reading

Carson, R. (1962) *Silent Spring*, Harmondsworth: Penguin.

Deudney, D. (1990) 'The Case against Linking Environmental Degradation and Security', *Millennium Journal of International Studies* 19(3): 460–476.

Dyer, H. (2000) 'Environmental Security: The New Agenda', in C. Jones and C. Kennedy-Pipe (eds) *International Security in a Global Age – Securing the Twenty-first Century*, London, and Portland, OR: Frank Cass.

Greene, O. (2005) 'Environmental Issues', in J. Baylis, and S. Smith (eds) *The Globalization of World Politics. An Introduction to International Relations*, 3rd edn, Oxford and New York: Oxford University Press.

Hardin, G. (1968) 'The Tragedy of the Commons', *Science* 162: 1243–1248.

Homer-Dixon, T. (1994) 'Environmental Scarcities and Violent Conflict: Evidence from Cases', *International Security* 19(1): 5–40.

Lomberg, B. (2001) *The Sceptical Environmentalist*, Cambridge: Cambridge University Press.

Useful web links

Stern Report: http://www.hm-treasury.gov.uk/independent_reviews/stern_review_eco nomics_climate_change/stern_review_report.cfm.

United Nations Environment Programme: http://www.unep.org/.

World Summit on Sustainable Development (Johannesburg 2002): http://www.johannesburg summit.org/.

Natural threats to security

> We cannot stop the forces of nature, but we can and must prevent them from causing major social and economic disasters.
>
> Kofi Annan, UN Secretary-General 1999 (Annan 1999)

Natural disasters

A major source of insecurity for much of the world's population is rooted in the natural, non-living world, from physical phenomena originating in the Earth's interior, its atmosphere and even from beyond our planet. The phrase 'Acts of God' encapsulates the notion of human helplessness in the face of such dangers which are out of our control, but the truth is that natural disasters are as much socio-political as geological or meteorological phenomena. '[A] disaster is the intersection of two opposing forces: those processes generating vulnerability on one side, and physical exposure to a hazard on the other' (Blaikie *et al*. 1994: 22). It is socio-political factors that make people vulnerable to hazardous natural events. The fact that people live, whether through their own choice, ignorance or compulsion, in places known to be prone to disaster is one such factor. Another is the capacity and/or willingness of governing authorities to take steps to alleviate the potential human cost of events known to be likely to occur.

Table 8.1 illustrates not only the horrific scale of human casualties that can accrue from natural disasters but also the importance of the socio-political component in such events. The Huang Ho and other Chinese rivers are more prone to dramatically bursting their banks than most of the world's waterways but this has been well known in China for centuries. Overpopulation, poor government and the human propensity to risk residing in such hazardous places for the benefits of farming on the fertile soils deposited by flooding are major contributors to the shocking death-toll that has accumulated over time.

Table 8.1 The ten worst natural disasters in history

	Place	Date	Type	Fatalities
1	Huang Ho River, China	1931	Flood	3.7 million[a, b]
2	China	1959	Flood	2 million[a, b]
3	Upper Egypt and Syria	1201	Earthquake	1.1 million[d]
4	Huang Ho River, China	1887	Flood	900,000[c]
5	Shaanxi, Shanxi and Henan, China	1556	Earthquake	830,000[c]
6	Huang Ho River, China	1938	Flood	500,000[b]
7	China	1939	Flood	500,000[a, b]
8	Bangladesh	1970	Cyclone	300,000[a, b]
9	Tang-shan, China	1976	Earthquake	242,000[a]
10	Indian Ocean	2004	Tsunami	235,000[a]

Sources: [a] CRED (2007), [b] Disastercenter (2003), [c] Castello-Cortes and Feldman (1996), [d] NGDC (2003).

Table 8.2 Average annual death-toll by types of natural disaster, 2000–06

1	Tsunamis	31,583
2	Earthquakes	19,028
3	Extreme temperatures	8277
4	Floods	5207
5	Windstorms	3040
6	Avalanches/landslides	894
7	Wildfires	29
8	Volcanic eruptions	29

Source: CRED (2007). Excludes droughts.

Historically, floods and earthquakes have presented the greatest natural hazards to human life but, in the 1990s, windstorms claimed more lives. These three categories of disaster have continued to account for thousands of deaths per year in the early years of the twenty-first century, as Table 8.2 illustrates. Statistics for the past six years are, however, distinct from previous eras since two particular events, the 2003 European heatwave and the 2004 Indian Ocean tsunami, were far and away the most calamitous incidents of their kind in history and have elevated the position of these phenomena to higher than ever before.

Windstorms

Cyclones

Known variously as hurricanes (in North America) or typhoons (in East Asia) cyclones are storm systems based on an area of low atmospheric pressure in tropical climes. Gale force winds circulate around the calm 'eye' of the storm (anticlockwise in the Northern Hemisphere, clockwise in the South) accompanied usually by torrential rains. The most devastating consequence of a cyclone is coastal flooding caused by a *storm surge*, when winds create huge sea waves. It was in this way that upwards of 300,000 people were killed around the Ganges delta in Bangladesh in 1970. Wind damage and riverine flooding can also result from cyclones and claim lives.

Tornadoes

Similarly to cyclones, tornadoes are storms which rotate around an eye of low atmospheric pressure. However, in contrast, they tend to be narrower and faster and generally originate inland rather than at sea. The world's most deadly tornado occurred again in Bangladesh when 1300 people were killed around the town of Shaturia in 1989 (Castello-Cortes and Feldman 1996: 27). Owing to their narrow,

funnel-like shape the destruction caused by tornadoes tends to be quite localized, although they move across the surface in an unpredictable manner. Damage by tornadoes tends to be of three forms:

1   *High winds*: Extremely strong winds associated with tornadoes can cause significant damage to buildings, either directly or through the propelling of debris.
2   *Updraught*: The circulatory winds and low pressure vortex can cause large objects and even people to be 'sucked up' the tornado funnel and deposited up to several kilometres away.
3   *Effect of low pressure*: The extremely low air pressure in the eye of the tornado is the most hazardous element of the phenomenon. Buildings caught in the eye are prone to explode due to the difference in pressure inside and outside the walls.

Floods

Floods historically are far and away the biggest security threat to humanity from the non-living world. Although overtaken by windstorms and tsunamis in recent years, most of these fatalities were also the result of flooding triggered by such events. Floods often occur as secondary effects of other natural phenomena, but can present a direct hazard to human life in a number of ways.

Flash floods occur when heavy rainfall exceeds the capacity of the ground to absorb the water and causes a rapid, widespread deluge. Approximately 600 people were killed in and around the Algerian capital Algiers in this way in 2001. *Riverine floods* occur when precipitation causes a river to burst its banks. This is the most dangerous type of flooding since it is relatively common and rivers frequently run through densely populated areas. The Huang Ho river system in China can lay claim to being the most hazardous natural feature on Earth, having claimed millions of lives over the centuries. Additional flooding hazards can occur when an excessive inflow from rivers or as a result of snow melt causes lakes or seas to flood.

Drowning, obviously, is the major means by which floods can kill but this can happen in a number of ways. People may simply be engulfed by rising waters, become trapped in buildings or cars, or caught in river sediment deposited by the waters. Collapsing buildings and trees form an additional significant hazard and structural damage may also lead to deaths by electrocution and even, with grim irony, fires. Hypothermia and water-borne diseases are also often associated with flooding. Flooding only represents a hazard when it is not predictable. The regular, seasonal flooding of rivers can not only be managed but utilized for its benefits to humankind, since silt deposits from rivers bursting their banks provide fertile soils. It is instructive that the Bengali language has two distinctive words for 'flood'. *Barsha* refers to the usual and beneficial floods, while the word *bona* is reserved for more infrequent and destructive large floods.

Earthquakes

Earthquakes, more clearly than any natural hazard, demonstrate the centrality of the social component in the onset of a disaster. Although the scale of seismic shocks in the Earth's crust cannot be entirely predicted, the places where such shocks occur is well established. Seismic activity is most pronounced on the margins of the Earth's tectonic plates, such as along the San Andreas Fault Line, which marks the point at which the Pacific plate meets the North American plate. The threat to humanity posed by earthquakes is almost entirely due to the secondary effects of seismic waves destroying the man-made infrastructure built in such susceptible areas rather than the event in itself.

Surface faulting

Direct death by earthquake is rare but possible if someone is killed by a fall into a fault line which has been widened or moved by seismic waves. More commonly, though still a relatively minor form of earthquake-related fatality, people can be killed by buildings being dislodged in this way.

Ground motion

Of far greater significance than faulting is the shaking effect of seismic waves on the Earth's surface. A combination of the waves' amplitude, frequency and duration will determine how much ground motion they create. This is generally most pronounced near the earthquake's *epicentre* (the point on the surface directly above the source of the seismic wave, the *focus*). Ground motion in itself is not especially hazardous to man, but the effects it has on the human environment can be devastating.

1   *Falling buildings*: The most common cause of death during an earthquake is as a result of the collapse of dwellings or other constructions. The twentieth century's most calamitous earthquake, in Tang-shan, China, in 1976, killed nearly a quarter of a million people in this way. Most of the city's buildings were destroyed during the principal earthquake and those which survived were then toppled by the *aftershocks* that followed. Hence, the design and location of buildings in earthquake-prone areas is a critical factor in the scale of security threat they represent. In some cities in locations vulnerable to earthquakes, such as Tokyo and San Francisco, the security threat to citizens is significantly diminished by the implementation of regulations requiring particular safety-conscious engineering techniques in the construction of buildings.

2   *Fire*: The structural damage caused by earthquakes can prove lethal in ways other than crushing victims with masonry or causing them to fall to their deaths. A common knock-on effect is the spread of fire through a town hit by an earth tremor. Most of the casualties of the famous earthquakes that hit San Francisco in 1906 and Tokyo in 1923 were killed in fires instigated by damage

to cookers and heating equipment. In Tokyo, fire swept through wooden dwellings specifically designed to avoid the sorts of casualties associated with the fall of stone buildings.

3   *Liquefaction*: Deaths may also result from earthquakes when geological conditions permit groundwater to seep to the surface due to seismic disturbance in a process known as *liquefaction*. This can result in major land subsidence or flooding. It was in this way that many of the victims of the 1985 Mexico City earthquake perished.

4   *Landslides*: Earthquakes can also pose a hazard by prompting the fall of stones or soil from a hillside overlooking a town.

Avalanches/landslides

Sudden mass movements of snow and ice down a mountainside, known as avalanches, can kill by directly smothering people in a valley or, more commonly, by destroying buildings. 'Wet' snow avalanches, which usually occur in spring when mountain snows begin to melt, tend to be the most destructive. The biggest ever avalanche disaster occurred in Peru in 1970 when nearly all of the 20,000 inhabitants of Yungay were killed when an earthquake triggered the fall of a wet 'slab avalanche' of ice and glacial rock down the side of the country's highest mountain, Nevado Huascaran. Airborne-powder-snow avalanches are less hazardous but can also kill, as they are frequently preceded by avalanche winds which can cause houses to explode as a result of rapid changes in air pressure (Whittow 1984: 45).

Landslides are a common knock-on effect of other geothermal and meteorological phenomena and are sometimes man-made, but can occur independently by the natural process of gravity acting on soil and rock accumulated on a hillside. Typically, rainwater is the catalyst for this process. Heavy rains associated with Hurricane Mitch in 1998 prompted a massive slide of debris dislodged from the Casita Volcano in Nicaragua, destroying two towns and claiming around 2500 lives.

Extreme temperatures

Both 'hot waves' and 'cold waves' can kill. The deadliest recorded heatwave swept across Western Europe in the summer of 2003 and claimed around 50,000 lives, principally in France and Italy (CRED 2007). Excessive cold represents the first and excessive heat, the second biggest annual causes of death by natural hazards in the USA (Kunkel *et al.* 1999). Short-term dramatic rises in temperature can kill through heat-stroke and cold waves can kill directly by hypothermia or frostbite. Most cold-wave deaths, however, are caused indirectly as a result of power lines freezing or heavy snow crushing dwellings.

Tsunamis

The Japanese term *tsunami* (meaning literally 'harbour wave') is the more correct term for what are still sometimes referred to as 'tidal waves'. These giant sea waves are not produced by tides but by seismic activity such as volcanic eruptions and earthquakes. Tsunami have a wavelength of between 100 and 150 kilometres (around 100 times the size of an ordinary sea wave) and can travel hundreds of kilometres at speeds ranging between 640 and 960 km/h. On the high seas, however, they can be very difficult to detect since their height may be no more than a metre (Whittow 1984: 554). By far the most devastating tsunami in history occurred in December 2004 in the Indian Ocean, triggered by earthquakes along the margins of the Indian and Eurasian tectonic plates near Aceh, Indonesia, and the Andaman Islands of India. Around 230,000 people were killed as a result of rapid coastal flooding in Indonesia, Sri Lanka, India, Thailand, Malaysia, the Maldives and Somalia (CRED 2007).

Volcanic eruptions

The threats to human life from volcanic activity come in many, diverse forms.

Lava flows

The most familiar threatening image of volcanicity is the sight of molten lava flowing down the hillside. Today, however, lava flows represent a minor threat to life since they are generally slow enough and well enough observed to permit the evacuation of nearby settlements.

Pyroclastic flows

More deadly than lava flows are the movement of mixtures of volcanic gases and debris that can form on the side of a volcano. The Roman city of Pompeii was famously destroyed in this way, and the highest death-toll by volcanicity in the twentieth century was also accounted for in this way when 29,000 people were killed near Mount Pelee, Martinique, in 1902.

Lahars (volcanic mudflows)

Volcanic debris mixed with water can also form a deadly agent, principally since this moves further and more quickly than lava or pyroclastic flows. The 1985 Nevada del Ruiz eruption in Colombia killed 23,000 people in this way when a relatively small eruption produced pyroclastic flows which mixed with snow at the summit and flowed many kilometres down the valley, engulfing the town of Armero.

Tephra

Various solid objects can be spat out at high speed during a volcanic explosion. Chunks of molten lava chilling in the air to form 'volcanic bombs', volcanic glass and ash may shower on to residential areas. Eruptions of Mount Pinatubo in the Philippines in 1991 killed over 200 people principally as a result of tephra collapsing the roofs of houses in nearby settlements. Tephra may also create knock-on disasters by downing aeroplanes, instigating lightning and damaging infrastructure and crops. A famine occurred following the 1815 Tambora eruption in Indonesia, the largest and most deadly volcanic eruption in history, killing 82,000 people in addition to the 10,000 direct deaths from tephra and pyroclastic flows (University of North Dakota 2002).

Poisonous gases

Many toxic chemicals can be emitted by volcanic eruptions including carbon dioxide, carbon monoxide, sulphur dioxide, hydrogen sulphide and gaseous forms of hydrochloric and sulphuric acid. It is even possible for poisonous gases to be released from a volcano without any eruption. In Cameroon in 1986 1700 people were killed by a cloud of carbon dioxide released from Lake Nyos, a crater (*caldera*) on a dormant volcano. The gas had seeped out of underground magma into the lake and was then released into the atmosphere owing to some sort of disturbance to the water (Coch 1995: 97).

Wildfires

Wildfires are prominent in woodland regions with an arid climate and strong winds. Droughts and hot winds can dry vegetation which may then be ignited by lightning or other forces causing fires which spread to other trees or shrubs carried by the wind. The USA and Australia are particularly prone to wildfires in the summer. The worst ever wildfire disaster occurred in 1871 in the US states of Wisconsin and Michigan, when around 1500 people perished (Smith 2001: 248). The Australian bushfires of 1974–75 burned around 15 per cent of the whole country (ibid.).

It is debatable, however, whether wildfires should be considered natural disasters at all since an estimated 80 per cent of them are man-made, resulting from negligence or ignorance in forestry, farming or some other form of land use (Goldammer 1999: 69). Indeed, it has become increasingly apparent in recent years that many wildfires are not only not natural but are also not accidents. It has been suggested that around a quarter of wildfires in California occur as a result of arson (Smith 2001: 256). There was a public outcry in Australia in 2002 when it appeared that the 2001–02 'Black Christmas' fires that devastated large areas of New South Wales were deliberately started by a number of youths and young adults for no clear motive. The human aspect, whether deliberate or accidental, has become more significant with the increased encroachment of settlements into wooded areas, and wildfires are becoming more common and even a regular phenomenon in certain places.

Space invaders: natural threats to security from other worlds

Although they have yet to greatly impact upon human society, natural phenomena emanating from beyond the Earth must also be seen to represent a security threat. 'An asteroid of size 1km or more hitting our world at the minimum possible velocity (11km/s – the escape velocity of the Earth) would release at least as much energy as 100,000 one-megaton hydrogen bombs' (Kitchin 2001: 54). Asteroids are minor planets within our solar system which vary in size from a diameter of 1000 kilometres to less than one kilometre. Most lie between the orbits of Mars and Jupiter but some, the 'Earth Crossing Asteroids' (ECAs), can cross this planet's orbit of the Sun. The ECAs together with comets and meteoroids (debris from asteroids or comets) which pass close to the Earth are collectively referred to as 'Near Earth Objects' (NEOs). The possibility of one of these celestial objects striking the Earth, and the likely effects, has been the subject of increasing speculation in recent years, and some measures have been taken to improve the capacity to predict if such a collision could occur and initiate thinking on how it could be avoided. The 'Torino Scale' has been devised to rationalize the likelihood of asteroid collision (Peiser 2001) (see Table 8.3).

There are no validated records of human deaths due to NEO collisions but there is evidence that such collisions have occurred. Meteoroids regularly enter the Earth's atmosphere (what are referred to as *meteors*), where most burn up and disappear, but some survive long enough to strike the surface (*meteorites*) or explode close to the surface (*bolides*). Evidence that comets can collide with planets was

Table 8.3 The Torino Scale[a]

0	Events having no likely consequence	Collision will not happen
1	Events meriting careful monitoring	Collision is extremely unlikely
2		Collision is very unlikely
3	Events meriting concern	1 per cent chance of localized destruction
4		1 per cent chance of regional destruction
5		Significant threat of regional devastation
6	Threatening events	Significant threat of global catastrophe
7		Extremely significant threat of global catastrophe
8		Localized destruction (occur every 50–1000 years)
9	Certain collisions	Regional destruction (occur every 1000–100,000 years)
10		Capable of causing global climate catastrophe (occur less than once per 100,000 years)

Note
[a]This scale was devised by Professor Richard Binzel.

provided in 1994 when *Shoemaker-Levy 9* was observed crashing into Jupiter. The 'Cretaceous/Tertiary Impact', caused by either a comet or an asteroid, 65 million years ago created the 250-km-wide Chicxulub crater in the Gulf of Mexico and is widely held to be responsible for the extinction of the dinosaurs and various other life forms. A bolide is believed to be responsible for the 1908 phenomenon around the River Tunguska in Siberia when over 1000 square kilometres of uninhabited forest were flattened (Chyba *et al*. 1993).

The rise of human vulnerability to nature

Natural disasters are, of course, as old as humankind. Even older, if the risk posed to other animals from natural events, such as the fate that befell the dinosaurs, is considered. Although the overall historical trend has been downward since the 1930s, the frequency and deadliness of natural disasters has increased since the early 1990s. A number of factors have contributed to this.

Better information

There is a case to be made that one key factor behind the apparent rise in natural disasters is simply that more are being reported in the world's media. The ever-extending lenses of the global media and concerted efforts of a developing global epistemic community continue to bring more events into focus than ever before.

Population growth

Since 'if people are not involved there is no disaster' (Loretti 2000), the more people there are in the world the greater the likelihood of a natural hazard having human security consequences and becoming a natural disaster. As significant population growth in the world is now largely confined to the countries of the Global South, where disaster mitigation policy tends to be as underdeveloped as the economy, ever greater numbers of people are being exposed to natural hazards.

Urbanization

The burgeoning population of the Global South in the main manifests itself in the growth of major cities. Around half of these new *mega-cities* which have emerged are located in areas prone to seismic or storm activity. A fair proportion of the 20,000 deaths in Nicaragua and Honduras caused by Hurricane Mitch in 1998 have been attributed to the rapid urbanization of those countries in recent decades, which left far greater numbers of vulnerable people exposed to the winds' effects than in previous, similar disasters (Martine and Guzman 2002). Similarly, the towns flattened by the Casita Volcano landslide prompted by Hurricane Mitch, El Porvenir and Rolando Rodriquez, were recently constructed urban settlements.

Land degradation

In many cases natural disasters are triggered or exacerbated by a lack of natural defences. Hence, changes in land use can have disastrous side-effects. For example, the loss of traditional vegetation on river banks can increase the likelihood of flooding, and on hillsides can make landslips more likely (UNEP 2002: ch. 3: 10).

Refugees

Increased flows of refugees and internally displaced people over recent years have contributed to the growth in number and deadliness of natural disasters. Desperate and, frequently, unwelcomed people are likely to settle in insecure places. The exodus of around two million Afghanis to neighbouring Pakistan over the past two decades has presented many of these people with a choice of relocating either in urban slums or rural margins, such as mountainsides (Matthew and Zalidi 2002: 74–75). Either option brings heightened vulnerability to natural hazards, the former from earthquakes and the latter from landslides.

Environmental change

Natural disasters often occur for rational, natural reasons. Tropical cyclones can be understood as 'safety-valves' which dissipate the buildup of excessive heat in the ocean or atmosphere (Ingleton 1999). This has led some climatologists to suggest that the increased prominence of the *El Niño* effect in the 1990s, associated with more frequent cyclones and other extreme weather phenomena, could be linked to global warming (Mazza 1998, Trenberth 1998). The 2003 European heatwave provided even clearer evidence of a correlation between global warming and natural disasters.

Global economic forces

In the same way that new health and environmental threats can be linked to social change prompted by global economic forces promoting modernization, so too can natural hazards. Changes to the human–environmental equilibrium can prompt natural hazards or make people more susceptible to 'regular' hazards. Lopez noted how subsistence farming tribes had, in the 1980s, become more at risk from tropical storms and landslides as a result of being pushed to higher ground by the establishment of modern farmsteads (Lopez 1987). In addition, the traditional relationship between people and natural phenomena may be weakened by global-ization. Societal coping mechanisms can develop over time in areas prone to extreme meteorological or geothermal events and these might be undermined by profound socio-economic changes related to modernization and development. Well-meaning outside interventions can sometimes even prove unhelpful. Traditional tactics for dealing with flooding in Bangladesh, which include building portable houses, burying precious possessions and responding to certain behaviour patterns in animals

associated with an imminent cyclone, have tended to be overlooked by outside agencies. A report on NGO activity in Bangladesh found that well-equipped relief agencies were sometimes less prepared for a flood than the local population, with serious consequences, since they had assumed control of response operations (Matin and Taher 2000).

Preparedness for coping with natural disasters may also be diminished by outside pressures in a more overt way. It has been suggested that the capacities of Nicaraguan and Honduran social services to deal with the effects of Hurricane Mitch in 1998 were diminished by structural adjustment policies put in place in both countries to meet the conditions of IMF loans (Comfort *et al.* 1999).

Vulnerability to natural disasters

In 1999 there were twice as many disaster events reported in the USA as in Bangladesh but Bangladesh suffered 34 times more deaths from those disasters (UNEP 2000). This is not an isolated example. The Red Cross highlights a clear correlation between economic development and the deadliness of natural disasters. Between 1991 and the end of 2000, an average 22.5 people were killed per reported disaster in 'highly developed states', rising to 145 per disaster in 'medium development states' and 1052 per disaster in low human development states (IFRC 2001: ch. 8). Clearly, money can buy some degree of security from natural disasters. More particularly, it is the sort of well-evolved legal environment associated with economic development that brings security to people. 'It is not an "Act of God" that no more than 10 per cent of the multi-storey structures in Indian cities are built according to earthquake resistant norms' (Wisner 2000).

Bankoff, however, cautions that shifting the focus for dealing with natural disasters from technical responses to tackling underlying vulnerability carries a danger of conflating securing those at risk with modernization and traditional notions of economic development. Designating large proportions of the population of the Global South as 'vulnerable' reinforces the notion that such people can only be 'saved' by technical assistance from the North (Bankoff 2001). Some aspects of economic globalization, as the previous section highlighted, have served to make LDC populations more vulnerable at the same time as furthering their economic development. In addition, the 2005 New Orleans flooding in the wake of Hurricane Katrina demonstrated that inadequate governance and social exclusion can render insecure sections of the population of wealthy, developed countries.

In thinking about natural disasters, then, 'vulnerable' should not simply be conflated with 'undeveloped' or 'poor', even though there is clearly some correlation. Various factors, natural and social and local and global, combine to render certain individuals vulnerable to natural hazards. From a 'horizontal' perspective, the strategy most effective for securing vulnerable people from the risks presented by natural hazards is by reducing their vulnerability through societal learning and empowerment. The less vulnerable of the world can assist in this through emergency assistance and technical applications to tame the effects of natural hazards but also by tackling their own contribution to exacerbating the effects of such hazards. Progress on the former has, to date, been much more impressive than the latter.

Preparing for the unexpected: the global politics of natural disaster management

The horizontal versus vertical approaches debate seen in combating global disease resurfaces in the global politics of natural disasters. Proponents of a horizontal approach have become more prominent in recent years, challenging traditional assumptions that the best way to minimize human suffering from 'Acts of God' is through the refinement and better application of technological solutions (a vertical approach). The appliance of science, indisputably, is vitally important in developing strategies to predict when disasters are likely to occur, lessen their human impact when they do occur and assist in the process of recovery from damages that do accrue. 'Horizontalists', however, contend that securing people from the effects of natural disasters is as much a social as a technical task. Security for people threatened by natural hazards cannot be achieved by tackling the physical causes of their risk if social factors making them vulnerable are not addressed. 'In many cases nature's contribution to "natural" disasters is simply to expose the effects of deeper, structural causes' (IFRC 2001: introduction).

The International Decade for Natural Disaster Reduction (IDNDR)

The 1990s were designated as the International Decade for Natural Disaster Relief by UN General Assembly Resolution 46/182 in 1989, following the recommendation of a specially commissioned *ad hoc* group of experts. The decade inspired unprecedented levels of international cooperation in this policy area and the formation or deepening of numerous epistemic communities for particular types of disaster. The decade also, however, witnessed an upsurge in the number of fatalities from natural disasters, which served to illustrate that transnational scientific cooperation, though welcome, was not enough.

The IDNDR approach was largely technical and vertical. A number of sectoral initiatives were launched such as the Global Fire Monitoring Centre, Tsunami Inundation Modelling Exchange Programme and Tropical Cyclone Programme which improved transnational early warning capacities. A number of pilot studies were also activated during the decade by coordinating the work of existing international organizations. UNEP, WHO and the World Meteorological Organization (WMO) collaborated in trial runs for a Heat/Health Warning System to better anticipate extreme weather. The International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) instigated a scheme monitoring 16 active volcanoes to assess how public awareness of the various hazards could be improved.

The arch 'horizontalist' Ben Wisner says of the decade: 'Science was exchanged all right, but generally it has not been applied' (Wisner 2000). This view is echoed by Britton:

> There is little doubt that IDNDR was effective in encouraging nations to focus attention on the threat posed by natural hazards and in creating

an environment wherein greater international collaboration was fostered. Nevertheless, the fundamental task of reducing societal consequences of disaster reduction remained.

(Britton 2001: 45)

The Secretariat of the IDNDR itself admitted: 'The application of science and technology was recognized as being essential for reducing the risk of natural disasters, but in the early years of the decade, it became evident that this was not sufficient by itself' (Jeggle 1999: 24).

The International Strategy for Disaster Reduction (ISDR)

To continue the work undertaken by the IDNDR a successor UN body was established in 1999 and launched in 2000. The ISDR was adopted at the 1999 IDNDR Programme Forum and then ratified by both the UN General Assembly (54/219, 22 December 1999) and ECOSOC (E/1999/63, 30 July 1999). The ISDR has a small secretariat based in Geneva under the authority of the Under-Secretary-General for Humanitarian Affairs and a policy-making body, the Inter-Agency Task Force on Disaster Reduction (IATF/DR), chaired by the same person.

The ISDR declares that its overriding aim is: 'To enable all societies to become resilient to the effects of natural hazards and related technological and environmental disasters, in order to reduce human, economic and social losses' (ISDR 2002a: 1). This aim is to be achieved in four ways: (1) stimulating public awareness, (2) obtaining the commitment of public authorities, (3) promoting interdisciplinary cooperation and (4) fostering greater scientific knowledge (ISDR 2002a: 2).

The ISDR has incorporated more horizontal, mitigation-based approaches into its overall strategy than during the IDNDR. 'Vulnerability to disasters should be considered in a broad context encompassing specific human, social/cultural, economic, environmental and political dimensions, that relate to inequalities, gender relations and ethical and racial divisions' (ISDR 2002b: 21).

Political initiatives for protecting the Earth against extra-terrestrial collisions

Surveillance of the night sky for early detection of NEOs has increased since the launch of the 'Spaceguard' initiative by NASA in the early 1990s and its subsequent linking up with other national schemes. What could be done if an NEO was set for collision with the Earth remains to be established, however. Military solutions have figured prominently in discussions. The possibility of destroying an NEO by nuclear strike has been aired regularly, particularly in the USA, the country most likely to be able to attempt such an action. Nuclear deterrence is always a divisive security measure, however, and a less dramatic strategy of deflecting an NEO off-course by crashing an unmanned spacecraft into it is now more commonly suggested.

Other, non-military suggestions for defending the Earth from such collisions border on the surreal. Lembit Opik, the leading spokesman in the UK Parliament on this topic (see Box 8.1), has proposed: 'You could have a big plastic condom or space sheath to collect near-Earth objects and tow them to safety' (Brown and Goodchild 2000: 9).

Box 8.1 Lembit Opik

In the UK no one has done more to highlight the need to act to avert the potential disaster of an asteroid or comet colliding with the Earth than the colourful Member of Parliament (MP) Lembit Opik. Opik is an unusual British politician in many ways. Despite being born and bred in Northern Ireland he bypassed sectarian politics in becoming a maverick Liberal Democrat MP with a seat in rural Wales, while maintaining a role in the peace process going on in his homeland. His family background would certainly appear to have influenced him politically. The Opiks emigrated to Northern Ireland from Estonia to flee brutal Soviet persecution, making a commitment to liberalism easy to understand. More particularly, Opik's grandfather was an astronomer who, on taking up a post at Armagh University after migrating, became active in research on asteroids and the potential dangers they posed to humanity.

The grandson of Ernst Opik has attracted some ridicule in the British media for what is perceived of in some quarters as an eccentric obsession, but he has not been afraid to court such publicity in the pursuit of highlighting the issue of Near Earth Object collisions. Opik has been a regular on television shows, both comic and serious, and has become a well-known and well-liked public figure. A media-friendly persona and colourful love life should not disguise the fact that he has made great strides in gaining political credibility for the issue for which he is best known. His one-man political campaign in 2000 convinced the British government to set up the Task Force on Near Earth Objects and then act upon its recommendation to fund a research centre, the Near Earth Object Information Centre. This centre is now a significant player in both the British and international political discourse on this vital, yet somewhat neglected issue.

The role of NATO in natural disaster relief

In a classic instance of traditional security widening, part of the post-Cold War restructuring of NATO saw, in 1998, the establishment of a unit at its Brussels headquarters to utilize military resources to protect citizens from natural rather than military threats. The Euro-Atlantic Disaster Response Coordination Centre (EADRCC) is a tiny cog in the NATO machine, but its creation epitomized not only a widening of its notion of security but also the widening of its sphere of operations

beyond the defence of NATO member-states. The EADRCC is, in fact, coordinated by the Euro-Atlantic Partnership Council (EAPC), in which the 26 NATO states are linked to 20 non-NATO partner states, and emerged from a proposal by one of those partners, Russia. NATO has had a role in disaster relief dating back to 1953 when North Sea floods prompted the initiation of a 'Policy on Cooperation for Disaster Assistance in Peacetime', but the EADRCC has enhanced this significantly.

The EADRCC helps coordinate international relief programmes responding to natural or industrial disasters occurring in any of the 46 EAPC states.[1] To avoid any duplication of roles with the UN, a permanent Office for the Coordination of Humanitarian Affairs (UN-OCHA) Liaison Officer is based at the centre alongside EAPC state representatives and permanent NATO staff. Hence the EADRCC represents a means of assisting UN relief when disaster occurs in an EAPC state or of coordinating assistance within the EAPC area if the UN-OCHA is distracted elsewhere. In the first year of its operation, for example, the EADRCC helped coordinate an international response to problems caused by flooding in Ukraine at a time when the UN-OCHA was preoccupied with the devastations being wreaked on Central America by Hurricane Mitch. When UN-OCHA is active in an EAPC state, the EADRCC cooperates closely with it and supplies material support, such as vehicles and medical facilities, or logistical support, such as in facilitating the waiving of visa restrictions for relief workers. A Euro-Atlantic Disaster Response Unit (EADRU), comprising both military and civilian experts from the EAPC countries, has been despatched by EADRCC to many prominent recent disasters within the EAPC area, such as to the USA for Hurricane Katrina and most notably outside of this area to Pakistan in 2005 when the government requested help with earthquake relief operations. The success of the EADRCC prompted the Malaysian government to propose a similar regional international mechanism for the Association of South East Asian Nations (ASEAN) at the 2006 Asian Security Summit.

Conclusions

As with the global politics of health, the horizontal approach to securing the lives of those most prone to natural disasters has steadily gained credibility in epistemic communities and in the global polity, but struggles to win the hearts and minds of governments and the general public of countries moved to help those people. Driven by greater media exposure, the European Community Humanitarian Office (ECHO) has increased its expenditure on LDC assistance but it allocates less than 1 per cent of its disasters budget to preparedness rather than relief (Twigg 2001: 3). The long game of promoting education, economic development and local empowerment is less sexy than sending in relief workers and raising charitable donations. 'It is hard to gain votes by pointing out that a disaster *did not* happen' (Christopolos *et al.* 2001: 195). When Gerhard Schroeder regained the Chancellorship at the 2002 German elections it was widely felt that his crisis management during recent devastating floods secured victory in a tight election. To put it another way, Schroeder won *because* German flood defences failed. Had they succeeded he would have been denied the opportunity to don his waders and demonstrate compassion and leadership in the media spotlight.

The 2004 Indian Ocean tsunami prompted an impressive global relief operation but also demonstrated how unnecessarily insecure large swathes of humanity are in the current world. Global governance, driven by human security rather than sporadic bouts of human compassion, could have saved most of the tsunami victims: specifically through the implementation of an early warning system of the kind operated in the wealthier Pacific rim and, more generally, through the appreciation of the way in which vulnerability turns natural hazards into human tragedies. In addition, the very fact that such a calamitous tragedy would not register on the 'seismographs' of narrow (and some wider) security scholars serves as a reminder of the irrelevance of such an approach to the discipline.

Although democracy can skew decision-making in the direction of media-driven responses above the mundanity of quiet preventive prescriptions, there is good evidence that democratic citizenship provides some measure of security from natural disaster. Civil society in Turkey was jolted into life by the 1999 earthquakes, and a major pressure group campaign critical of the government and existing legislation of a kind not seen before emerged. The failings of nineteenth-century colonial rule in mitigating against famines, described in Chapter 4, finds some parallels (albeit on a far less graphic scale) in late twentieth-century natural disaster politics. The UK government did not have contingency planning in place to deal with the 1995 onset of volcanic activity on the Caribbean overseas territory of Montserrat (Twigg 2001: 4) and appeared reluctant to finance relief to the islanders following the most devastating eruption in 1997.[2]

Similarly, the democratic peace thesis holds for this realm of security politics. A special edition of the *Cambridge Review of International Affairs* in 2000 dedicated to 'disaster diplomacy' demonstrated how *security communities* can emerge among neighbouring states facing a common threat, in which information is shared to minimize a common risk. The warming of relations between Greece and Turkey after earthquakes ravaged both countries in 1999 is a classic case of two governments and societies overcoming cultural and political differences when faced with a common foe. At the one level this was a case of basic human empathy at the societal level triumphing over *realpolitik* and then being reciprocated, but Ker-Lindsay demonstrates that the case is more revealing than that. The level of cooperation between the two governments, which surprised the rest of the world, was a result of an agreement reached at a meeting of foreign ministers a few months before the earthquake (Ker-Lindsay 2000). Turkish Foreign Minister Cem and his Greek counterpart Papandreou had met principally to discuss the regional military security implications of the crisis going on at that time in Kosovo. Sharing a common concern about the possible spread of conflict to other parts of the Balkans and the flow of refugees from Yugoslavia which was already happening, the two traditional foes engaged in uncharacteristically cordial dialogue. One dimension of this, barely noticed at the time, was to offer reciprocal help in the instance of a deadly earthquake striking either country. Relations between the two governments remain somewhat frosty on certain issues but have certainly continued to be better than for many years prior to 1999, and societal contact has increased since the disasters. This represents a clear case of spillover, with sectoral cooperation promoting wider cooperation between governments and bringing people closer together through realizing their common interests.

Disasters can inspire acts of conciliation which are at odds with diplomatic hostility, as witnessed in 2001 when the destruction wreaked by earthquakes in India prompted offers of relief from Pakistan and the first contact between the two countries' leaders for two years. Such occurrences may assist in improving relations but security communities require more systematic levels of cooperation and information-sharing to be able to develop. NATO's role in natural disaster relief looks set to develop and become a routine feature of risk sharing and mitigation between its member-states and associates. The functional spillover logic which drives EU integration saw natural disasters adding a new policy area to the European Commission's roster with the creation of the Natural and Environmental Information Exchange System (NEDIES) in 1997. The 2002 floods across existing and future member-states in Central Europe emphasized the need for further cooperation in this area.

At the global level, in a similar manner as seen in the politics of health, the horizontal approach to securing people against natural hazards has come to prominence from epistemic communities and operates alongside more prominent vertical strategies. The ISDR maintains research on technical solutions to particular forms of hazard but has a far more holistic approach than that seen during the IDNDR. UN agencies have also shifted the emphasis towards a more horizontal strategy. From 2001 the UNDP began work on the first World Vulnerability Report, an annual index to aid disaster mitigation based on identifying where the world's most vulnerable populations, from a socio-economic perspective, are located. While it might be expected that the UNDP would approach the problem of natural hazards from a socio-economic perspective, a more surprising convert is the World Bank, which has moved well beyond lending money just for post-disaster reconstruction. The Disaster Management Facility (DMF) established in 1998 aims to improve state preparedness through insurance and better public education (Arnold and Merrick 2001). In the sphere of global civil society the Global Disaster Information Network was launched in 1998 linking experts from academia, industry, IGOs, pressure groups and governments with the express purpose of providing information to potential victims rather than money to victims after the event.

Inter-state competition and sovereignty have nothing to offer when it comes to dealing with natural disasters. Sharing security information in this context carries no risks and can only serve to make states more secure. A common non-human foe can forge human solidarity in the most unlikely of locations. The power rivalries of Turkey and Greece or India and Pakistan are irrelevant in the face of a threat from a higher power. Where the potential threat is unearthly and to humanity as a whole, as is the case with extra-terrestrial collision, the futility of intra-human quarrels is even more apparent. In addition, natural disasters present a straightforward basis for governments to widen state security since armed forces can easily be utilized for relief operations. The post-Cold War 'peace dividend' in Europe has seen armies increasingly engaged in this non-military function as illustrated by the increased prominence of NATO in this sphere of activity. The UK Liberal Democrats have advocated the establishment of a UN Rapid Reaction Disaster Task Force. As with other areas of security, however, widening rather than deepening can lead to a misallocation of resources. The concern that the 'war on terrorism' may be hampering governments in dealing with other threats to their citizens became apparent in 2005

with the US administration's response to the New Orleans disaster. The first batch of relief supplies sent to the area by the Federal Emergency Management Agency (FEMA) was made up of materials intended for dealing with the aftermath of a chemical terrorism strike.

Natural disasters are global problems in both a geological and human sense. State borders are irrelevant in both regards. The natural dimensions can better be countered by a pooling of human effort and ingenuity and the socio-economic dimensions of vulnerability can better be addressed by global action. Global problems require global solutions and natural disasters are doubly global problems.

Key points

- Natural disasters are socio-political phenomena since it is human vulnerability to natural hazards, rather than the hazards themselves, which chiefly accounts for the security threat they pose.
- The 2004 Indian Ocean tsunami and 2003 European heatwave were the worst disasters of their type in history and, together with earthquakes, account for most recent natural disaster deaths.
- Human vulnerability to natural hazards has increased in recent years due principally to population growth and movement in the Global South.
- Global policy to mitigate the effects of natural disasters has traditionally been dominated by technical fixes, such as increasing predictive capacity, but recently has begun also to address the underlying socio-political issue of human vulnerability to hazards.

Notes

1   EADRCC operations have been dominated by natural disasters, particularly floods.
2   The UK Minister for International Development, Clare Short, famously accused the Montserrat administration of demanding 'golden elephants' when they appealed for greater aid.

Recommended reading

Blaikie, M., Cannon, T., Davis, I. and Wisner, B. (2005) *At Risk. Natural Hazards, People's Vulnerability, and Disasters*, London and New York: Routledge.

Ingleton, J. (ed.) (1999) *Natural Disaster Management. A Presentation to Commemorate the International Decade for Natural Disaster Reduction (IDNDR)*, Leicester: Tudor Rose.

Kelman, I. and Koukis, T. (eds) (2000) 'Disaster Diplomacy', *Cambridge Review of International Affairs*, special section, XIV(1), Autumn–Winter: 214–294.

Smith, K. (2001) *Environmental Hazards. Assessing Risk and Reducing Disaster*, 3rd edn, London and New York: Routledge.

UNEP (2002) GEO3 Chapter 3, *Human Vulnerability to Environmental Change*: http://geo.unep-wcmc.org/geo3/.

Wisner, B. (2000) 'Disasters. What the United Nations and its World Can Do', *United Nations Chronicle (online edition)* XXXVIII(4): http://www.un.org/Pubs/chronicle/2000/issue4/0400p6.htm.

Useful web links

Centre for Research on the Epidemiology of Disasters: http://www.cred.be/.

Disastercenter, *The Most Deadly 100 Natural Disasters of the Twentieth Century*: http://www.disastercenter.com/disaster/TOP100K.html.

NATO, 'Euro-Atlantic Disaster Relief Coordination Centre': http://www.nato.int/eadrcc/home.htm.

United Nations International Strategy for Disaster Reduction: http://www.unisdr.org/.