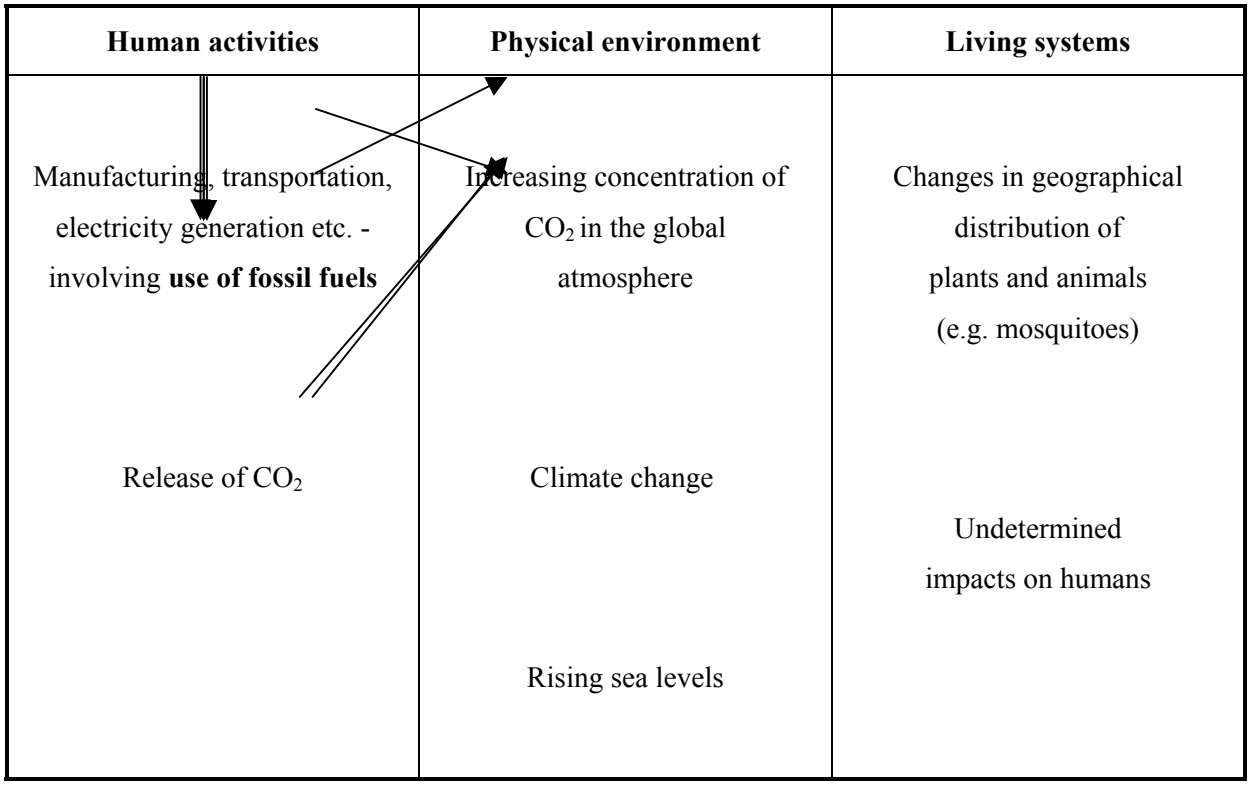
Major ecological issues in Australia today

This pamphlet contains brief summaries of ten especially important ecological issues in Australia at the present time. It also contains, for each issue, a diagram summarising the cause-and-effect chains that link undesirable changes in living systems with the human activities that cause them. In some cases the chain is short and direct (e.g. the impact of logging on the trees of forests), while in others it is complex and indirect (e.g. the likely impacts of releasing CFCs into the environment).

Enhanced greenhouse effect

The concentration of carbon dioxide in the atmosphere is increasing globally as the result of human activities, mainly as the result of the combustion of fossil fuels as a source of energy.

While there is still uncertainty about the precise consequences of this change, the majority of atmospheric scientists predict that, together with the release of other greenhouse gases (e.g. methane and halons), it will lead to progressive climate change, causing major disturbances in global ecology, with wide-ranging consequences for humankind. Most atmospheric scientists are of the opinion that global warming resulting from the release of greenhouse gases is already underway.



Thinning of the ozone layer

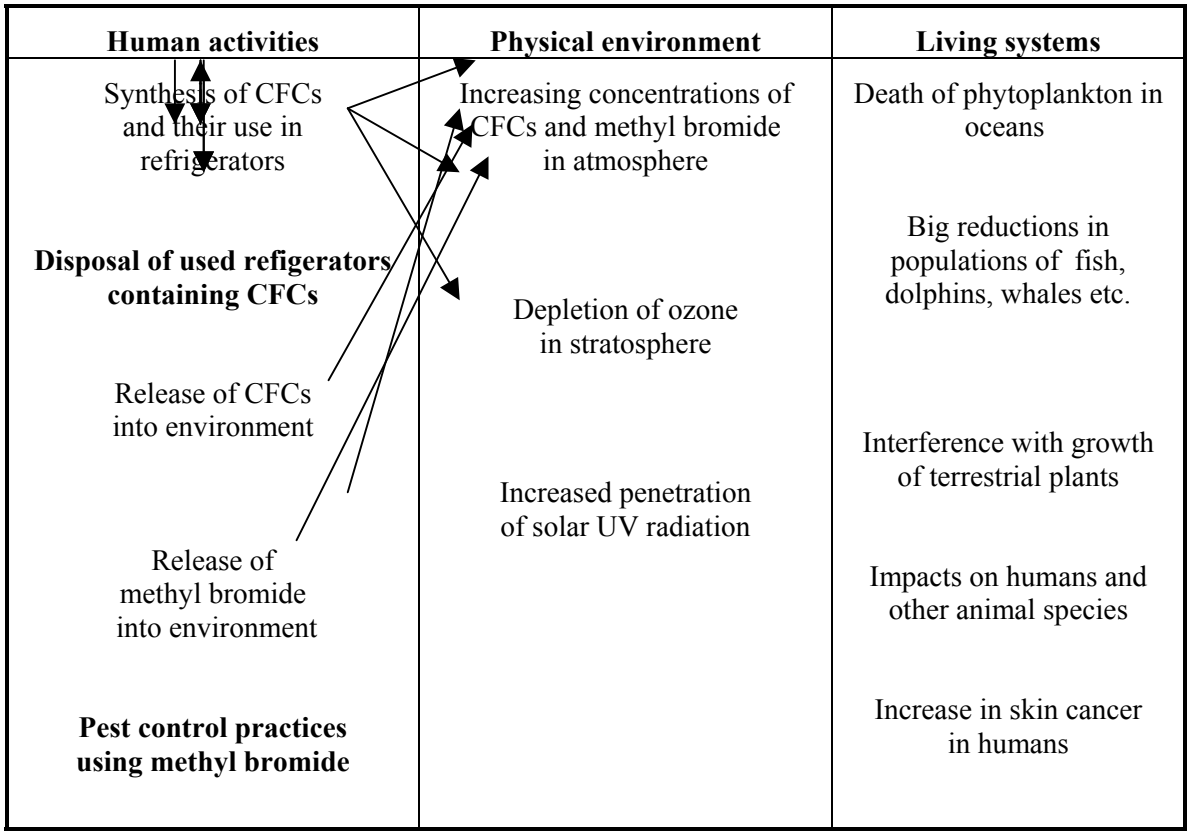
In recent decades there has occurred a steady accumulation of chlorofluorocarbons (CFCs), methyl bromide and halons in the atmosphere. CFCs are synthesised chemical compounds used in refrigerators, and methyl bromide is used as a biocide for the control of insect pests in the soil and in grain products. The main source of the halons is fire extinguishers.

These gases are causing the progressive destruction of the ozone layer in the upper atmosphere. Certain waste products of high flying aircraft also contribute to the destruction of the ozone layer.

Because the ozone layer acts as a filter, shielding the surface of the Earth from ultraviolet radiation from the Sun, the thinning of this layer is resulting in an increase in the intensity of UV radiation reaching the Earth's surface. This is likely to have an increasingly damaging effect on terrestrial organisms, with serious consequences for the natural environment and for humankind. The shorter wave UV-B rays are especially harmful. It is predicted, for example, that the yields of soya beans, peas and beans will decrease by a quarter when UV-B radiation increases by 25%. Increased UV radiation is also likely to destroy the phytoplankton at the surface layers of the oceans. Because phytoplankton are at the base of the oceanic food chain, this change would have a devastating impact on populations of fish and other animal life in and around the sea.

Research suggests that the incidence of skin tumours in humans increases by about 5% for every 1% decrease in stratospheric ozone.

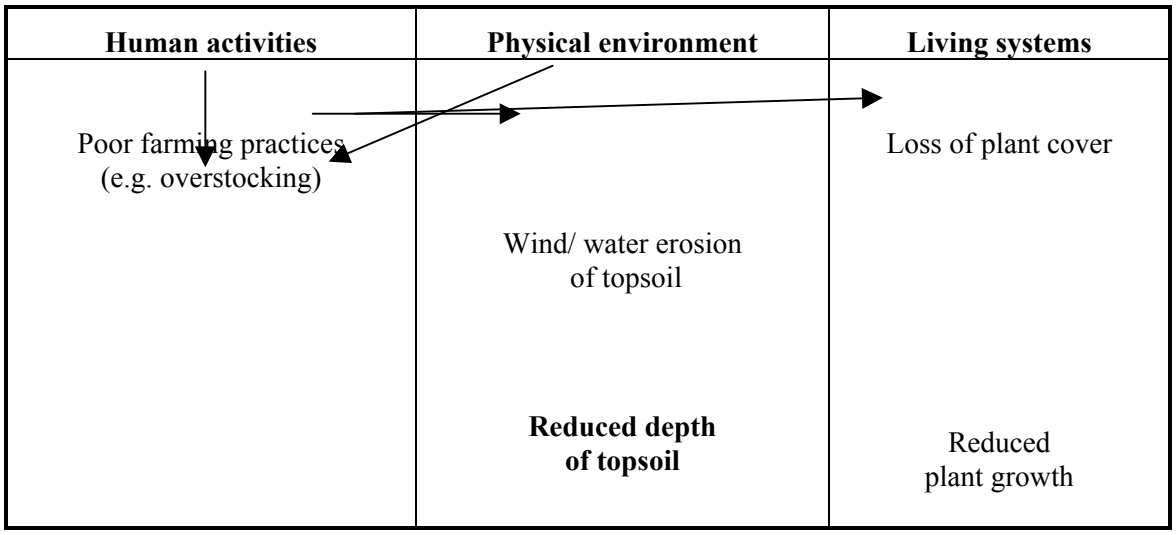
As a result of international agreements, there has been a major reduction in the release of CFCs and related compounds, and it is now hoped that the ozone layer will be back to normal by around 2015. However, this will depend on the extent to which the current black market in halons and CFCs in developing regions of the world is brought under control



Soil erosion

Soil loss resulting from wind or water erosion is a major ecological problem in many parts of the world today, especially in Australia. It is largely the consequence of land being denuded of a protective cover of vegetation as a result of over-stocking with cattle or sheep or the widespread use of the plough and other cultivation implements in areas with shallow topsoil. It can also come about as a result of disruption of the soil surface in the construction of roads and buildings.

Soil erosion leads to greatly reduced bioproduction and reduced biodiversity. In Australia the wheat and sheep areas of New South Wales, for example, are subject to serious soil erosion.



Soil salinity

Salt is a natural component of soils and water, but certain human activities have increased the salinity of soils in many areas. There are two main forms of human-induced salinity in rural parts of Australia. They are dryland salinity and irrigation salinity.

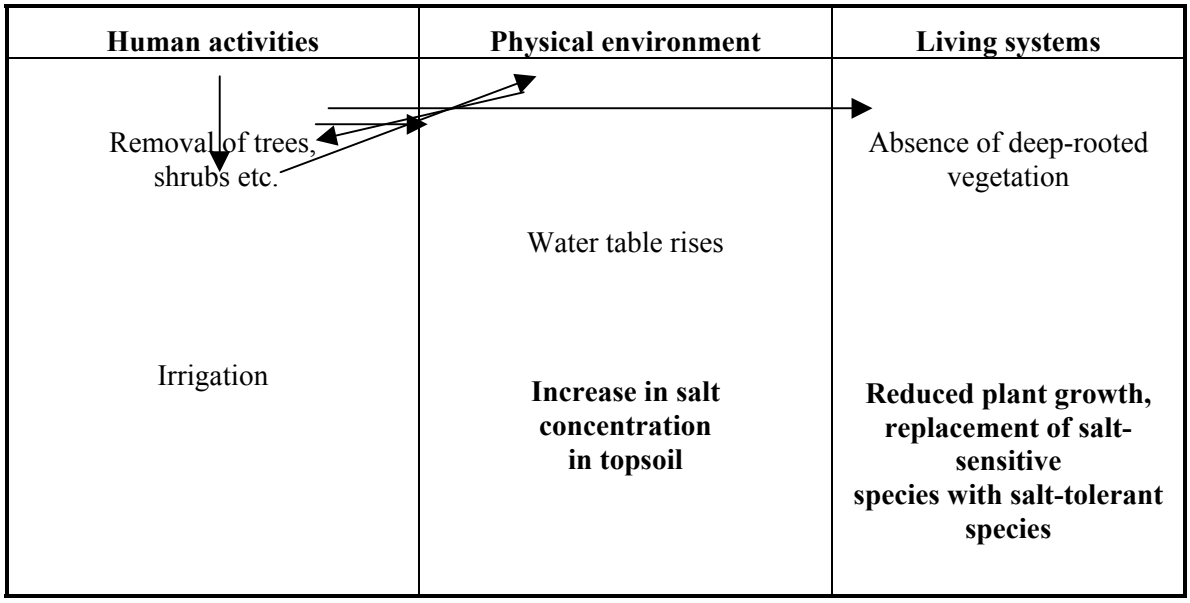
According to the prevailing view, dryland salinity is due to the clearing of native vegetation, with the result that rainwater seeps down through the soil to the groundwater. This leads to a raising of the level of the water table. Because the ground water has a high salt content, this leads to an increase in salt concentration at or near the soil surface. Before land clearance native trees, shrubs and perennial grasses effectively dried out the soil to the depth of root penetration.

Another school of thought holds that the underlying cause of much dryland salinity is a decline in soil structure due to the loss of organic matter – resulting in particular from the disappearance of native perennial grasses. This results in increased lateral flows of water in the soil and a decrease in deep percolation, leading, in turn, to the accumulation of water in low areas, where evaporation results in increased concentration of salt. According to this hypothesis the effect is not due to a rising water table. (This hypothesis is not represented in the diagram below).

Irrigation salinity occurs when water that is added for irrigation is not used by crops and vegetation. It seeps through to the water table, raising its level and so leading to soil salinity. Basically it is caused by over-irrigation.

Salinisation of soils and streams is a regional problem and is especially serious in the irrigation areas along the Murrumbidgee and Murray Rivers. Dryland salinity, as distinct from irrigation salinity, occurs across much of the south-west of Western Australia, where 250 km^2 of agricultural land is lost each year due to soil salinity resulting from over clearing of native vegetation.

Salinisation of soils leads to serious reduction of bioproductivity. There is commonly a time lag of some decades between the clearing of vegetation and the impacts of salinisation.

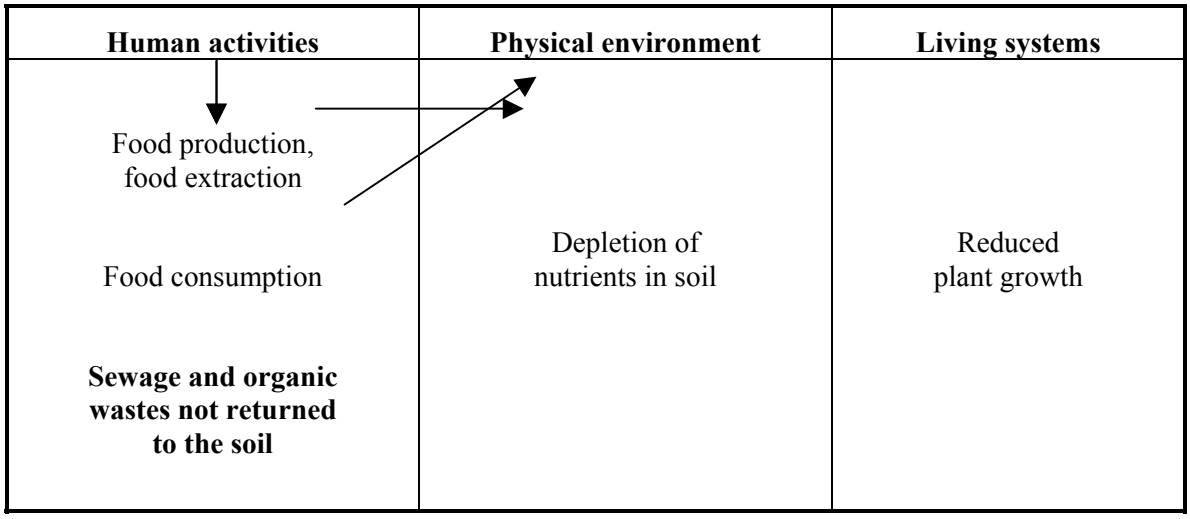


Disruption of natural nutrient cycles

In natural ecosystems there is continual recycling of nutrients involved in the processes of life, and the continued bioproductivity of these systems is dependent on this cycling process.

Human activities can interfere with natural nutrient cycles by extracting nutrients from farmland in the form of food, and eventually disposing of them in organic waste which is not returned to the farmland. Consequently, there is a progressive loss of key nutrients from food producing ecosystems. Serious soil erosion resulting from poor farming practice can also lead to permanent loss of nutrients.

At present, this problem is largely overcome by replacing the extracted nutrients with artificial fertilisers, like phosphorus and nitrogen from other sources. This, in turn, often builds up a high level of acidity in soils, which then requires neutralisation with lime. There are serious doubts about the long-term sustainability of these practices.

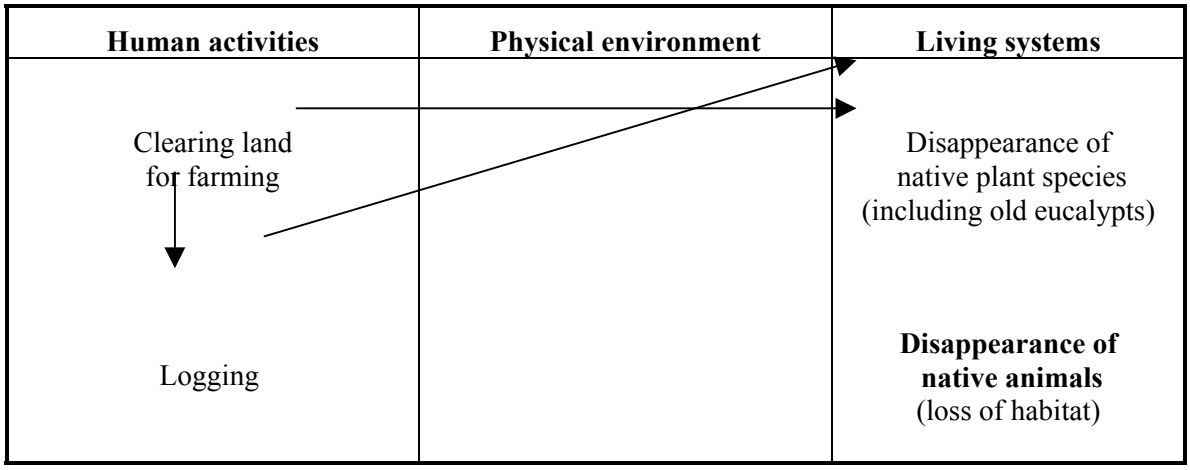


Loss of biodiversity

The present rate of extinction of living organisms is exceptionally high, due to the activities of humankind. According to one estimate, species are becoming extinct at a rate about 1000 times higher than was the case in the late Pleistocene epoch, when the extinction rate was well above the average for geological time as a whole.

There are believed to be some 5 to 7 million species of animals, plants, fungi and micro-organisms (excluding bacteria and viruses) on Earth. Some authorities believe that about a quarter of these will be extinct by around 2025. Nearly 9000 kinds of trees, representing around 10% of the species known to science, are threatened with extinction. Over 34 000 species of plants face extinction. Among animals, mammals are now recognised to be much more endangered than birds.

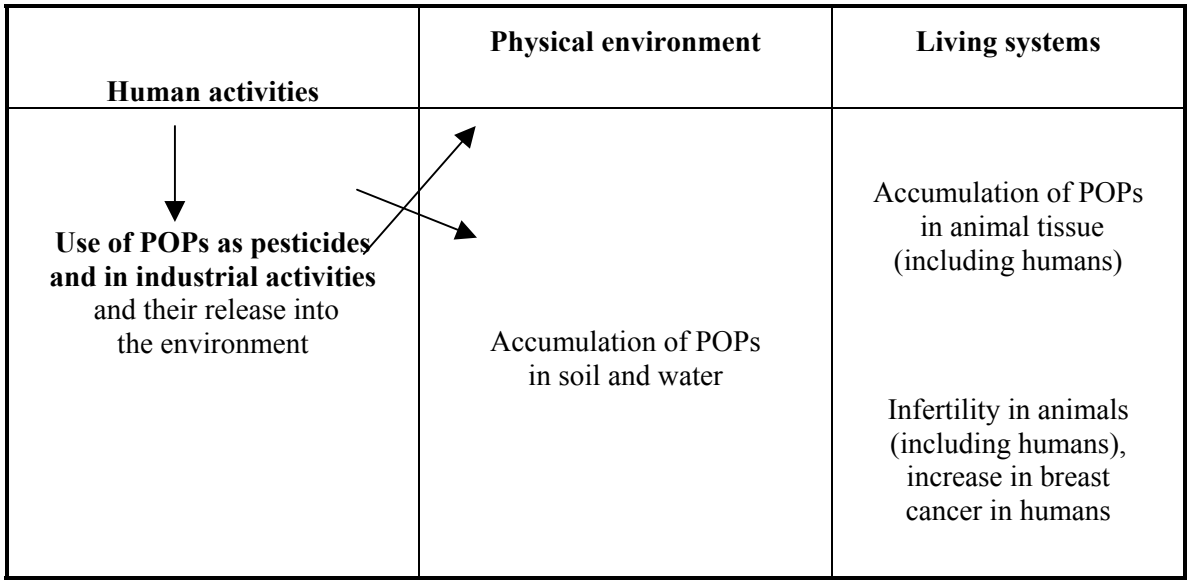
The main cause of this loss of biodiversity on land is habitat destruction through various bioharvesting activities of humankind, including farming and logging. Other causes include the release of feral species into the environment and construction of buildings and roads. Serious and progressive loss of biodiversity in the oceans is the result of the increasing and unsustainable scale of the fishing industry.



Persistent organic pollutants (POPs)

These are compounds which are used as pesticides and in various technological processes, and which are being released into the environment in large quantities, and accumulating in soils, lakes and in the oceans. They include DDT, PCBs, chlorinated furans, Dioxins, Aldrin, Dieldrin, Endrin, Chlordane, Hexachlorobenzene, Mirex, Toxaphene, Polybrominated biphenyls (PBBs) and Polybrominated diphenyl ethers (PBDs), as well as oestrogen-like compounds, such as bisphenol used in white tooth fillings and for lining tin cans, and 4-octyphenol used in detergents, pesticides, herbicides.

POPs accumulate in the tissues of living organisms, and they are believed to be to be responsible for widespread and increasing infertility in wild animals, and probably also in humans. They are also suspected of contributing to the increase in breast cancer in women and to reduced sperm counts in men.



Conclusion

This overview has summarised the major human-induced ecological issues encountered in Australia at the present time – ranging from local causes for concern through to some issues of global significance.

The causes of the current ecological unsustainability of human societies across the world, including Australia, need also to be considered at a more general level. It is clear, for example, that a major factor is the sheer scale of human activities and their impacts. There are two underlying causes of this:

1. **The number of humans now living on our planet.** There are now about 1000 times as many people on Earth as there were when some of our ancestors started farming, around 450 generations ago. Most of the increase in population has occurred since the beginning of the industrial transition, some 8 generations ago. Since that time over 5000 million people have been added to the global human population, bringing the present total to over 6000 million. This change inevitably means a colossal impact on agricultural ecosystems.
2. **Changes in patterns of human activity.** A major trend with widespread ecological repercussions has been the massive intensification of industrial activities over the past few generations, involving enormous increases in the rate of use of resources and energy and production of technological wastes. This change has so far mainly occurred in the developed nations and is associated with intense consumerism and increase in material standard of living. The amount of carbon dioxide produced by the human population every day, for example, is about 12 000 times what it was when farming began One tenth of this increase is direct the result of the growth in population, while the rest is due mainly to the use of fossil fuels in manufacturing, transportation and the production of electricity.

What, then, are our prospects for the future? On the one hand we have witnessed an extraordinary growth in environmental awareness over the past few decades, and most people have at least heard of most of the ecological issues discussed in this pamphlet. And here and there some specific action is being taken aimed at improving the situation. On the other hand, these responses have not been sufficient to have any significant impact on the overall picture. Many of the ecological problems, especially the regional and global ones, continue to worsen.

An important report relevant to these considerations was published in March 2005. It is known as the Millennium Ecosystem Assessment (MA), and was called for by United Nations Secretary-General Kofi Annan in the year 2000. It involved the work of 1360 experts around the world.

The following excerpts from the statement from the Board governing the MA process summarise some of its conclusions.

> At the heart of this assessment is a stark warning. Human activity is putting such a 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.
>
> The provision of food, fresh water, energy and materials to a growing population has come at considerable cost to the complex systems of plants, animals, and biological processes that make the planet habitable.
>
> As human demands increase in coming decades, these systems will face even greater pressures – and the risk of further weakening the natural infrastructure on which all societies depend.
>
> Protecting and improving our future well-being requires wiser and less destructive use of natural assets. This in turn involves major changes in the way we make and implement decisions.
>
> We must learn to recognise the true value of nature – both in an economic sense and in the richness it provides to our lives in ways much more difficult to put numbers on.
>
> Above all, protection of these assets can no longer be seen as an optional extra to be considered once more pressing concerns such a wealth creation or national security have been dealt with.
>
> This assessment shows that healthy ecosystems are central to the aspirations of humankind.
>
> … this is not a counsel of despair. The natural balance sheet we bequeath to future generations depends on choices made at every level and in every corner of the planet – from the head of a village in Bangladesh to a corporation board in a New York skyscraper, from international gatherings of finance ministers to consumers in a Brazilian furniture store.

There are, perhaps, some grounds for cautious optimism. Humans, after all, have extraordinary ingenuity – given the motivation. Putting a man on the moon and the development of nuclear weapons and computers are among countless examples.

The key word here is 'motivation'. It is reasonable to suppose that, given the motivation, humankind could successfully overcome all of these ecological problems. But at present, the motivation to do so is lacking – despite all the growth in environmental awareness. Economic growth and increase in material standard of living still has top priority in the decision-making process at the governmental level, and probably also at most other levels in our society. This is a deeply ingrained characteristic of the dominant culture of our time.

The necessary motivation to take effective action to achieve ecological sustainability will not come about until there is a vastly improved understanding, right across the community, of the processes of life, the human place in nature and the health needs of people and of the ecosystems on which they depend

The seriousness and urgency of these issues cannot be overstated, for if a society is not ecologically sustainable it cannot, in the long term, be sustainable in any other way.