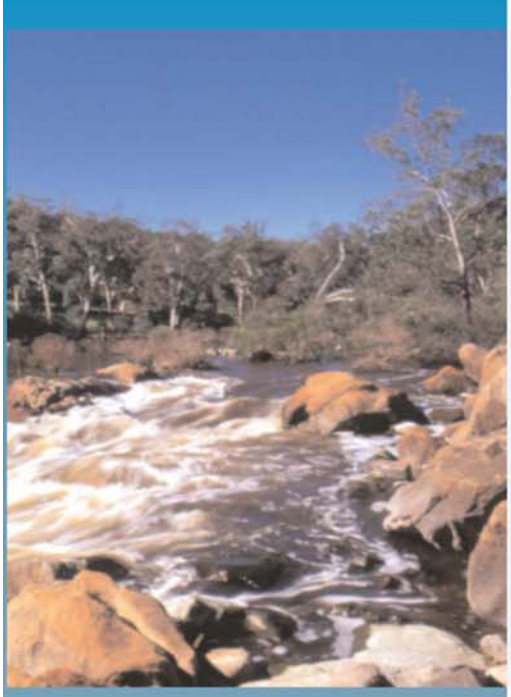

Towards Sustainability

Position Statement No. 6

August 2004

Environmental Protection Authority

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Foreword

The Environmental Protection Authority (EPA) publishes a series of Position Statements to set out its views on matters of environmental importance. The Statements provide an avenue for the Authority to inform the public about environmental values and its vision for the future, as well as providing principles for environmental protection and sustainability on particular environmental matters.

This Position Statement, 'Towards Sustainability', puts forward a view from the environmental protection perspective to complement the State Government's 'State Sustainabilitiy Strategy' (Government of Western Australia 2003). In preparing this Position Statement the EPA has been greatly assisted by Professor Ian Lowe of Griffith University, who is widely known for his work on sustainability. The document has also benefited from a range of submissions made to the EPA on the Preliminary Position Statement.

The work of the EPA is largely about the biophysical environment – protecting plants and animals and the habitats which sustain them. Also considered are social aspects and, to a limited extent, economics. In this position paper the EPA has been quite general in its statements, noting that sustainable development requires integrating ecological thinking into all social and economic planning and actions. The EPA recognises that such statements may extend beyond of the definition of the environment set down in the *Environmental Protection Act 1986* (EP Act). However, the EPA believes that it is appropriate to do so to assist in the discussion about sustainability.

This Statement discusses the concept of sustainability and draws attention to a range of global issues. It then introduces sustainability issues in a number of sectors such as natural resource management, delivery and use of energy, communities, transport, and the production and use of minerals. It discusses sustainability in triple bottom line reporting as well as acknowledging requirements, education and planning for the future.

The Position Statement endeavours to draw attention to some practical aspects of sustainability by providing (Appendix 1) a provisional checklist of questions to be asked when proposals are being considered.

Dr Wally Cox
CHAIRMAN
ENVIRONMENTAL PROTECTION AUTHORITY

26 August 2004

It has been two decades since the notion of 'sustainable development' entered the lexicon of international jargon, inspiring countless international meetings and even some action. But it is our conviction that the *first wave* of sustainability activity, in progress since the Earth Summit of 1992, is insufficient to alter alarming global developments. A new wave must begin to transcend the palliatives and reforms that until now may have muted the symptoms of unsustainability, but cannot cure the disease. A *new sustainability paradigm* would challenge both the viability and desirability of conventional values, economic structures and social arrangements. It would offer a positive vision of a civilised form of globalisation for the whole human family.

This will happen only if key sectors of world society come to understand the nature and gravity of the challenge, and seize the opportunity to revise their agendas. Four major agents of change, acting synergistically, could drive a new sustainability paradigm. Three are global actors – inter-governmental organisations, trans-national corporations and civil society acting through non-governmental organisations and spiritual communities. The fourth is less tangible, but is the critical underlying element – wide public awareness of the need for change and the spread of values that underscore quality of life, human solidarity and environmental sustainability.

Global change is accelerating and contradictions are deepening. New ways of thinking, acting and being are urgently needed. But as surely as necessity is the spur for a *Great Transition*, the historic opportunity to shape an equitable world of peace, freedom and sustainability is the magnet.

Raskin et al 2002, Great Transition

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1. INTRODUCTION

There is increasing support for the view that we should be aiming for sustainable interaction with natural systems. Moving toward sustainability is most often based on an improved understanding of the impacts of human activity on the natural world. There are many recent examples. The science predicting that chlorofluorocarbons (CFCs) would deplete the ozone layer, when later confirmed by actual measurement, became the basis of policies to phase out release of the chemicals. The emerging understanding that human actions are discernibly influencing the changing global climate has driven the policy debate and led to the establishment of some broad targets for national emissions. The developing awareness of the need for environmental flows in river systems and the causes of salinity is driving policy decisions in Australia about water allocation and land repair. Thus, sustainability requires, as a pre-requisite, improved understanding of natural systems, particularly more basic data about local species and a better understanding of the complex systems by which they interact, together with an improved decision-making framework. That framework needs to incorporate better scientific knowledge, as there is a clear need for improved understanding of complex natural systems and the way we affect their functioning.

A better understanding will not by itself bring about sustainability. Achievement of that goal will also require effective implementation programmes based on a new social ethic which recognises our responsibility to future generations. The urgent task for society is to find a framework that will unite disparate interest groups and support both the knowledge that will underpin sustainability and the political decisions based on that understanding.

This Position Statement brings together some recent thinking about the way to achieve the goal of sustainability. It is directed towards the particular circumstances of Western Australia, with a growing population and a growing economy based largely on the use of natural resources, as well as a range of problems that are the direct consequence of past practice. It sets out a range of criteria to judge whether proposed activities are consistent with attaining the goal of sustainability. It recognises that the transition to a future sustainable society will involve many changes, but there is no reason to be concerned that these will produce a poorer quality of life. In fact, many of the changes will produce desirable social and economic outcomes, as well as reducing the environmental impacts of our activities.

Following recent amendments, the EP Act includes a set of principles which underpin the environmental protection component of sustainability. The EPA's *Position Statement No. 7, Principles of Environmental Protection (EPA, 2004)* provides further information.

2. WHAT DOES SUSTAINABILITY MEAN?

At a simple level, sustainability means an ability to be sustained, kept going, maintained at an acceptable standard, recognising that the definition of this standard is itself problematic. A sustainable business, is one that seems likely to keep going for the foreseeable future. A sustainable weight is one that can be maintained. In the last twenty years, 'sustainability' and 'sustainable development' have become part of the political dialogue as a result of a growing awareness that some activities are **not** sustainable. The whaling industry, once a significant part of the WA economy, closed down because it depleted the whale population (and because of

changing community values and economic viability). Some logging activities stopped when the timber supply had become depleted. Mining operations cannot be sustained indefinitely because the resource is finite and they close when the ore body is worked out. There is an increasing problem of salinity in the WA wheatbelt, making some farming activities unsustainable.

Sustainability, or sustainable development, is now widely seen as a goal to be achieved, but there remains confusion about the process for achieving that goal. One approach is based on the report of the World Commission on Environment and Development, the 'Brundtland report' (WCED 1987). It said that sustainability involves meeting present needs in ways that do not reduce the capacity of future generations to meet their needs. That defines sustainability in a negative way. It says that a sustainable society is one that doesn't produce problems for the next generation by depleting resources or damaging natural systems. Several reports at the national and global level have all concluded that the objective is not being met and that a transition to sustainability will involve making some significant changes (Krockenberger et al 2000, Yencken & Wilkinson 2000, SoEAC 2001, UNEP 1999, NRC 1999, Raskin et al 2002).

There are at least three dimensions to sustainability: social, environmental and economic goals. Erosion of the resource base reduces the resources available to future generations. The natural environment is being damaged in ways that affect the capacity of future generations to meet their needs for potable water, breathable air and food that is adequate in quantity and quality, as well as the cultural identity and spiritual sustenance sourced from the natural world. Finally achieving sustainability requires a stable and just social system. In the view of Raskin et al 2002, producing a more equitable and stable world is an essential pre-requisite for a sustainable future, while that goal depends, in turn, on nurturing our natural environment:

> *A resilient and productive environment is the pre-condition for sustaining peace, freedom and development. Preserving the essential health, services and beauties of the earth requires stabilising the climate at safe levels, sustaining energy, materials and water resources, reducing toxic emissions and maintaining the world's ecosystems and habitats.*

The 1996 report on the state of the Australian environment (SoEAC 1996) concluded that progress toward sustainable development requires integrating ecological thinking into all social and economic planning. Traditional thinking is generally based on the model (Figure 1) which sees the economy as the main game, with social and environmental issues peripheral (Lowe 1994). A more accurate model of the relationship is shown in Figure 2. This approach recognises that the economy is an important part of society, but only a part. Society is expected to provide other important things which are not part of the economy, such as a sense of cultural identity, social justice, security, love, a sense of place and so on. Similarly, society is totally enclosed within natural ecosystems, the provider of essential support services of breathable air, drinkable water and food, as well as other less tangible benefits. Thus, economic is one part of social interaction; and social activity is contained within the capacity of natural systems. Sustainable development recognises the need to live within the limits of natural systems and the dependence upon natural systems for survival over time.

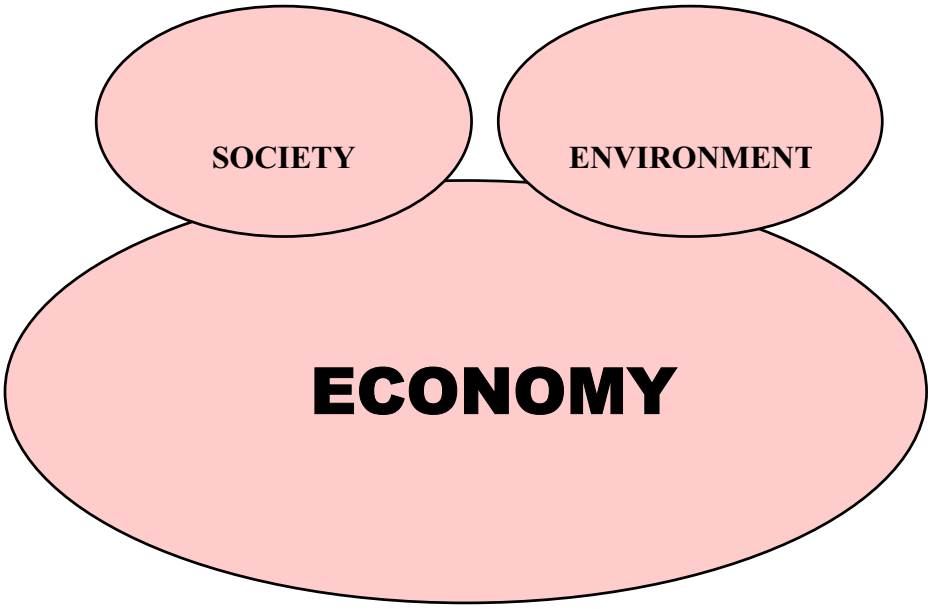

Figure 1: Traditional Relationship between Economic, Social and Environmental Dimensions

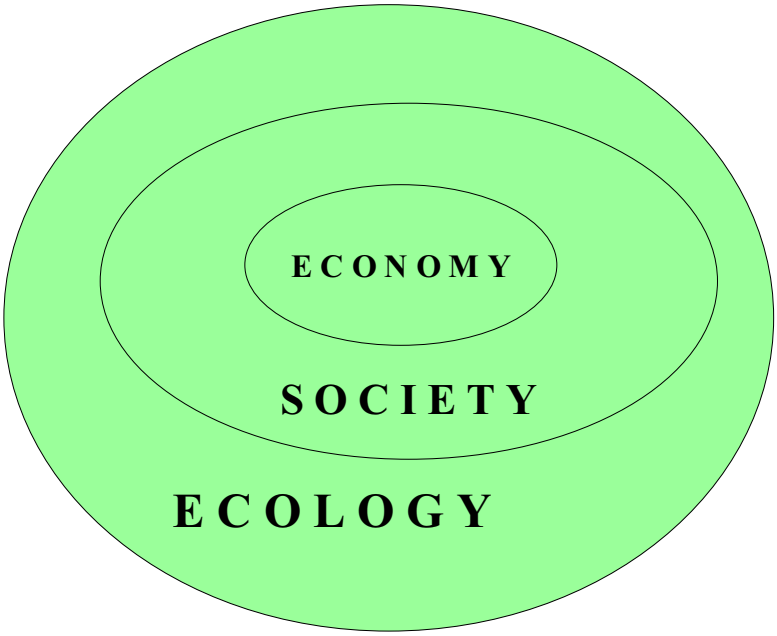

Figure 2: Current/Realistic relationship between Economy, Society and Environmental Dimensions

The natural surroundings of Western Australia also provide a sense of place and a cultural identity. An approach to sustainability for Western Australia needs to recognise as a starting point the unique opportunities and problems that are a consequence of the State's geological foundation and past history. Rich mineral endowments are the source of much of the economic wealth of WA. Equally, the State generally has extensively weathered nutrient-poor soils, with very low rates of soil formation, low and variable rainfall, very low levels of water run-off and serious problems resulting from past land use. The State has endemic species and biodiversity values

which are restricted in many cases to the local soils, rocks and climatic conditions. CSIRO predicts further declining rainfall in the south-west of the State. A large fraction of the State's population (75 per cent) is concentrated around Perth, where population growth and the pattern of settlement are putting serious pressure on natural systems. These factors need to be explicitly recognised in discussing the State's strategy for sustainable development. This Position Statement therefore includes a review of the sustainability of current economic activities and patterns of social organisation.

The 2001 State of the Environment report confirmed that many critical environmental indicators, such as salinity, biodiversity and the state of our inland rivers, have worsened in recent years (SoEAC 2001). The 'Headline Indicators' in the ABS report *Measuring Australia's Progress* confirm the SOE analysis (ABS 2002). Economic indicators have been strongly positive throughout the 1990s. The social indicators have been mixed, with a few positive, others unchanged and some serious negative trends, such as growing inequality and more children living in poverty. Except for urban air quality, all the environmental indicators were negative. It appears that the strong economic growth of the 1990s was achieved at serious social and environmental cost. It is not sustainable to produce economic benefits by running down natural and social capital.

In 2003, the Western Australian Government published 'Hope for the future: the Western Australian State Sustainability Strategy' (Government of Western Australia 2003). This sets out the clearest statement yet of an action plan designed to progress sustainability in the State across a broad front.

3. GLOBAL ENVIRONMENTAL ISSUES

The local strategy for sustainable development needs to be set in the global context. It remains true, as it was observed fifteen years ago, that the two most serious causes of environmental degradation are extreme poverty in many developing countries and unsustainable levels of consumption in many OECD nations (WCED 1987). Arguably the most fundamental problem is the loss of biological diversity, mainly caused by the destruction of habitat. There are other serious problems. Human activity is now changing the global climate. Interference in the nitrogen and phosphorus cycles may well prove as serious as the effect on the carbon cycle. The present historical age has been termed the Anthropocene, a geological period in which the defining characteristic of natural systems is the impact of humans (Crutzen & Stoemer 2000). A recent review of human impacts at the global level gave the following list of serious interventions into natural systems (Steffen and Tyson 2000):

- Nearly 50 per cent of the land surface has been transformed by human activity, including soil loss and a breakdown in soil structure.
- More than half of all accessible fresh water is now used directly or indirectly.
- More nitrogen is now fixed synthetically than naturally.
- More than half of all mangroves and coastal wetlands have been lost.
- Two-thirds of fisheries have been depleted or are at their exploitable limits.
- Arctic sea ice area is now 70 per cent of the 1870 figure and shrinking rapidly.
- Terrestrial glaciers and permanent snow cover are in retreat around the world.

- In the second half of the twentieth century the human population doubled, grain production trebled, energy use quadrupled and economic activity quintupled. So on average people became much richer and better fed, while doubling average energy use.
- The human population is expected to continue growing to about 1.5 times the present level, while the average consumption of resources is also increasing. So the total demand for resources is likely to double in the next fifty years.

The serious environmental problems do not have simple causes. They are the combined effect of the growth and distribution of the human population, lifestyle choices, the technologies used and the demands they make on natural systems (SoEAC 1996, SoEAC 2001). In other words, the human population is not interacting sustainably with the natural systems of this planet. The effects of the growing human population are compounded by increasing resource demands and environmental costs per person, causing a cascade of escalating impacts on natural systems. More pressure is being applied to natural systems that are already under stress. About half the Earth's surface has now been transformed for human needs (Vitousek et al 1997). Forest cover is still being lost at a rate of about 10 million hectares per year. Australia has the highest rate of vegetation loss of any industrialized nation (SoEAC 2001). World population is expected to increase to at least 9 billion before stabilising and per capita demand for goods and services is still increasing, so the likely future demand (and therefore resulting environmental impact) is at least double the present level. Existing demands are visibly stretching the capacity of natural systems. It has been estimated that human activity uses, directly or indirectly, about 40 per cent of the total photosynthetic product of the Earth's land area (Vitousek et al 1986).

The United Nations Environment Program recently released its third report on the global environmental outlook (UNEP 2002). It notes some significant recent successes, such as addressing ozone depletion, improving air quality in many cities and the development of an integrated approach to environmental policies. The report also lists a series of environmental challenges: global climate change, over-exploitation of water, loss of species, depletion of fish stocks, land degradation, loss of forests and local environmental problems in the cities of poorer countries. It identifies as 'a serious threat to sustainable development' the lifestyle divide between 'excesses of consumption' in the developed world and 'extreme poverty' in the poorest developing countries. Most importantly, it states that it is now widely recognised that economic development and environmental stability should be seen as mutually supportive goals, rather than conflicting aims. Achieving the goal of sustainability requires a consideration of the social, economic and environmental dimensions of our lifestyle choices.

4. SUSTAINABILITY IN NATURAL RESOURCE MANAGEMENT

Is current practice eroding the resource base of future generations? An obvious issue to consider is the rate of use of the non-renewable resources, especially the fossil fuels and the most important minerals. It is also necessary to look at the use of potentially renewable resources such as land, water, forests and fisheries, to determine whether present patterns of use are sustainable.

In the case of mineral resources, most of the deposits which are commercially exploited in Western Australia are quite large by comparison with the rate of use. The State's local energy resources are considerable, as discussed in the following section. While the State is well endowed

with hydrocarbons, the transport system is almost totally dependent on imported petroleum fuels. This issue is discussed in the Section 7.

Farming arable land has resulted in a number of serious resource management issues, with one of the most talked about being salinity. The recent National Land and Water Resources Audit estimated that 4.4 million hectares in south-west Western Australia have a high risk of developing salinity (water table less than 2m or between 2 and 5m and rising). Without preventative action this is predicted to rise to 8.8 million hectares by 2050. Salinity has already had a significant effect on potential agricultural production, remnant and perennial vegetation, wetlands and infrastructure.

Soil acidity is also a serious resource issue, with more than 80% of the agricultural soils in WA having a topsoil pH of below 5.5. Unlike salinity, this problem can be solved in theory in the short to medium term by the application of lime. In the last six years between 12 and 16% of acid soils in Western Australia have been treated with lime. However, lime use is still half the minimum annual estimated requirement to reduce acidity and topsoil pH needs to be 5.5 to assist downward movement of lime to treat subsurface acidity. As well, loss of soil and deterioration of soil structure are problematic.

There are other natural resource issues concerning the use of renewable resources. There is increasing global concern about the issue of water. The future development of Western Australia will be significantly influenced by the availability of water. The south-west of the State has been in a dry mode for 25 years. The main feature of the decline has been the lack of wet years. The frequency of winters with rainfall above decile 8 (i.e. wettest 20%) during the past 25 years (i.e. 1977-2001) is about half that during the 25 years before (i.e. 1952–1976).

The consequences of this decline are most apparent in the area of water supply. Dam catchments require about 300mm of rain before they produce runoff. The pattern of less rain early in the season, plus fewer heavy rain events has meant that runoff into dams has been significantly affected. Other sectors that depend on or are affected by accumulation of rain over seasons and longer, such as forests and woodlands, shallow aquifers and wetlands are also showing signs of water stress.

With CSIRO forecasting declining rainfall, there is now concern about the sustainability of water use on the coastal plain around the Swan River. For example, as an unusually large fraction of the reticulated water supply of the area around Perth is used to water gardens, considerable economies could be made in principle by changes to gardening practices, especially a move away from exotic species and lawns that need watering toward local species that are adapted to the rainfall pattern.

Local biodiversity should be regarded as an important resource. As many local species are found only in WA, they are significant globally as well as locally; if they disappear from WA they are lost to the world forever. There is concern about biodiversity in all areas. The 2001 national state of the environment report noted the problems caused by grazing, mining, altered fire and hydrological regimes, pests and weeds in areas away from the coastal plain. Noting that the pastoral industry ‘covers about 70 per cent of the continent’, it said ‘grazing in arid and semi-arid regions is considered partly responsible for the extinction of many plant species and continues to threaten around one-quarter of the plant species listed as endangered.’ More generally, the report concluded ‘sustainable management of Australia’s resource base will not be possible unless many

more financial and human resources are directed to support improved understanding and management' of ecosystems. This conclusion recognizes that there is a range of pressures threatening local biodiversity, including salinity, land clearing, introduced species, over-grazing and climate change (SoEAC 2001).

The 1998 report on the state of the WA environment identified three issues that have the highest priority for government and community action: land salinisation, maintaining biodiversity and salinisation of inland waters (Government of WA 1998). All three issues are in the broad field of natural resource management, confirming the impression that this needs to be accorded a very high priority in moving toward sustainability.

In principle, sustainability requires not eroding the resource base in ways that would foreclose options for future generations. So a commitment to sustainability will mean that new proposals need to be examined to determine the impact they would have on the base of renewable resources, such as water, as well as resources which are non-renewable but infinitely recyclable, including, most obviously, minerals. Land and biodiversity are also resource issues. A commitment to sustainability should also involve reconsideration of some current activities that are putting serious pressure on natural resources. All natural resource agencies have an environmental responsibility within which their core management responsibilities can be delivered. The philosophy of sustainability leads agencies to develop broad indicators of environmental performance that can be understood by the community. The indicators need to cover areas such as:

- Maintence of the productivity and environmental quality of land;
- Maintenance of biodiversity on land, in rivers and oceans;
- Maintenance of breeding stock levels for capture fisheries;
- Maintenance of water quality and quantity for human use;
- Interaction between production activities and the maintenance of natural resources; and
- Rehabilitation programmes, such as reversing salinity.

More generally, the community needs to be involved in the development of recovery plans for entire ecosystems rather than threatened species or communities. As a specific example, since rangelands cover 87 per cent of this State (National Land and Water Resources Audit 2001, Rangelands – Tracking Changes), a recovery plan would address many general issues and involve the community over a very wide area.

The EPA is currently developing approaches to evaluating the environmental performance of natural resource management agencies. This can only be achieved by EPA working closely with natural resource management agencies and the community to establish agreed environmental objectives, targets and monitoring and evaluation programmes.

5. SUSTAINABILITY IN THE DELIVERY AND USE OF ENERGY

Society is critically dependent on the use of energy, with the current Australian level of use about 6 kilowatts per head (SoEAC 1996). This literally powers every activity: industry and commerce, transport, housing, recreation and so on. There is some scope for reducing the level of energy-

related services in a modern community and more recently the development industry has made some responses to that challenge. There is, however, considerable scope for improving the efficiency of turning raw energy into those services. Analysis of the sustainability of energy supply and use has three phases. The scale of available resources needs to be studied. The environmental limits on energy resource use also need to be explicitly considered, given that Australia is party to the Framework Convention on Climate Change. Finally, the scope for substituting new energy supply technologies for those which appear problematic and the capacity to reduce demand by efficiency improvement need to be considered.

Western Australia has large reserves of hydrocarbons, especially natural gas which is sufficiently plentiful for it to be exported without significantly eroding the resource base in the short to medium term. WA has very large amounts of renewable energy. The amount of solar energy hitting the State in one summer day is more than the global energy use for a whole month (Lowe 1993). The State already makes extensive use of solar energy, with about 25 per cent of domestic hot water supplied by solar panels and a vibrant local industry producing and distributing the equipment. Wind energy is also a resource of considerable potential, especially in the south-west corner of the State. Other States are now seeing the heat in artesian bore water as a source of renewable energy, and there is increasing interest in other forms of geothermal energy such as hot dry rocks. These energy resources are unlikely to pose a problem in the medium-term future, except for transport, as discussed in Section 7, but environmental concerns are likely to force changes in the balance of energy supply.

Environmental constraints are increasingly serious, now that it is accepted that greenhouse gas emissions are changing the global climate. The average temperature is now about 0.7 degrees higher than it was 100 years ago and there have been significant changes in rainfall patterns, such as the decline in the south-west of the State. The scientific analysis of the changes and the role of human emissions of greenhouse gases has steadily become more confident. The Third Assessment Report of the Inter-governmental Panel on Climate Change (IPCC) concluded that 'most of the warming observed over the last 50 years is attributable to human activity'. The modelling in the Third Assessment Report shows that the smallest predicted increase in temperature, based on the most optimistic scenario of fossil fuel use reduction and the most cautious interpretation of the science, is a further 1.5 degrees by the end of this century, with associated changes in rainfall and sea level, as well as in the frequency and severity of extreme events. Given the significant effects on natural systems produced by the changes of the twentieth century, even this optimistic scenario would have serious impacts on human life, especially in agriculture and the pattern of settlement (Walther et al 2002). That scale of climate change would also have very serious impacts on natural systems such as forests and bushland. Research needs to address adaption to change as well as response.

Other, more likely, scenarios of fuel use and other interpretations of the scientific uncertainty predict much larger increases in temperature and more severe changes in other areas. The IPCC also warns that the climate system is complex, so surprises cannot be ruled out. The Global Change Science Conference in Amsterdam last year warned that many of the parameters of the Earth's natural systems are now outside the range of previous human experience, making it quite possible serious disruption could be experienced. Action has been forced by recognition of the serious economic and social consequences of the climate changes being projected for the next few decades.

The 1997 Kyoto conference saw recognition by leaders of the world community that climate change demands concerted political action. Under the Kyoto agreement the developed world as a whole, which has been responsible for about 80 per cent of the human production of greenhouse gases from fossil fuels, is obliged to reduce emissions to 95 per cent of the 1990 level by the 2008-2012 period. Though not a signatory to the Kyoto agreement, in line with that agreement, Australia has committed to limit its emissions for that period to 108 per cent of the 1990 figure. Data presented in the 1996 and 2001 State of the Environment reports showed that Australia had not made the sorts of reductions in carbon emissions per unit of economic output made by other OECD nations. There is no reason to delay any further those 'no regrets' measures that provide short-term economic benefits as well as reducing emissions. As Australia's energy-related greenhouse gas emissions in 2000 were 24 per cent above the 1990 level, meeting the 108 per cent target will require cutting emissions before 2012 (AGO 2002). There are two obvious ways to make the sort of large cuts that are needed: using less carbon-intensive fuels (e.g. LNG) and improving the efficiency of turning those fuels into energy-related services.

Applying the principle of sustainability will mean assessing major proposals for their impact on our greenhouse gas emissions. The absence of a strategic plan at the national level means there has been no serious discussion of the apportioning of our carbon 'budget' between States or between different activities. It is probably prudent to assume that WA will have to contribute to the national effort to meet Australia's overall target. Within the local envelope of carbon emissions, there is room for discussion on the relative importance and the different opportunities for reduction in different areas such as agriculture, manufacturing, commercial energy use, domestic energy use and transport.

Meeting any realistic emissions target will involve a gradual move away from conventional coal–fired electricity to less carbon-intensive forms of energy, such as direct use of natural gas and the harnessing of renewable energy. Meeting a target also needs a commitment to moving toward international best practice for energy-using appliances and equipment. Recent work by the OECD concluded that resource use can be reduced by factors of two to four in most areas, using technology that is currently available and cost-effective. At all levels, from domestic appliances to major industrial production facilities, the use of efficient technology should be encouraged. More efficient technology brings economic benefits as well as reducing emissions.

6. SUSTAINABLE COMMUNITIES

A sustainable community would be secure, healthy and equitable, and have a clear sense of place. One hundred years ago, Australia was one of the more equitable societies, but recent studies of inequity rank us among the worst in the developed world (Ziguras 2002, Smeeding & Rainwater 2002, UNDP 2001). Insecurity in modern cities and large towns is apparent in higher levels of crime, calls for greater levels of public spending on police services, and higher levels of defensive expenditure on alarm systems, guard dogs and private security services. Community health has been improved by almost eliminating serious infectious diseases and significantly reducing rates of coronary heart disease (Hetzel and McMichael 1985). However, a new range of health problems has arisen – accidents and suicide are killing large numbers of young people, while cancers are now a serious problem among older people and longer working hours are associated with higher stress levels (Baum 1998). As discussed above, the economic growth of

the 1990s came at significant social cost, as well as coinciding with environmental decline (ABS 2002).

Changes in economic organisation have led to the withdrawal of many services once routinely provided in local (especially rural) communities, such as banking and postal services, reinforcing a spiral of decline. A sustainable community also needs economic security. Some areas of economic activity have disappeared (whaling), declined (forestry) or are in decline (some types of agricultural production) because they did not use natural resources sustainably. Other activities are in decline because of changes in world demand (wool) or political choices by governments (textiles, clothing and footwear). In others, the economic activity is expanding but employment is declining as a result of policy decisions (electricity supply, provision of telecommunications). Technological change has dramatically reduced the labour demands of some types of economic activity, including farming. All these changes have reduced the economic security of many rural communities.

As discussed in section 7, the pattern of development in urban areas has led to rapid growth in transport use. A sustainable community should probably be organised around the principle of making the services people want readily accessible. Mobility is a second-order priority, needed to cope with accessibility problems. The pattern of development also influences demand for various other services, ranging from supply of water and electricity to the management of waste. Sustainable urban development must incorporate key environmental considerations such as the protection of urban bushland, but a commitment to sustainability will also require consideration of the consequences of all aspects of urban planning, including not just such obvious issues as housing density but also the spatial relationship between housing and employment opportunities, or between housing and such services as shops, schools and recreational facilities. It will also involve choices of infrastructure provision. A commitment to sustainability might lead local councils to follow the example of the City of Mandurah in basing its strategic plan on the guiding principles of People (social), Planet (environment), Prosperity (economic) and Planning.

The city of Perth and the surrounding region are of particular importance, given the large portion of the State's population that lives there. Some general conclusions have been drawn about Australian cities, with the data showing that growth has generally made them more sustainable in terms of per capita use of resources and production of wastes, as well as improving such indicators of social well-being as education and housing (Newman and Kenworthy 1999). However, the same data also show that large cities are 'more likely to reach capacity limits in their air sheds, watershed etc.' and so need to be innovative to be sustainable. Near-urban coastal settlements 'have large environmental impacts, high metabolic flows and low livability on all indicators' (ibid). That suggests that achieving sustainability for the Perth metropolitan region would require some sort of growth management strategy that seeks to contain urban expansion generally and discourage expansion of coastal near-urban settlements in particular.

The same authors suggest a check-list for city sustainability in terms of economic efficiency, environmental responsibility, social equity and livability. Most of the indicators of environmental quality relate directly or indirectly to the pattern of transport use: air pollution, noise and greenhouse gas emissions. Urban planning is therefore a crucial determinant of environmental aspects of sustainability. Other indicators include loss of natural areas, water quality in urban creeks and rivers, and the state of local flora and fauna. Indicators of livability and social equity include accessibility of services, such as public spaces, shopping, educational institutions and recreational facilities, as well as less quantifiable aspects such as security and safety. In a paper

prepared for the Committee for a Vision for Perth in 2029, Newman (2000) argued that Perth's sustainability hinges on whether it will be able to develop 'livable community' centres. He quotes urban planner Peter Hall as saying that great innovative cities 'spring from egalitarian, self-reliant societies, at the moment of transition between a conservative, tradition-bound past and an open trade oriented future' with strengths coming from the blending of traditions with 'new global horizons' (Hall 1994, cited by Newman 2000). One possible positive for Perth to become 'the nation's second Global city with its different geographical focus and culture able to offer a different future to that in Sydney' (Newman 2000). On the other hand, Newman warns, failure to develop livable community centres could lead to Perth becoming a city divided between an increasingly wealthy elite, living in gated areas with private security to protect their possessions, and an under-class with reduced opportunities, making the city a less attractive investment site for global capital (ibid). This argument suggests that economic sustainability is closely related to social stability and quality of life. In this analysis, urban planning to maintain quality of life becomes the key determinant of sustainable communities.

In terms of resources, a key issue for the Perth metropolitan region will be the availability of water. Allowing the desired growth in local population, while keeping water use within sustainable limits, will require innovations in the pattern of use, including sound water management.

7. SUSTAINABILITY IN TRANSPORT DECISIONS

The present pattern of transport raises several issues. It is almost totally dependent on a limited resource, it contributes to environmental problems ranging from local air quality to global climate change, and it imposes serious social costs in the form of deaths and injuries. Given mobility of society, a serious issue for analysis is the sustainability of present transport patterns. Structural decisions taken now will influence choices for many decades, so it is an area that demands particularly careful consideration. Studies by Kenworthy and Newman show that there are very large differences between cities in the pattern of transport use (Newman & Kenworthy 1989, Newman & Kenworthy 1999). These differences are complex consequences of urban planning, infrastructure provision, pricing of transport alternatives, climate, lifestyle choices and other factors. Much of the present transport task in Western Australia is a direct consequence of the pattern of urban development, discussed in section 6, so these two issues should be considered together.

Many European cities have between 20 and 40 per cent of all urban trips made by bicycle, despite a less favourable climate: they are compact cities, so journeys tend to be shorter. The infrastructure makes cycling much safer by separating cyclists from heavier vehicles. Australia now has a National Cycling Strategy, setting out the principles for encouraging safe cycling. Data recently collected on the fuel-efficiency of transport alternatives show that cars take twice as much energy per passenger-kilometre as the average for buses, four times the energy of tram or light rail systems, seven times the energy of electric trains and fifty times the energy of bicycles (Newman & Kenworthy 1999). This suggests that the order of preference for urban transport is an important matter to be evaluated on sustainability grounds. There is a link between infrastructure provision and the pattern of transport. For example, building a busway in Brisbane confirmed that providing infrastructure generates its own demand, while the closure for structural reasons of a London bridge showed that removal reduces demand. In all forms of transport, the

provision of increased capacity, whether it is in the form of extra buses or new cycleways or road space for cars and trucks, is effectively a decision to stimulate increased use of that particular travel mode.

Whatever strategic decisions are made about the overall transport pattern, the question of transport fuels will need consideration. Various options are possible: we could extend petroleum fuels by plant-based products such as ethanol, methanol and bio-diesels; we could use compressed or liquefied natural gas; we could use hydrogen fuel cells, with the hydrogen initially coming from fossil hydrocarbons and eventually produced by using renewable electricity to split water molecules; we could use batteries to store renewable electricity and so power electric vehicles. Each of these alternatives has its own characteristic strengths and weaknesses, and some may prove to be not sustainable. The future transport system will use a mix of different fuels for different purposes. Transport is such a basic element of modern WA society that its sustainability deserves close attention.

8. SUSTAINABLE PRODUCTION AND USE OF MINERALS AND PETROLEUM

Some fundamental issues arise in discussion of the sustainability of minerals production and use: the scale of the resource in proportion to extraction levels; the rehabilitation of mined land; the value of other natural systems which may be influenced by mining (e.g. the value of those natual systems to tourism); and the responsible use and re-use of the end product. The mining industry has instigated a study of these issues at the global level.

Western Australia is richly endowed and mineral processing is important to the State's economy. Many of the major mineral deposits now being worked have several decades of proven ore at present extraction rates. Several decades is not a long time. The future of the industry in its present form depends on the discovery of new resources. Many overseas minerals provinces have developed strategies for ensuring that there are enduring economic and social benefits beyond the life of the mineral deposits. Those approaches could be considered in addressing future employment options, ensure the survival of communities and social institutions which have grown up around mining activities. More broadly, our approach to the wise use of non-renewable resources also merits attention.

The early days of the mining industry in this State, as elsewhere in Australia, left a legacy of disturbed and contaminated land. Modern practice is dramatically improved, usually involving restoration of topsoil, replacement of native vegetation and encouragement of the return of animal and bird species. Accepting this new standard of practice is a move toward sustainability, in recognising the need to protect such natural values as the existing biodiversity. Even though mining disturbs a tiny fraction of the State's land area, sustainability requires the restoration of that land at the end of the mine's life to its previous state or some other safe, productive use. WA now expects new mines to be planned on a whole-life-cycle basis, with provision for closure and land rehabilitation.

There is also increasing attention at the global level to the issue of stewardship or responsible use of the end product. A study of the sustainability of mineral production and use involves consideration of the end-use of the products as well as the resource base of the operation. In those

terms, it would be reasonable for an authority concerned about sustainability to ask about product stewardship, promoting re-use or recycling, as well as the direct environmental impacts of production, the final restoration of the site and the scale of the resource. A related issue is the growing tendency for overseas customers, especially in western Europe, to be forced by either consumer sentiment or local legislation to consider issues of sustainability in their purchasing decisions. This means that it could be a prudent investment in the continuing viability of the local minerals industry to ensure that it meets best international standards of sustainability.

9. MANAGING FOR SUSTAINABILITY: TRIPLE BOTTOM LINE REPORTING

Many businesses have now adopted the concept of Triple Bottom Line (TBL) reporting, in which the traditional financial accounts (detailing economic performance) are supplemented by analysis of environmental and social performance. The fields of welfare economics and environmental economics have worked to place financial values on social costs or environmental damage, with some success: it is possible to put approximate dollar values on such environmental costs as the loss of productivity from salinity, or such social costs as the unavailability of grand-parents to provide child care during the working day. However, most analysts see the three domains as separate. There is certainly no agreed way of evaluating some environmental costs, such as loss of species, or some social costs, such as youth suicide. In the case of other environmental costs, such as the impacts of global climate change, estimates using different legitimate assumptions differ by as much as a factor of a hundred. In developing the TBL approach, Elkington (1997) argued that it was driven by a growing demand for transparency in the way corporations discharge their environmental responsibilities and social obligations, the demand coming from both financial stake-holders and the community generally.

The TBL approach applies to government decisions as well as the management of companies. When mining was proposed at Coronation Hill in the Northern Territory, the Resource Assessment Commission drew up an evaluation of the project under the same three headings by assessing the economic benefits, the social costs and benefits, and the environmental risks (RAC 1991). It left the value judgement of deciding whether the economic and social benefits justified the social costs and environmental risks to the elected government, arguing that the decision must inevitably be a political one. There is an integration involved to achieve the objectives of all three, so the RAC argued that the balance should be decided through an open political process. While decision-makers may be uncomfortable with the process of balancing costs against benefits under public scrutiny, the community is more likely to have confidence in a transparent process, and acceptance of the outcome.

There have been many attempts to develop frameworks or standards for TBL reporting. Among the more important are:

* ICC Business Charter on Sustainable Development, developed by the International Chamber of Commerce in 1991 – www.iccwbo.org/home/environment/charter.asp

* OECD Guidelines for Multinational Enterprises, including environmental requirements and human rights obligations – www.oecd.org/daf/investment/guidelines

* APEC Business Code of Conduct, developed by Asia Pacific Economic Cooperation from the two above – www.apecsec.org.sg

* Global Reporting Initiative, developed by the Coalition for Environmentally Responsible Economies, cited by Elkington (2001) as 'the de facto global standard for corporate sustainability reporting' – www.globalreporting.org

At the corporate level, some companies in the Australian minerals industry began to expand traditional financial reports with a separate environmental report several years ago, then added reporting on such social issues as worker safety and community relations, before moving to sustainability reports which combines economic, social and environmental dimensions of the year's performance. It is likely that this will generally be expected of large corporations by stake-holders, ranging from individual share-holders to large financial institutions, and the wider community. More recent practice is based on what has been called the TBL + 1 or the quadruple bottom line, adding governance issues to economic, social and environmental, although governance in this context is a process, not an outcome like the other three.

10. THE KNOWLEDGE BASE

Recent studies have concluded that many of the present problems we face are the direct consequence of either ignorance or applying what had been regarded as knowledge at some earlier time (SoEAC 1996, NRC 1999). Thus the transition to sustainability will require improved understanding of the interactions between natural and social systems. The need has led to the emergence of the new field of sustainability science.

> *A growing body of evidence and experience suggests that the needed understanding must encompass the interaction of global processes with the ecological and social characteristics of particular places and sectors. The regional character of much of what sustainability science is trying to explain means that relevant research will have to learn how to integrate the effects of key processes across the full range of scales from local to global. It will also require fundamental advances in our ability to address such issues as the behaviour of complex self-organising systems, the responses, some irreversible, of the nature-society system to multiple and interacting stresses, and the options for combining different ways of knowing and learning so that social actors with different agenda can act in concert under conditions of uncertainty and limited information* (Kates et al 2001).

An international workshop on sustainability science developed an initial set of core questions (ibid). These suggest areas of inquiry, such as improving understanding of complex non-linear systems generally and developing a framework for coping with the simultaneous application of a range of stress factors. The questions also identify priority issues, such as trying to identify thresholds or limits beyond which the behaviour of natural systems changes radically or irreversibly. Finally, they call for new approaches to scientific inquiry, such as inverse approaches that start from outcomes which should be avoided and work backward to identify relatively safe corridors of action, or semi-qualitative representation of entire classes of dynamic behaviour. The crucial point is that it is not yet possible to say which courses of action are

certainly sustainable. As an extreme example, it is estimated that 10 to 15 per cent of the species that live in Australia (SoEAC 1996) have been identified. Therefore, understanding of the way they interact in natural systems is necessarily very incomplete. Many past environmental problems were caused by ignorance. It is an inescapable conclusion that needless damage is still occurring through our lack of understanding of both the natural systems of WA and the impacts on them of our actions. The goal of sustainability thus requires a better understanding of the complex interactions between social and natural systems. As the quotation above states, the understanding needs to span the range of scales from the local to the global, recognising (as an example) that the way farming is undertaken in Western Australia will be affected by the changing global climate, but is also one of the factors influencing the global climate. Kates et al (2001) argue that the development of improved understanding will involve scientists and others (farmers, pastoralists, industry, community groups) working together to define the problems, collect data and develop new knowledge which combines scientific integrity with practical relevance. It is a significant challenge to integrate science with traditional knowledge and intuitive understandings.

The US National Research Council's Board on Sustainable Development (1999) identified that the transition to sustainability will require the development of an integrated and place-based understanding of significant environmental threats and options for dealing with them. It also concluded that indicators are essential to inform society about how, and to what extent, progress is being made in navigating the transition towards sustainability.

The transition towards sustainability will require:

- The development of a deeper understanding of the interactions between economic systems, social systems and environmental systems;

- The development of effective indicators of the transition to sustainability in WA;

- The development of effective policy tools, policy assessments and tools for adaptive management of policy implementation;

- Regional sustainability models, strategies and assessment tools;

- A multidisciplinary understanding of the current and likely future production systems and consumption patterns, including the pressures underlying these systems, their mechanics, and their integrated environmental, social and economic impacts;

- The development of more eco-efficient and effective ways of growth with an increasing population, healthy social systems and a high standard of living, while reducing the ecological footprint; and

- The development of an improved understanding of sustainability issues and their interactions at different spatial scales (local, regional, and global) and time scales.

The transition towards sustainability also requires multidisciplinary research based on enhanced institutional capacity linking government, academia and the private sector in research partnerships. This will probably require governments to play a leadership role in bringing

together the partnerships. The proposed Global Centre for Sustainability (Government of Western Australia 2002) to be located in WA is one step in this direction.

11. EDUCATION FOR SUSTAINABILITY

As stated by the first Australian report on the state of the environment, our serious environmental problems are the consequence of the scale and distribution of the human population, lifestyle choices, technologies used and the consequent demands on natural systems (SoEAC 1996). In other words, everyone now makes decisions that have implications for the natural systems – as a worker, consumer, parent or member of a community group. Our urban structures, legal system, economic development choices, use of transport, recreations and amusements, diet and the way we live daily activities all have significant impacts on the natural environment. The argument for universal environmental literacy is simply an argument that the effects of choices should be understood, rather than ignorance leading to continuing and unnecessary. The State Sustainability Strategy (Government of Western Australia 2003) describes four phases for education for sustainability:

- Awareness raising "Does it matter to me?"
- Shaping of values "Should I do something about it?"
- Developing knowledge and skills "How can I do something about it?"
- Making decisions and taking action "What will I do?"

and concludes 'Education becomes the means to which current and future generations are inspired to live more sustainably and to find innovative solutions for the future.'.

Recognising the importance of aiming at widespread or universal environmental literacy has implications for both the content and the process of education. In terms of content the goal is an understanding of the underlying dimensions of our interaction with natural systems, but that understanding needs to include the complexity of the questions and the consequent limitations on knowledge. The limits of present knowledge mean that scientific knowledge could be described as islands of understanding in oceans of ignorance. Science is, in the terms of that metaphor, always engaged in land reclamation, but there is no prospect of filling in the oceans of ignorance in a lifetime. Pursuing that metaphor one step further, an enduring problem is that islands of scientific and other forms of understanding have been seen as separate entities which are not connected. So agronomists have expert knowledge of pastures, but may not understand the implications for surrounding bushland of changes to the pattern of land use on farms. Foresters have detailed knowledge of the managment of wooded land, but may not know about the effects on river systems of changes to the way we use our forests. Transport experts may be able to build roads and design overall systems of urban transport, but may not understand the effects of the resulting travel on the social dynamics of the city, on local air quality or on the global climate.

The key **content** of education for environmental literacy is probably what Barry Commoner called the Four Laws of Ecology (Commoner, 1971):

- everything has to go somewhere;
- everything is connected to everything else;
- there is no such thing as a free lunch; and
- nature knows best.

Most of the serious environmental problems arise directly from a failure to understand those basic ideas. While there is also value in making all Australians aware of, for example, our unique biological diversity, traditional education has often concentrated on the individual trees rather than the nature of the woods. The over-arching principles are much more important than the details of particular species or habitats.

The need for environmental literacy makes obvious demands for changes to the process of education in general and science education in particular. The traditional process of science education consists of the revelation of a fixed body of knowledge (Lowe 1992, Lowe 1975). This is educationally questionable, as it gives a totally misleading impression of the state of scientific knowledge. Science is not a stable body of knowledge, but the **process** of trying to understand the natural world and impacts on it. Working scientists actively strive to improve understanding of the world by collecting more data, by improving theoretical frameworks or by challenging existing ideas. Therefore environmental science has to be taught as a process rather than a body of knowledge, with explicit recognition of the levels of uncertainty in current understanding, in terms of both basic knowledge of the local environment and general understanding of complex natural systems. It also needs to be recognised that applying our understanding of the natural world to real decisions is inevitably a complex process that has social, political and economic dimensions, going outside the realm of science.

Some forty years ago Weinberg (1962) warned that there is a class of problems which can be framed in scientific terms, which sound like scientific questions, but cannot be answered in terms which are acceptable to the scientific community. The two specific examples he gave were the operating safety of nuclear reactors and the biological effects of low doses of ionising radiation. Many ecological problems are equally intractable. In the absence of full scientific certainty, Weinberg warned, values inevitably play a role in assessing the data. There is no prospect of resolving that disagreement by careful evaluation of epidemiological evidence or by controlled experiments.

Therefore the content of education for sustainability needs to be broader than an emphasis on ‘environmental science’, especially where that is interpreted narrowly as the body of knowledge about environmental systems. It has to include the social, economic and political dimensions of our interaction with natural systems. It must explicitly recognise that our engagement with natural systems is inevitably driven by social factors and influenced by the dominant values of the time. So it must be inter-disciplinary in nature and based on a recognition of the complexity and uncertainty of the real world.

These considerations suggest a cooperative learning model in which teachers and students work together to understand complex problems for which there is no simple correct answer. In the real world, science is mixed up with economics and geography is merged into history, while maths is used to obtain partial solutions to messy problems rather than neat answers which are always whole numbers. There are some broader implications to taking such an approach. Producing a credible solution for a complex problem is a much more demanding task than trotting out a well-rehearsed proof for an obscure theorem. It requires real environmental literacy, including an appreciation of general principles, an awareness of the specific issues of the case being considered and a recognition of the limits of our current knowledge. Not only is such an approach a better preparation for the making of wise decisions about the environment, it is also arguably a better general preparation for the complex world in which we now live. In the modern world of rapid change, where much of the knowledge and many of the skills that people will need in their

future life do not yet exist and so cannot be taught, the formal education must emphasise the processes which will prepare people for that world. An explicit commitment to environmental literacy could lead to a better educational preparation for the complex, rapidly-changing world of the future.

As discussed in earlier sections, sustainability does not just involve considering the effects of our actions on the natural world. It also has social dimensions. Education for sustainability must include issues of social justice and equity, which in turn requires an understanding of ethics and the role of values. Some educators have also argued that it should include an orientation toward willingness to challenge dominant paradigms, recognising the limitations of our current understanding.

As well as considering how young people should be educated to help them make decisions that will promote sustainability, it would be advisable to give some attention to the much more difficult task of adult education, bringing those who have completed their formal education up to speed on these issues. In-service programmes have been developed by many professional bodies, such as the Royal Australian Institute of Architects and the Institution of Engineers, Australia, to make their members aware of the new environmental issues they are expected to understand. Achieving broader community understanding of the principles of sustainability will be an essential part of the process of building support for the changes required.

12. PLANNING A SUSTAINABLE FUTURE

The development of sustainable communities requires conscious steps to be taken to achieve that goal. This raises the question of a mechanism for bringing together environmental, social and economic considerations to make decisions about sustainability. This requires arrangements which are not limited or dependent totally on market forces. The EPA recognises that it is moving to the very edge of its scope of responsibility in this area, but this step has been taken in the interest of stimulating a broader discussion of the process for moving toward sustainability. Markets take no account of ability to pay, so they take no account of equity; indeed, the allocation of any scarce resource by a market is almost certain to increase inequity. Markets take no account of such externalities as the social impacts of the distribution of resources, unless the social impacts are severe enough to influence consumer behaviour. Market economics systematically discounts the future, for the economically rational reason that a dollar today is more valuable than a dollar in five years time. Future costs and benefits are thus explicitly and systematically discounted, leading to resource allocations that are not optimal and the imposition of large financial costs on future generations. More fundamentally, there are two groups crucially affected by today's choices that cannot even in principle express their preferences in today's market: **all other species** and **all future generations**. For all these reasons the attainment of sustainability cannot be left to market forces alone. Some means is required to factor into decision-making considerations of environmental values and social equity.

Since environmental assets are usually not priced, they are often consumed at rates that exceed the optimum. One response is to argue for prices to reflect the true value of the environmental assets used. This approach would be an improvement on present practice, which effectively puts no value on those assets. The problem is the lack of an intellectually defensible framework for calculating those environmental costs: as an extreme case, the estimates of the appropriate

addition to the price of coal-fired electricity to reflect the cost to future generations of climate change vary by a factor of 100, based on different legitimate estimates of the possible scale of disruption to food production and coastal settlements (Sorensen 1997). In the absence of agreed prices, any attempt to include a component reflecting environmental costs would meet political resistance. When a modest carbon tax was canvassed in the 1990s, the response from industry was understandably to portray it as an arbitrary levy. However, the growing awareness of environmental problems may be changing this traditional response. There are now several examples of local authorities persuading the community to impose a levy or charge to fund environmental protection or repair. As one instance, after full consultation with the local community, Albany waste water is being piped to a tree farm rather than being discharged into the ocean, even though this option required increased rates. A carbon tax or environmental levy could be used to provide economic incentives for desirable behaviour, and so influence behaviour at the margin. A crucial component of policy changes to promote sustainability will be the design of economic instruments which promote sustainable use of natural resources.

This raises some broader policy issues. In some recent discussions on natural systems, options considered have included translocation of species, restoring species, recovering species that are potentially at threat from disease or recovering threatened ecosystems. These are not easy and are often expensive. For the community to make informed decisions about retaining natural values managed for future generations, it needs to know the likely cost, as well as the consequences if the threatening processes are allowed to continue. Another example is the cost (economic, social and environmental) of addressing salinity in Western Australia. How does the cost of not instigating change at a rate required to halt the current process compare with the potential costs of waiting to do something in the future when the degrading process continues? Is this a failure of our accounting systems and the time frame we use, or is it a failure of awareness and cost sharing needs? The costs (economic, social and environmental) of not addressing an issue now may impose much greater costs in the future. Informed choices require evaluation of the options, and decisions going well beyond the life of a government.

As discussed earlier, the goal of sustainability will require a significant investment to improve understanding of the complex interactions between social and natural systems. The 1996 State of the Environment report noted that successful responses to environmental problems had taken a systems approach, integrating the different aspects, whereas failures were usually piecemeal efforts that tackled only parts of the problem. Therefore an urgent priority is developing a better understanding of our complex natural systems and the impacts on them of human activities, so that there is a more secure basis for future decisions. Extending this principle to the present legal framework, a commitment to sustainability will require a broadening of the legal requirement to assess the environmental impact of major proposals. The environmental impact is one of the components of a determination of whether a proposed activity is sustainable. Taking sustainability seriously will require a broader analysis of the environmental, social and economic impacts of major development proposals, incorporating the sorts of considerations canvassed in this Position Statement. Such an approach is being termed ‘sustainability assessment’ where ecological, social and economic factors are considered in an integrated manner from the start, openly and transparently. However, it will take time for such processes to develop and gain legitimacy. Until then, maintenance of existing environmental impact assessment processes augmented by institutionalised, orderly and systematic evaluation of social and economic factors taking into account public review would go some considerable way towards providing decision-makers with the basis for making sound decisions in an integrated way relatively quickly. One way to do this would be for these matters to be specifically considered by the Minister and fellow

decision-makers when reaching agreement on a proposal under section 45 of the EP Act. The checklist in Appendix 1 could be used to guide that consideration.

Finally, the Australian Inter-governmental Agreement on the Environment (1992) contains the precautionary principle: 'where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'. The Agreement goes on to state that decisions should be guided by 'careful evaluation' and 'an assessment of the risk-weighted consequences of various options'. As discussed above, a high priority for expanding understanding of complex natural systems is the identification of thresholds or limits beyond which serious or irreversible change is likely to occur. This principle suggests that there is an obligation to err on the side of caution when there is both uncertainty and a high risk of damage if the wrong decision is made. An area not developed now can always be developed in the future, whereas development usually involves some degree of irreversible change.

13. CONCLUSION

Above all else, moving toward the sustainable society of the future should be seen as an ongoing journey. It will involve many small steps which will accumulate over time to produce a significantly different society. There is nothing unusual about this notion. The WA of today is fundamentally different from the WA of 1950. The changes did not happen suddenly and were usually not seen as a radical departure from the past; they were a long series of incremental steps that eventually produced the significantly different State of today. This example of the recent past is a reminder that the future is not somewhere we are going, but something we are creating. It will be the product of today's decisions and actions, just as the world of today has been shaped by past choices. Strategic choices that open up some opportunities inevitably close off others.

Aiming for a sustainable society will involve developing a vision of the desired future, finding viable pathways to move in that direction and building community support for the process. Developing the vision through a process of community participation is a crucial first step, but that alone may not achieve the political momentum to implement the vision. It is at least as important to devise viable pathways from where we are to where we want to go. Articulating those viable pathways is the key to gathering support from a broad coalition of interests for the substantial changes that are needed. Without such viable paths, there is no real prospect of developing the community's commitment to change. This Position Statement suggests some issues to be considered. It is not a map for the journey toward a future sustainable society, but it is a guide to the broad direction to take and the landmarks expected to be seen as we travel in that direction.

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Appendix 1

Provisional check list of questions to be asked when proposals are being considered with respect to sustainability

Does the proposal deplete non-renewable resources significantly?

Does the proposal deplete assimilative capacity significantly?

Does the proposal use natural resources responsibly?

Does the proposal satisfactorily restore any disturbed land?

Does the proposal follow the waste hierarchy and manage satisfactorily any waste produced?

Does the proposal incorporate best practice in water and energy efficiency?

Does the proposal make good use of best practice to prevent pollution?

Does the proposal increase use of non-renewable transport fuels?

Does the proposal use energy efficient technologies?

Does the proposal result in net improvements in biodiversity?

Does the proposal increase greenhouse gas emissions?

Does the proposal involve acceptable levels of risk?

Does the proposal have a secure foundation of scientific understanding of its impacts?

Does the proposal minimize the ecological footprint?

Does the proposal avoid or minimize adverse impacts and promote beneficial impacts on the surrounding community?

Does the proposal produce sustainable net economic benefits?

Does the proposal produce sustainable net social benefits?

Does the proposal add to heritage protection and provide a sense of place?

Does the proposal produce net environmental benefits?

Does the proposal contribute to a more equitable and just society?

Does the proposal interact positively with other likely developments?

Does the proposal provide new opportunities (social, economic or environmental)?

Criteria for Sustainability Assessment – (from the State Sustainability Strategy) and relationship to the Provisional Checklist

Criteria for sustainability assessment		Preliminary checklist of questions to be asked
Managing the negative	**Promoting the positive**	**When proposals are being considered. Does the proposal…**
Provides short-term gain but long-term economic gain is uncertain.	Provides both short and long-term economic gain.	• produce sustainable net economic benefits?
Minimises impacts on access, equity and human rights in the provision of material security and effective choices.	Increases access, equity and human rights in the provision of material security and effective choices.	• produce sustainable net social benefits? • avoid or minimise adverse impacts and promote beneficial impacts on the surrounding community?
Avoids damage to biodiversity, ecological integrity and life support systems.	Improves biodiversity and ecological integrity and builds life support systems.	• result in net improvements in biodiversity?
Minimises the increase in ecological footprint while improving quality of life.	Reduces ecological footprint while improving quality of life.	• minimise the ecological footprint? • deplete non-renewable resources significantly? • use natural resources responsibly? • follow the waste hierarchy and manage satisfactorily any waste produced? • incorporate best practice in water and energy efficiency? • make good use of best practice to prevent pollution? • increase use of non-renewable transport fuels? • use energy efficient technologies? • increase greenhouse gas emissions?
Minimises impacts on community and regions, 'sense of place' and heritage protection.	Builds up community and regions, 'sense of place' and heritage protection.	• add to heritage protection and provide a sense of place? • contribute to a more equitable and just society?
Minimises conservation loss and social impact while providing economic benefit.	Provides conservation benefit and net social-economic benefit.	• satisfactorily restore any disturbed land? • produce net environmental benefits?
Minimises the reduction of 'common good' resources.	Increases 'common good' resources	• deplete assimilative capacity significantly?
Minimises the risks which are not understood.	Ensures there are acceptable levels of risk with adaptation processes for the worst scenarios.	• involve acceptable levels of risk?
Brings change without hope for the future as it is not part of a broader strategic vision.	Brings change and a sense of hope for the future as it is linked to a broader strategic vision.	• provide new opportunities (social, economic or ecological)?
No clearly equivalent criterion		• have a secure foundation of scientific understanding of its impacts? • interact positively with other likely developments?