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1 April 2005 21:32

The state of the world? It is on the brink of disaster

An authoritative study of the biological relationships vital to maintaining life has found disturbing evidence of man-made degradation. Steve Connor reports

30 March 2005

Planet Earth stands on the cusp of disaster and people should no longer take it for granted that their children and grandchildren will survive in the environmentally degraded world of the 21st century. This is not the doom-laden talk of green activists but the considered opinion of 1,300 leading scientists from 95 countries who will today publish a detailed assessment of the state of the world at the start of the new millennium.

The report does not make jolly reading. The academics found that two-thirds of the delicately-balanced ecosystems they studied have suffered badly at the hands of man over the past 50 years.

The dryland regions of the world, which account for 41 per cent of the earth's land surface, have been particularly badly damaged and yet this is where the human population has grown most rapidly during the 1990s.

Slow degradation is one thing but sudden and irreversible decline is another. The report identifies half a dozen potential "tipping points" that could abruptly change things for the worse, with little hope of recovery on a human timescale.

Even if slow and inexorable degradation does not lead to total environmental collapse, the poorest people of the world are still going to suffer the most, according to the Millennium Ecosystem Assessment, which drew on 22 national science academies from around the world.

Walt Reid, the leader of the report's core authors, warned that unless the international community took decisive action the future looked bleak for the next generation. "The bottom line of this assessment is that we are spending earth's natural capital, putting such strain on the natural functions of earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted," Dr Reid said.

"At the same time, the assessment shows that the future really is in our hands. We can reverse the degradation of many ecosystem services over the next 50 years, but the changes in policy and practice required are substantial and not currently under way," he said.

The assessment was carried out over the past three years and has been likened to the

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prestigious Intergovernmental Panel on Climate Change - set up to investigate global warming - for its expertise in the many specialisms that make up the broad church of environmental science.

'menace to society'

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In summary, the scientists concluded that the planet had been substantially "re-engineered" in the latter half of the 20th century because of the pressure placed on the earth's natural resources by the growing demands of a larger human population.

Tories pose too big a risk to prosperity, says Brown

"Over the past 50 years, humans have changed ecosystems more rapidly and extensively than at any time in human history, largely to meet rapidly growing demands for food, fresh water, timber and fibre," the reports says.

The full costs of this are only now becoming apparent. Some 15 of the 24 ecosystems vital for life on earth have been seriously degraded or used unsustainably - an ecosystem being defined as a dynamic complex of plants, animals and micro-organisms that form a functional unit with the non-living environment in which the coexist.

The scale of the changes seen in the past few decades has been unprecedented. Nearly one-third of the land surface is now cultivated, with more land being converted into cropland since 1945 than in the whole of the 18th and 19th centuries combined.

The amount of water withdrawn from rivers and lakes for industry and agriculture has doubled since 1960 and there is now between three and six times as much water held in man-made reservoirs as there is flowing naturally in rivers.

Meanwhile, the amount of nitrogen and phosphorus that has been released into the environment as a result of using farm fertilisers has doubled in the same period. More than half of all the synthetic nitrogen fertiliser ever used on the planet has been used since 1985.

This sudden and unprecedented release of free nitrogen and phosphorus - important mineral nutrients for plant growth - has triggered massive blooms of algae in the freshwater and marine environments. This is identified as a potential "tipping point" that can suddenly destroy entire ecosystems. "The Millennium Assessment finds that excessive nutrient loading is one of the major problems today and will grow significantly worse in the coming decades unless action is taken," Dr Reid said.

"Surprisingly, though, despite a major body of monitoring information and scientific research supporting this finding, the issue of nutrient loading barely appears in policy discussions at global levels and only a few countries place major emphasis on the problem.

"This issue is perhaps the area where we find the biggest 'disconnect' between a major problem related to ecosystem services and the lack of policy action in response," he said.

Abrupt changes are one of the most difficult things to predict yet their impact can be devastating. But is environmental collapse inevitable?

"Clearly, the dual trends of continuing degradation of most ecosystem services and continuing growth in demand for these same services cannot continue," Dr Reid said.

"But the assessment shows that over the next 50 years, the risk is not of some global environmental collapse, but rather a risk of many local and regional collapses in particular ecosystem services. We already see those collapses occurring - fisheries stocks collapsing, dead zones in the sea, land degradation undermining crop production, species extinctions," he said.

Between 1960 and 2000, the world population doubled from three billion to six billion. At the same time, the global economy increased more than six-fold and the production of food and the supply of drinking water more than doubled, with the consumption of timber products increasing by more than half.

Meanwhile, human activity has directly affected the diversity of wild animals and plants. There have been about 100 documented extinctions over the past century but scientists believe that the rate at which animals and plants are dying off is about 1,000 times higher than natural, background levels.

"Humans are fundamentally and to a significant extent irreversibly changing the diversity of life on earth and most of these changes represent a loss of biodiversity," the Millennium Ecosystem Assessment says.

The distribution of species across the world is becoming more homogenous as some unique animals and plants die out and other, alien species are introduced into areas in which they would not normally live, often with devastating impact.

For example, the Baltic Sea contains 100 non-native species, of which about one-third come from the Great Lakes of North America. Meanwhile, a similar proportion of the 170 non-native species found in the Great Lakes come from the Baltic.

"In other words, the species in any one region of the world are becoming more similar to other regions.... Some 10 to 30 per cent of mammals, birds and amphibians are currently threatened with extinction. Genetic diversity has declined globally, particularly among cultivated species," the report says.

Agricultural intensification, which brought about the green revolution that helped to feed the world in the latter part of the 20th century, has increased the tendency towards the loss of genetic diversity. "Currently 80 per cent of wheat area in developing countries and three-quarters of all rice planted in Asia is now planted to modern varieties," the report says. Dr Reid said that the authors of the assessment were most worried about the state of the earth's drylands - an area covering 41 per cent of the land surface and home to a total of two billion people, many of them the poorest in the world.

Drylands are areas where crop production or pasture for livestock is severely limited by rainfall. Some 90 per cent of the world's dryland regions occur in developing countries where the availability of fresh water is a growing problem.

One-third of the world's people live in dryland regions that have access to only 8 per cent of the world's renewable supply of water, the scientists found. "We were particularly alarmed by the evidence of strong linkages between the degradation of ecosystem services in drylands and poverty in those regions," Dr Reid said.

"Moreover, while historically, population growth has been highest in either urban areas or the most productive ecosystems such as cultivated lands, this pattern changed in the 1990s and the highest percentage rate of growth is now in drylands - ecosystems with the lowest potential to support that growth.

"These problems of ecosystem degradation and the harm it causes for human well-being clearly help set the stage for the conflict that we see in many dryland regions including parts of Africa and central Asia," he said.

Poor people living in dryland regions are at the greatest risk of environmental collapse. Many of them already live unsustainably - between 10 and 20 per cent of the soil in the drylands are eroded or degraded.

"Development prospects in dryland regions of developing countries are especially dependent on actions to slow and reverse the degradation of ecosystems," the Millennium Assessment says.

So what can be done in a century when the human population is expected to increase by a further 50 per cent?

The board of directors of the Millennium Assessment said in a statement: "The overriding conclusion of this assessment is that it lies within the power of human societies to ease the strains we are putting on the nature services of the planet, while continuing to use them to bring better living standards to all.

"Achieving this, however, will require radical changes in the way nature is treated at every level of decision-making and new ways of co-operation between government, business and civil society. The warning signs are there for all of us to see. The future now lies in our hands," it said.

Asked what we should do now and what we should plan to do over the next 50 years, Dr Reid replied that there must be a fundamental reappraisal of how we view the world's natural resources. "The heart of the problem is this: protection of nature's services is unlikely to be a priority so long as they are perceived to be free and limitless by those using them," Dr Reid said.

"We simply must establish policies that require natural costs to be taken into account for all economic decisions," he added.

"There is a tremendous amount that can be done in the short term to reduce degradation - for example, the causes of some of the most significant problems such as fisheries collapse, climate change, and excessive nutrient loading are clear - many countries have policies in place that encourage excessive harvest, use of fossil fuels, or excessive fertilisation of crops.

"But as important as these short-term fixes are, over the long term humans must both enhance the production of many services and decrease our consumption of others. That will require significant investments in new technologies and significant changes in behaviour," he explained.

Many environmentalists would agree, and they would like politicians to go much further.

"The Millennium Assessment cuts to the heart of one of the greatest challenges facing humanity," Roger Higman, of Friends of the Earth, said.

"That is, we cannot maintain high standards of living, let alone relieve poverty, if we don't look after the earth's life-support systems," Mr Higman said.

"Yet the assessment hasn't gone far enough in specifying the radical solutions needed. At the end of the day, if we are to respect the limits imposed by nature, and ensure the well-being of all humanity, we must manage the global economy to produce a fairer distribution of the earth's resources," he added.

THE TIPPING POINTS TO CATASTROPHE

NEW DISEASES

As population densities increase and living space extends into once pristine forests, the chances of an epidemic of a new infectious agent grows. Global travel accentuates the threat, and the emergence of Sars and bird flu are prime examples of diseases moving from animals to humans.

ALIEN SPECIES

The introduction of an invasive species - whether animal, plant or microbe - can lead to a rapid change in ecosystems. Zebra mussels introduced into North America led to the extinction of native clams and the comb jellyfish caused havoc to 26 major fisheries species in the Black Sea.

ALGAL BLOOMS

A build up of man-made nutrients in the environment has already led to the threshold being reached when algae blooms. This can deprive fish and other wildlife of oxygen as well as producing toxic substances that are a danger to drinking water.

CORAL REEF COLLAPSE

Reefs that were dominated by corals have suddenly changed to being dominated by algae, which have taken advantage of the increases in nutrient levels running off from terrestrial sources. Many of Jamaica's coral reefs have now become algal dominated.

FISHING STOCKS

Overfishing can, and has, led to a collapse in stocks. A threshold is reached when there are too few adults to maintain a viable population. This occurred off the east coast of Newfoundland in 1992 when its stock of Atlantic cod vanished.

CLIMATE CHANGE

In a warmer world, local vegetation or land cover can change, causing warming to become worse. The Sahel region of North Africa depends on rainfall for its vegetation. Small changes in rain can result in loss of vegetation, soil erosion and further decreases in rainfall.

