Appendix One: A further snap-shot of ecological challenges

In the pages that follow, I draw heavily from the global trends documented by the Worldwatch Institute publication, *Vital Signs 2005*, in order to add to the reader's understanding of the ecological challenges facing us in current times.

The Worldwatch Institute is an independent research organisation and a leading source of information on the systemic inter-relatedness of key environmental, social and economic trends. It commissions and draws on high-quality, interdisciplinary research, and its publications are popular among a cross-section of society, and is of particular interest to those who seek to contribute to the transition towards an environmentally sustainable and socially just society, including government and business decision-makers, students, the media and the general public. As the Institute's mission statement explains:

> By providing compelling, accessible, and fact-based analysis of critical global issues, Worldwatch informs people around the world about the complex interactions between people, nature, and economies. Worldwatch focuses on the underlying causes of and practical solutions to the world's problems, in order to inspire people to demand new policies, investment patterns and lifestyle choices. (http://www.worldwatch.org/about/mission/, accessed 1 April 2006)

The analyses I include below are those relating to climate change; population growth; military expenditure; decline in mammal species; wetlands deterioration; deforestation; and air pollution. The trends and details presented below highlight the intricate and complex links between various local and global challenges, including those to which I referred in Chapter One, and which were broadly categorised as destruction of nature and of the natural; increasingly unequal distribution of wealth; erosion of a sense of community and place; marginalisation of persons, communities and cultures; erosion and denial of the spiritual or sacred; and elite knowledge generation leading to learned incapacity and helplessness.

To be clear, the list of trends and challenges presented in this appendix is by no means exhaustive; rather, the intention is that it provides an indication of some of

the particular trends which contribute to the complexity, intricacy and scale of the planetary crises facing us. Significantly, the *Vital Signs 2005* analyses presented below together make the case that true global progress will remain staggeringly elusive as long as priority is given to narrow economic and military goals at the expense of human development and environmental protection.

Climate change (Adapted from Sawin, 2005:40-41)

1. The average atmospheric carbon dioxide (CO_2) concentration has risen by more than 19% since measurements began in 1959, and has gone up by 35% since the commencement of the industrial age. Since 1960, average annual rates of increase have more than doubled. The 10 warmest years on record have all occurred since 1990.

2. According to some climate experts, the impacts of rising CO_2 concentrations and temperatures are already visible worldwide, and are arriving at a faster pace than expected. The World Health Organization estimates that at least 160,000 people die annually due to climate change. Furthermore, there is growing evidence of direct links to observed ecological changes. Higher temperatures and changes in precipitation have driven species northward or to higher elevations, and have affected the timing of breeding and migratory seasons. Mountain glaciers are shrinking at ever-faster rates, threatening water supplies for millions of people and species. A study by the US National Center for Atmospheric Research, for example, found that rising global temperatures have been a key factor in increasing drought worldwide.

3. In recent decades in the Arctic, temperatures have risen at almost twice the average rate for the rest of the world. Over the past 30 years, a fall of 15-20% in the average area of summer sea ice cover has led to shrinking habitats for polar bears, caribou and other Arctic species. Over the past century, sea levels there have risen by 10-20 centimeters.

4. It is estimated that fossil fuel burning in 2004 released more than 7 billion tons of carbon, an increase of at least 3% over 2003. Nearly three times as much carbon was released in 2004 as in 1960, and it is believed that carbon

emissions from fossil fuels are the main factor behind the rise in atmospheric concentrations and global temperatures.

5. Ten countries are responsible for about two thirds of global carbon emissions from fuel use. The United States accounts for nearly a quarter of the total, despite the fact that it holds only 5% of the world's population. China ranks second, with a 14% share. China alone accounted for half of the global increase in 2003, and emissions there are up more than 47% since 1990. Nevertheless, China still ranks far behind in the industrial world in terms of emissions per person.

Population growth (Adapted from Nierenberg, 2005:64-65)

6. Global human population grew to more than 6.3 billion in 2004, more than twice the number of people who were alive in 1950. More than 95% of population growth occurs in so-called 'developing' countries, where fertility rates remain high. Nevertheless, in many industrial nations, population growth and high levels of consumption coincide, and where this is the case, the significance of added numbers of people is even greater.

Military expenditures surge (Adapted from Renner, 2005:76-77)

7. World military expenditures amounted to $932bn in 2003, the equivalent of $100m spent *every hour of every day* worldwide on soldiers, weapons, and ammunition. The US spends almost as much as all other countries on Earth combined, with Japan, the UK, France and China (the four largest spenders after the US) accounting for 17% of global spending in 2003. Spending large sums on the military and on the 'war on terrorism' threatens to sideline international pledges to counter poverty, health epidemics and environmental degradation, as agreed in the Millenium Development Goals. In this way, scarce financial resources and political capital are siphoned away from the root causes of insecurity.

8. Investment in health, education and environmental protections are modest when compared with military budgets. Estimates suggest that programmes to provide clean water and sewerage systems would cost roughly $37bn annually; to cut world hunger in half, $24bn; to eradicate illiteracy, $5bn.

Millions of lives would be saved following a $10bn annual spending on a global HIV/AIDS programme and a spending of $3bn or so to control malaria in sub-Saharan Africa. In 2004, donor countries gave $68bn in official development assistance. However, if all donors met their promises of providing 0.7% of their gross national income, annual development aid would increase by over $110bn.

Mammals in Decline (Adapted from Youth, 2005a:86-87)

9. Nearly one in four mammal species is in serious decline, primarily due to human activities. Within the next fifty years, such well-known animals as chimpanzees—primates with which humans share 98% of their DNA—may be extinct in the wild. Several factors contribute to mammal population losses, and virtually all of these are driven by human activity. The most widespread problems are habitat loss and habitat fragmentation, often compounded by uncontrolled hunting. This combination quickly kills or drives off the largest mammals. For example, mammals quickly become isolated when new roads, settlements, farms, or logging operations carve up their habitats. Species such as tigers and the giant panda live in populations peppered across heavily farmed, increasingly populated areas, few of which are large enough to sustain these animals well into the future. The world's changing climate is emerging as a new challenge for mammal populations, with species in the Arctic particularly vulnerable, as has been mentioned already. In other areas, shortages of water exacerbate the dangers mammals face. In East Africa, the Grevy's zebra is now endangered, its breeding success cut short after critical water sources dried up due to irrigation schemes or became crowded with cattle herds, which forced the zebras to drink at night, when they are more vulnerable to predators.

Wetlands drying up (Adapted from Youth, 2005b:90-91)

10. Wetlands cover up to 6% of the Earth's surface but provide a disproportionate amount of natural goods and services. The world's wetlands harbour staggering biodiversity, protect vital water supplies and fisheries, and provide medicinal, agricultural, and timber products. In addition, they buffer coastal or riverside areas from storms and floods,

control erosion, help maintain water quality, and retain nutrients and sediments. Despite these assets, an estimated half of the world's wetlands have been lost since 1900, and their destruction continues at an alarming rate. The main causes of this loss have been drainage and conversion of wetlands to agricultural or urban land, compounded by pollution.

11. A particularly striking example of wetland destruction is provided by the Mesopotamiam marshlands of Iraq and western Iran, the largest remaining wetland ecosystem in the Middle East and western Europe. By 2000, more than 90% of this unique ecosystem had dried up after construction of dams upstream and government efforts to drain the wetlands. Many wildlife populations were wiped out, and most of the area's indigenous Marsh Arabs were forced to abandon their land.
12. The conservation of wetlands is truly an international challenge, since many wetlands occur in border areas or are fed by water sources in different countries. For example, in Iraq, any future marsh restoration will likely prove impossible without cooperation from Turkey and Syria, countries whose dams now affect water flow in the Tigris and Euphrates watersheds. Although global conservation agreements have helped to raise awareness and concern for wetlands in many countries, enforcement of conservation laws remains lax in most areas.

Forest Loss Continues (Adapted from Gardner, 2005a:92-93)

13. Deforestation remains a serious issue globally, with many countries losing more trees than they are able to regenerate. Even in countries which can claim an expanding forest area, new growth is often of lower-quality plantation forests. Often, such forests are cultivated to produce harvestable wood and are therefore less ecologically complex than natural forests. A lack of consensus around how to define a forest and how to measure deforestation means that it is difficult to accurately estimate current levels of deforestation. Global forest cover is thought to stand a approximately half the original extent of 8,000 years ago, with a conservative estimate by the UN Food and Agriculture Organization of a net loss of 9.4m hectares of forest a year during the 1990s, an annual loss roughly the size of Portugal.

14. Forests are important in regulating the planet's carbon and hydrological flows and provide a host of local environmental services; hence deforestation is a matter of grave concern. Trees may be understood as carbon warehouses, with their carbon being released when the roots of felled trees rot in the ground and when the paper or wood products made from trees decompose in landfills. It is estimated that deforestation (and other land use changes) accounted for one third of global carbon emissions between 1850 and 1998. At a local level, forests are home to a broad range of species: Indoensia, for example, accounts for only 1.3% of the Earth's land surface, but is home to 11% of the world's plant scpecies, 10% of mammal species, and 16% of bird species. Indonesia's current loss of nearly 2m hectares of forest annually, and its 40% decrease of forest cover between 1950 and 2000, will therefore have serious ramifications for a wide variety of species.

15. The direct and underlying causes of deforestation are numerous and complex. Immediate drivers include agricultural expansion, wood harvesting, and infrastructure expansion such as road building. Underlying drivers include poverty, economic growth, and other economic factors; government policies; technological advances; demographic change; and cultural factors. Soil and water profiles, and social triggers such as war, can also influence the extent of deforestation. With growth in human populations, wood, paper, and other forest resources are in greater demand, and forest governance is also changing. Already, some 22% of the world's forests are privately owned.

Air Pollution Still a Problem (Adapted from Gardner, 2005b:94-95)

16. Although emissions of many air pollutants have declined or stabilised in industrial countries in recent years, pollution levels are still unhealthy, with new studies suggesting that the health risks from air pollution are greater than scientists believed even a decade ago. Furthermore, in developing countries, especially nations undergoing rapid industrialization, most air pollutants are present at levels that are now causing significant numbers of deaths. The six contaminants identified by the WHO as being particularly harmful to human health (namely, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide, ground-level ozone and suspended particulate

matter) are generally the product of fossil fuel use in factories, power plants, and motor vehicles or the result of burning biomass such as forests or post-harvest crop stubble.

17. A 2000 World Bank study estimated that on average 1.8m people would die prematurely each year between 2001 and 2020 because of air pollution. In many countries, lead is added as an anti-knock agent to gasoline, and the effects of this practice have been shown to damage the kidneys, nervous system, brain, cardiovascular and reproductive systems, and has been linked to reduced intelligence, lack of focus and behavioural problems in children. Rapidly increasing rates of asthma have been linked to air pollution, and in particular to high levels of ground-level ozone. In a study carried out in southern California, it was found that children who were active in sports in communities with polluted air were 3-4 times more likely to have asthma than less active children in communities with cleaner air.

18. Air pollution can also move well beyond the cities in which it originates. For example, acidic lakes in Scandinavia have long been linked to pollution from factories in the US. Recent scientific attention has focused on the 'Asian Brown Cloud', a two-mile thick collection of soot, fly ash, and sulphuric acid which, for over a decade, has been hovering over South Asia. The cloud originates from forest fires, wood-burning stoves, and a sharp increase in fossil fuel burning which as gone hand-in-hand with economic expansion in South Asia. In 2002, the UN Environment Programme reported that this cloud had killed tens of thousands of people in the past 10 years, including 52,000 in India alone in 1995. Furthermore, the amount of sunlight reaching the Earth's surface has been reduced by 10-15% as a result.