The Economics of Biodiversity: The Dasgupta Review and Australia

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Abstract

The Economics of Diversity: The Dasgupta Review (Dasgupta, 2021a) is an erudite and detailed publication that discusses the key issues of biodiversity and economics and the need to integrate them. This need is illustrated by the following quotes, from experts:

> The drive toward perpetual expansion—or personal freedom—is basic to the human spirit. But to sustain it we need the most delicate, knowing stewardship of the living world that can be devised (Wilson, 1988, Chapter 1, p. 16).
>
> Destroying rainforest for economic gain is like burning a Renaissance painting to cook a meal (Wilson, in Sheppard, 1990, p. 4).
>
> … maintenance and regulating (biosphere) services are the foundation on which we exist (Dasgupta, 2022, p. 1019).
>
> The global economy has accumulated produced capital and human capital in the Anthropocene but has degraded natural capital to an extent that we have been endangering our collective futures (Dasgupta & Besley, 2023, p. 761).
>
> (Biodiversity issues) are inextricably linked to multiple Earth system interactions that couple human, economic and social activities to the biosphere, atmosphere, hydrosphere, and lithosphere. While this complexity makes tackling biodiversity loss challenging, it also provides opportunities for solutions (Australian Academy of Science, 2021, p. 2).
>
> Economists have gone from the beginning of their discipline assuming that the economy and the environment can be analysed in separate boxes. … In an era of climate change and growing loss of species, this is clearly untenable. The economy and the natural environment that sustains it have to be joined up (Gittins, 2023, p. 1).

This article informs the reader about the content of the *Dasgupta Review*, recounts reactions to it, describes its adoption by the United Kingdom Government, shows that Australia has been lagging in dealing with biodiversity problems and that action is needed on several issues.

The following overview highlights the significance of the *Dasgupta Review* and includes a summary of suggestions to provoke thinking about its relevance for decision making in Australia.

Keywords: Dasgupta review, biodiversity, economics, UK policies, law reform, population, poverty, political decision making

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Overview

The Significance of the *Dasgupta Review* and a Summary of Its Content

The *Dasgupta Review* of economics and biodiversity (2021a) (the *Review*) provides compendious information about biodiversity and related economic issues. It was commissioned by the United Kingdom (UK) Government in 2019 to assess the economic benefits of biodiversity and identify action needed for simultaneous benefits for

biodiversity and economic prosperity. The *Review* is 610 pages long. It is accompanied by a separate abridged version and a headline messages document.

The *Review* is important for Australia, with its biologically megadiverse status, continuing biodiversity losses and apparent failure to deal with this biodiversity crisis. The former Commonwealth Environment Minister, Tanya Plibersek, has acknowledged that Australia's economic system does not reflect the value of protecting biodiversity. There is evidence that our institutional framework for overcoming this parlous state of affairs has deteriorated for most of the last 30 years or so.

The *Review* is the product of an exhaustive process over nearly two years. The argument in the *Review* is that life on Earth is dependent on the biosphere; we don't look after our natural assets well because ecosystems don't have a value in our economic systems; we can no longer take nature for granted and exploit it; and we have to learn to live within nature's constraints.

Recognition of a relationship between the environment and economic activity is not new, but Dasgupta saw that economists and financial decision makers were not acting on prior knowledge. Hence, the *Review* is aimed squarely at these groups.

The *Dasgupta Review* is significant because it is the first one commissioned by a government to explicitly consider how economic policies and measures must change to protect and restore biodiversity. It is the most comprehensive attempt to address the issue for economists and was identified by Edward O. Wilson, the 'father of biodiversity', more than 20 years ago when he lamented that most economists did know that humanity was destroying biodiversity, but they did not want to think about it.

The *Review* is significant because its recommendations are actually being acted on by the UK Government and because it highlights the many issues requiring attention for success with economic reforms to support the protection and restoration of biodiversity. The *Review*'s acceptance has been positive, notwithstanding some commentators raising various criticisms. None of these, however, diminish its significance in demonstrating that mainstream economic thinking is badly flawed and needs to be reformed to avoid environmental disaster.

The UK Government agreed with the *Review*'s conclusions on linking nature, economics and wellbeing. The government committed to a nature positive future. It amended its Environment Bill to reflect this direction. It undertook to reverse biodiversity loss and protect 30% of land and seas by 2030, to leave the environment in a better state than it found it, to incentivise farmers, to curb deforestation, to set legally binding environment targets, to consider natural capital issues in all government decision making, and to improve natural capital accounting.

In 2022, Dasgupta, while indicating his pleasure at acceptance of most of the ideas in his *Review*, lamented that the human population pressure issue was "politically too sensitive even to acknowledge in public". This denialist problem is all too common around the world, not just in the United Kingdom and Australia.

The *Dasgupta Review* has important lessons for Australia, including the need to change how we think, act, and measure success. If we heed the lessons from the *Review*, we will need to transform our institutions, including our laws, to face the sensitive issue of matching human population numbers to available natural resources, to overcome poverty, to manage risk and uncertainty better, to improve incentives, to review trade law and practices, and to increase public and private investment. We must heed Dasgupta's urging to avoid reductionism – we must act on all fronts, recognise that all are connected and avoid simple solutions that may just mean environmental burden shifting.

This paper includes suggestions aimed at provoking thinking, provoking pressure on private and public decision makers, and provoking real action. Here is a summary.

Changing How We Think and Act

We must change our historical exploitive relationship with nature so that our day-to-day activities, values and beliefs drive outcomes that are positive for the environment and human wellbeing.

We need to adopt the Australian Royal Societies' proposals on New Stewardship of Country and implement its supporting action suggestions.

We need better marketing of science and articulation of problems, learning from successful social marketing, with targeted approaches aimed at people

understanding their relationship to the causes of loss of biodiversity and the solutions for protection and restoration of biodiversity.

Progress with biodiversity protection and restoration will require consultation and collaboration procedures that recognise differences in values; for example, using processes that involve different parties coming together to understand their different perspectives and to seek common visions and agreement on steps they can all live with – a socio-ecosystems approach involving the whole community. We need to continue to enhance processes to seek common ground on an issue, agreement on acceptable action, and the sharing of benefits and burdens.

Changing Measures of Success

We need to continue to develop ways to identify, measure and account for biodiversity and other natural assets, while recognising, as the *Review* does, that many ecological phenomena are dynamic, silent and invisible. We need to complement any nature-measuring arrangement with monitoring the human activities that affect the environment, using, for example, continuous improvement processes with verifiable outcomes.

Law Reform

We need substantial law reform going beyond the limited proposals based on the 2020 Samuel report on the *Environment Protection and Biodiversity Conservation Act 1999* to make the environment front and centre in policy making and to overcome the current conflicts in laws and their administration. We also need a major law reform exercise to identify the laws whose terms or administration are antithetical to good environmental outcomes.

Property Rights

Property law reform is needed to reflect ecological reality and to help resolve tensions between private rights and obligations to those affected by the exercise of private property rights; for example, by introducing conservation property rights.

Human Population

On the basis of present knowledge, two tasks are necessary if we are to succeed with protection and restoration of biodiversity:

1. Stabilise and slowly reduce our population, with immigration policies restricted as far as possible to humanitarian situations such as refugees from conflicts and from the impacts of global changes.
2. Foster changing patterns of production, consumption and trade to reduce our individual impacts on the environment.

Intergenerational Equity

We need to entrench the intergenerational equity concept in law and practice so that current actions avoid diminishing for future generations the level of resources, quality of environment, and amenities we enjoy now.

Poverty

Continuing enhancement of welfare, education, health and housing policies and programs to eliminate poverty will help everyone to contribute and to avoid harmful activities driven by immediate necessity.

Risk

Decision-making processes should be modified as necessary so that shorter-term socio-political risks (governments) and profits (businesses) do not overwhelm longer-term risks to the environment.

Precautionary Principle

We need to:

(1) develop guidelines for application of the precautionary principle in private and public decision making, using preferred futures and net environmental gains approaches; and
(2) entrench the precautionary approach in law as a dominant consideration in risk assessment and management and in private and public decision making.

Domination of Trade Over the Environment

It is difficult to overcome the bias against the environment in international trade laws that successive Australian governments have supported. Law reform proposals should include a requirement for strong and comprehensive environmental impact assessments of proposed Australian bilateral and multilateral trade

agreements. Australia should negotiate to remove investor–state dispute settlement provisions from trade agreements.

Incentives

We do not have a satisfactory situation in Australia with incentives and disincentives, despite the issue being under notice for more than 30 years. One lesson from the *Review* is that the great search for market solutions for environmental problems is no closer to realistic answers than it was 50 or more years ago.

We need systems to encourage improved environment behaviour and to reward those who go beyond their normal personal or business requirements without the high transaction costs, complexities, narrow focuses and unintended consequences of some current and past schemes.

Empowering individuals is important; for example, by revitalisation of Landcare and extended use of environmental management schemes. We must ensure that landholders who want to help protect and restore biodiversity have access to the necessary incentives, knowledge and resources.

Underfunding

Governments, businesses and other organisations, along with individuals, need to maximise their investments in activities that protect and restore biodiversity.

Reductionism

We need to work against reductionist rather than holistic approaches to environmental management; for example, as is occurring now with carbon trading. We need to invest in more Earth-system science. Widespread use of continuing improvement processes would help as they require attention to all impacts of a person's or organisation's activities. Organisations using these processes will attract less regulatory attention.

Immediate Action

Many of these suggestions will take time and leadership, noting that we continue to be handicapped by lack of political will and underinvestment. There are, however, areas where we could act quickly; for example, by accelerating current action, including on the reduction of land clearing and associated incentive needs, improving pests and disease control, initiating law reform with primacy for the environment, reviewing immigration to reduce its impact on environmental decline, and introducing budget processes identifying environmental impacts.

The *Dasgupta Review*, combined with other studies, suggests that the best immediate way forward is to stop land clearing, restore ecosystems and ensure that the necessary incentives, knowledge and resources are available for landholders, managers and their advisers who want to help protect and restore biodiversity.

The remainder of this paper is structured as follows. In Part 1, I describe the *Review*, its origins, processes and content. Part 2 is about the significance of the *Review*. I set out responses to the report by commentators and critics and by the UK Government in Part 3. Then I provide examples of unresolved issues and analysis based on historical biodiversity-economic studies to provide some context for what follows in Part 4, canvassing the potential value of the report for Australian issues. The conclusions in Part 5 include recommendations for action in Australia if it is to match or better the United Kingdom in its actions, noting the urgency reflected in State of Environment reporting and former Minister Plibersek's statements.

Part 1
Introduction: The *Dasgupta Review* and Australia's Biodiversity Problems

1.1 The *Dasgupta Review*

The objectives of *The Economics of Biodiversity: The Dasgupta Review* were (HM Treasury, 2019, p. 3):

> … to assess the economic benefits of biodiversity globally, assess the economic costs and risks of biodiversity loss, and identify a range of actions that can simultaneously enhance biodiversity and deliver economic prosperity.

Three documents comprise the *Dasgupta Review*: a 610-page *The Economics of Biodiversity: The Dasgupta Review – Full Report*; a 103-page *The Economics of Biodiversity: The Dasgupta Review – Abridged Version;* and a 10-page *The Economics of Biodiversity: The Dasgupta Review – Headline Messages*. The size of the *Dasgupta Review* and

its comprehensiveness is not surprising, given the range and complexity of biodiversity issues, and that biodiversity and economics are inextricably entwined with everything we do.

The *Review* provides options for change for enhancing biodiversity while delivering economic prosperity rather than making specific recommendations on how to implement policies and programs based on the options.

1.2 Australia and Biodiversity

The *Dasgupta Review* provides a basis for reflecting on biodiversity-economic issues in Australia. Australia is one of the biologically megadiverse countries (Mittermeier & Mittermeier, 1997) and has continuing high biodiversity losses. The key messages on biodiversity from the 2021 Australian State of the Environment report were (Murphy & van Leeuwen, 2021a):

> … our biodiversity is declining, and the number of threatened species is increasing;
>
> … climate change, habitat loss and degradation, and invasive species are the key threats to Australia's biodiversity; and
>
> … protected areas, recovery efforts and better management of pressures can help secure our most threatened species.

There is a national strategy for overcoming our biodiversity problems – *Australia's Strategy for Nature 2024–2030* (Biodiversity Working Group, 2024, p. 2) with the following vision:

> Australia will halt and reverse biodiversity decline by 2030, putting nature on a path to recovery, meaning that by 2050 we will be living in harmony with nature.
>
> Australia's nature, now and into the future, is healthy and resilient to threats, understood, and valued both in its own right and for its essential contribution to our health, wellbeing, prosperity and quality of life.

Australia has committed to the *Pledge for Nature* (Cox, 2022), a global pledge endorsed by 64 countries committing them to reverse biodiversity loss. (Leaders' Pledge for Nature, 2020, p. 1):

> … commit to putting biodiversity, climate and the environment as a whole at the heart both of our COVID-19 recovery strategies and investments and of our pursuit of national and international development and cooperation.

The Australian Government claims that it was actively engaged in the development of the *Kunming-Montreal Global Biodiversity Framework* agreed in December 2022 (Department of Climate Change, Energy, the Environment and Water, 2023). The Australian Government has signed the high seas biodiversity treaty (Plibersek & Wong, 2023), an important complement to the *Kunming-Montreal Global Biodiversity Framework* (Convention on Biological Diversity, 2022).

Therefore, these conclusions after a detailed study are not surprising (Brazil is the other country). (Martin et al., 2020, p. 230):

> Both countries have many instruments and programmes, and much useful work and substantial investment have occurred. Without this, biodiversity loss would have been far worse. The three levels of government in each country have agencies, rules and programmes to manage the use or conservation of biodiversity. However, neither country has adequate coordination and harmonisation, and both lack robust and transparent evaluation of national, State and local programmes. In both countries, confidence in environmental governance has sometimes been shaken by indications of weak integrity in public agencies. Coordination and integrity are aspects of implementation where better supervision would give confidence to the community and contribute to effective governance.
>
> Underperformance is often because there are not enough resources for public agencies, business or civil society to do what is needed. A lack of private incentives to invest in protecting biodiversity adds to this problem. Neither country has made a serious attempt to systematically address these problems. Though it is unrealistic to believe in a simple solution, there is a strong case for tackling these fundamental economic-ecological governance problems.

The *Dasgupta Review* and the UK Government's positive response lets us reflect on our sorry history and on what we might do to catch up and live up to the promises of action set in train in the

1980s. Prime Minister Hawke's *Statement on the Environment* was a promising start (Hawke, 1989), but, as indicated above, successor governments have not risen to the challenge.

Part 2
The *Dasgupta Review* and Its Significance

2.1 The *Dasgupta Review* Development

The following exposition follows the 'show, don't tell' approach, with many direct quotes to spare the reader the need to read the more than 700 pages of the *Dasgupta Review* and associated documents.

The UK Chancellor of the Exchequer tied the *Review* to the link between biodiversity and economic growth (Hammond, 2019, p. 14):

> Now, for the first time in 60 million years, the number of species worldwide is in sustained mass decline.
>
> The UK's 1,500 species of pollinators deliver an estimated £680 million annual value to our economy—so there is an economic, as well as an environmental, case for protecting the diversity of the natural world.

The *Review* was supported by a secretariat in HM Treasury, an Advisory Panel of distinguished experts (HM Treasury, 2019b) and a call for evidence (submissions in Australian terms). The *Review* acknowledges contributions from many others. It uses the planetary boundaries concept as a framework (Rockstrom et al., 2009; Steffen et al., 2015, Steffen et al., 2018). The most recent review of the planetary boundaries concept indicates a continuing decline in biodiversity conditions (Richardson et al., 2023). That review considered that forest restoration, a biodiversity answer, is the single most important response to stemming anthropogenic global changes (p. 11): "Bringing total global forest cover back to the levels of the late 20th century would provide a substantial cumulative sink for atmospheric CO_2 in 2100."

Professor Dasgupta was a logical choice to head the biodiversity review because of his contributions to the study of environmental/economic relations going back to the 1970s (Dasgupta & Heal, 1979). He saw the *Dasgupta Review* as building on his previous publications to provide an economics of biodiversity.

The Headline Messages in the *Review* are:

- Our economies, livelihoods and well-being all depend on ourmost precious asset: Nature.
- We have collectively failed to engage with Nature sustainably, to the extent that our demands far exceed its capacity to supply us with the goods and services we all rely on.
- Our unsustainable engagement with Nature is endangering the prosperity of current and future generations.
- At the heart of the problem lies deep-rooted, widespread institutional failure.
- The solution starts with understanding and accepting a simple truth: our economies are embedded within Nature, not external to it.

We need to change how we think, act and measure success.

The change required should be geared towards three broad transitions:

1. Ensure that our demands on nature do not exceed its supply, and that we increase Nature's supply relative to its current level.
2. Change our measures of economic success to guide us on a more sustainable path.
3. Transform our institutions and systems – in particular our finance and education systems – to enable these changes and sustain them for future generations.

Transformative change is possible – we and our descendants deserve nothing less (Dasgupta, 2021c, pp. 1–5).

Dame Fiona Reynolds, a member of the Dasgupta Review Advisory Panel, provides an insider's overview of the process and conclusions (see Attachment 1.1) (Reynolds, 2020).

Those familiar with the body of study devoted to the relationship between the environment and economic activity will not be surprised by the conclusions in the *Dasgupta Review*, as they have been developed over many years, particularly since the publication of *Natural Capitalism: The Next Industrial Revolution* (Hawken et al., 1999). They, in turn, followed earlier pioneers who publicised important concepts.

Leopold (1949, p. 242) observed that "A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when

it tends otherwise." He understood that ecosystem integrity is the key to maintaining entire functioning ecosystems. The term 'natural capital' was introduced by Scott (1955). The environment movement and government action were triggered by *Silent Spring* (Carson, 1962). The need for an environmentally sensitive economic system was becoming increasingly recognised (Boulding, 1966; Krutilla, 1967; Daly & Cobb, 1989; Jacobs, 1991). Schumacher popularised the natural capital concept and promoted sustainable development (Schumacher, 1973). Wilson's *The Diversity of Life* showed the value of biodiversity (Wilson, 1992). There had been increasing attention to concepts for integrating nature and economics (Pearce et al., 1989; Costanza, 1991, 1996; Pearce, 1995; Costanza et al., 1997). Waring (1988) argued for inclusion of the value of nature (as well as unpaid household work) as productive elements of national accounts.

Later, The Economics of Ecosystems and Biodiversity (TEEB) for policy makers work (TEEB, 2009) linked economics, biodiversity and policy. Dasgupta acknowledges the more recent work of Capaldi and colleagues (2015) on connecting with nature and human wellbeing.

The *Dasgupta Review*, however, was aimed squarely at economists and financial decision makers rather than at those already familiar with the concepts and issues. Dasgupta elaborated on this point at and after the *Review* launch, reinforcing the need as he saw it to change the way economics teaches about nature, and for governments to ensure that actions are aligned with the common good (see his detailed elaboration in Attachment 1.2).

2.2 Significance of the *Dasgupta Review*

The *Dasgupta Review* is the first one commissioned by a government to explicitly consider how economic policies and measures must change to protect and restore biodiversity. The *Review* is the most comprehensive attempt to address the issue for economists highlighted by Wilson (2002, p. 28) more than 20 years ago:

> Most economists today, and all but the most politically conservative of their public interpreters, recognize very well that the world has limits and the human population cannot afford to grow much larger. They know that humanity is destroying biodiversity. They just don't like to spend a lot of time thinking about it.

Issues covered in the *Review* relevant for Australia (as well as probably everywhere else) include the need to change the human relationship to the rest of nature so that we engage with it sustainably, the need to count and value nature, the impacts of human population on biodiversity, the need to accommodate intergenerational equity in decision making, the role of poverty in biodiversity decline, understanding and managing risk and uncertainty, and legal issues, property rights, incentives, trade and underfunding, which all have an influence on biodiversity.

The UK Government's positive action following acceptance of the *Dasgupta Review* conclusions described in Part 3.2 provides a significant example for other governments.

Part 3
Responses to the *Dasgupta Review*

This section addresses responses to the *Review*. The responses have been favourable, along with commentary suggesting the desirability of greater coverage of some issues as well as difficulties of implementation. The UK Government's response describes how it accepted the conclusions in the *Dasgupta Review* and has acted on them with legislative changes and new environmental policies. The following sections explore this aspect further.

3.1 Some Criticisms of the *Dasgupta Review*

The *Dasgupta Review*'s reception has been generally favourable, although there have been some adverse comments. One criticism was its apparent acceptance of our common capitalist economic framework, "Malthus in Smith's clothing" (Fletcher, 2021). As Spash and Hache (2022, p. 653) explain:

> Framing critical biodiversity loss as an issue of asset management and population size is a blind to avoid questioning economic growth, which remains unchallenged and depoliticized despite apparently recognizing natural limits. Dasgupta ignores long-standing problems with capital theory and social cost–benefit analysis. Rather than a scientific review of biodiversity economics he offers impossible to achieve valuation, based on old, flawed theories and methods, embedded in an unsavoury political economy.

This view is consistent with Langridge's (2021, p. 7) position:

> Longer-term solutions require a shift away from such a system (economic growth orientation of capitalism), towards flourishing, post-productivist societies governed by the wider set of social and environmental values and metrics on which life itself depends.

Steele (2021) argued that concentrating on valuing natural capital in the *Review* neglects the importance of budget formulation; for example, using a biodiversity expenditure review process, removal of subsidies and imposition of biodiversity enhancing taxation and financial regulation to inhibit and expose environmentally damaging investment. He maintains that the Stern Report's (2007) finance recommendations led to positive action on climate change in Britain. Ironically, Dasgupta (2007) had been critical of aspects of the Stern Report.

Lahde (2022) worried that the Dasgupta treatment of biodiversity as 'assets' oversimplifies the complexity of biodiversity and the difficulties of establishing a master metric for biodiversity, which is not a unified phenomenon, compared with the simple metric of greenhouse gas emissions in the climate change context, and the difficulties of meaningful wide application of the term 'ecosystem services'. Similarly, McPherson et al. (2022, p. 2) argue that:

> Biodiversity loss … can be a more elusive concept. It is not easily captured in a simple or single indicator. Composed of many elements beyond the headline-grabbing topic of species extinction, biodiversity loss has several direct and indirect drivers and impacts. "Ecosystem services", including services provided by the natural world such as the organic decomposition of waste, and the cleaning of toxins from the air, are dynamically complex. Such critical services elude monitoring, and avoid an easy fit into comparable metrics, especially to assess dependencies for businesses.

The *Dasgupta Review*, however, does recognise that there are difficulties in measuring biodiversity: "We can't use one measure to describe the state of global biodiversity" (Dasgupta, 2021a, p. 77).

Treich (2022) argued that the *Review* is too anthropocentric, while attention should be paid to taking care of the wellbeing of sentient species living in the ecosystems we want to safeguard.

Richardson (2021) lamented that the *Review* failed to emphasise the value of connectedness with nature, as distinct from just contact with nature, in its *Headline Messages*, despite references to this in the *Full Report* and the *Abridged Version*.

Sikka (2021, p. 5), an academic accountant who criticises the profession for its role in auditing failures, money laundering and tax avoidance, was not convinced by the emphasis in the *Review* on financialisation of nature:

> There is also a fundamental error in the Dasgupta Review. Just because something is priced does not mean that it will not be exploited, at least by those who can afford to pay. Does financialisation deliver the desired outcomes? Carbon pricing generates a lot of revenues, but it has not significantly reduced global resource consumption or emissions. To save humanity and all living things, we need a transformation of education and society. Equitable distribution of income and wealth and stakeholder capitalism are the first necessary stepping stones towards that goal.

Empirical research suggests that most carbon pricing schemes have not reduced carbon emissions by any meaningful amount and that taxes are more effective than trading schemes (Green, 2021). Years ago, Spash (2010) showed us the preference for a tax if we were serious about reducing emissions, and the government led by Prime Minister Gillard did accept the need for pricing carbon in Australia (Gillard, 2011).

It is also possible to criticise some points of detail and to recognise the need to take care to modify conclusions in the *Dasgupta Review* to accommodate Australian circumstances. For example, the *Review* (2021a, p. 35) recognises that "Food production is the most significant driver of terrestrial biodiversity loss." It goes on to suggest that meat eating is a major problem, citing two articles in support. This is an important issue because of the obvious relationship between agriculture and biodiversity, a particularly significant issue for Australia.

Grazing livestock on rangelands and on pastures does affect biodiversity but also involves sharing of

ecosystems with other living things and, if properly managed, can contribute to biodiversity protection and recovery. The 12% of land used for cropping, however, is inherently destructive of biodiversity. Combining cropping and good biodiversity management is quite difficult (Freudenberger & Stol, 2002; Lou et al., 2014). It is estimated that roughly 25 times as many animals and other living things die to produce a kilogram of protein from wheat than a kilogram of protein from beef (Archer, 2021, p. 2). (A subsequent criticism that this article included an error about mouse plagues does not affect the point here.)

The Intergovernmental Science – Policy Platform on Biodiversity and Ecosystem Services (Balvenara & Pfaff, 2019) points out that varied agricultural–forestry–pastoral systems allow maintenance of biodiversity, lower degradation of nature and provide a wide range of benefits. This conclusion was already well known in Australia (e.g. Dorough et al., 2008) and, somewhat ironically, underlies the proposals of the United Kingdom Committee on Climate Change (2020). These positive outcomes contrast with the simplification of ecosystems inherent in cropping systems that reduces their resilience in the face of pressures; for example, from pest animals, weeds, floods, droughts, heat waves, cyclones, fires, pollution and continuing global changes.

The other study cited in the *Dasgupta Review*, by Poore & Nemecek (2018), did not deal with biodiversity although it suggested a move away from meat-based diets. Its references to relevant life-cycle analyses are skimpy and inadequate; for example, in relation to use of waste human food products for animal feed, the water footprint, the wide variety of farming systems, and the fact that animals are just part of the natural carbon cycle and therefore cannot add any new carbon to the atmosphere (Farmers Against Misinformation, 2021). Accordingly, the conclusions in the more recent study *Vegans, vegetarians, fish-eaters and meat-eaters in the UK shows discrepant environmental impacts* (Scarborough et al., 2023) has to be greeted with caution because of its reliance on Poore & Nemecek.

The reality is that any pressure to increase cropping lands at the expense of pasture-based livestock raising or wild animal harvesting, particularly where global changes reduce productivity on arable land, would exacerbate biodiversity loss.

We need to base our policies and programs on the Australian situation, which is rather different from that in places such as Brazil, North America and Europe. My earlier analysis for Australia (Quinn, 2020a, p. 14) indicated the conclusions in Box 1, including for negative impacts on biodiversity from cropping.

Box 1

1. There are some credible claims for reducing the proportion of animal protein in human diets for environmental reasons, and, in some cases, for health reasons, while in some cases a meat and dairy free diet would cause health problems.
2. Plant cropping is enormously destructive of native biodiversity and its habitats and can exacerbate or cause soil, water and pollution problems.
3. Disposing of domestic livestock could worsen the already enormous problem from previous releases of other domestic stock.
4. There could be pressure to increase cropping lands, particularly where global changes reduce productivity on arable land.
5. Mixed landscapes involving domestic as well as native animals and cropping with maximum retention of natural features and perennial groundcover will be less environmentally damaging and involve far less animal cruelty than using the same land for cropping for plant-based foods.
6. As world demand for animal protein continues to increase, there is an urgent need for more research to accommodate this demand without increasing environmental problems.
7. The simplification of ecosystems inherent in cropping systems reduces their resilience in the face of pressures caused or exacerbated by global changes; for example, weeds, floods, ocean surges, droughts, heat waves, cyclones, fires.

Our priorities for doing anything about methane from herbivores in Australia would be greatly increased investment in control of pest herbivore animals (camels, buffaloes, banteng cattle, feral cattle, feral horses, deer, feral pigs, donkeys, goats, rabbits) and to stop killing dingoes (Pollock, 2021; Boronyak & Smith, 2023).

This discussion raises the debate about land sharing (the integration of conservation and production) versus land sparing (separation of conservation and production) (Acton, 2014; Fischer et al., 2014). In Australia we find a combination of protected areas and increasingly environmentally sensitive production practices, consistent with one of the Principles in Australia's first national strategy for biodiversity protection in 1996 (Australian and New Zealand Environment and Conservation Council, 1996, p. 11):

> Central to the conservation of Australia's biological diversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas integrated with the sympathetic management of all other areas, including agricultural and other resource production systems.

It is not clear that the land sharing/land sparing debate is very helpful in Australia, or in any event would lead to changes in this analysis (Sidemo-Helm et al., 2021). If anything, the debate indicates the value of the more holistic approaches already under way in Australia (e.g. Gonthier et al., 2014). This is consistent with the conclusions in the *Dasgupta Review* (Dasgupta, 2021a, Chapters 16 & 19).

Our priority for reducing the climate change implications of food production, storage, transport, retail sales, preparation in homes and institutions, and managing waste, should be reducing the energy inputs – historically, about 90% have been beyond the farmgate (Gifford & Millington, 1975). This would provide immediate and long-lasting economic and financial benefits, as well as slowing global warming and sea-level rise with their consequential biodiversity impacts.

Overall, however, none of the criticisms of the *Dasgupta Review* diminish its significance (Keating, 2021, p. 5):

> … the Dasgupta Review does make one thing clear that nearly everyone can agree on: Mainstream economic thinking is badly flawed and needs to be reformed if environmental disaster is to be avoided.

Its conclusions provide a comprehensive summary of biodiversity problems and the failure to deal with them. Most importantly, it emphasises the need to include biodiversity considerations in private and public financial decision making.

3.2 The United Kingdom Government Response

The UK Government responded positively to the *Dasgupta Review* fairly quickly. Ministers announced agreement with the *Review's* fundamental conclusion-linking nature, and the biodiversity that underpins it, economies and wellbeing, with a commitment to a nature-positive future supported by changed economic and financial decision making (Badenoch & Eustace, 2021). Its specific response action included amendments to its Environment Bill (the Environment Act came into effect in November 2021), and commitments to reverse biodiversity loss and protect 30% of land and seas by 2030, to leave its environment in a better state than they found it, to incentivise farmers, to curb deforestation, to set legally binding environment targets, to consider natural capital issues in all government decision making, and to improve natural capital accounting (Badenoch & Eustace, 2021).

The new UK Government elected in 2024 has confirmed its continuation of these commitments (Department of Environment, Food and Rural Affairs, 2024).

These commitments followed earlier positive action by the UK Government in support of biodiversity protection, such as the release in 2011 of the White Paper *The Natural Choice: securing the value of nature* (Spelman, 2011a). In the United Kingdom a White Paper is a public policy document that sets out information and government proposals about a subject. White Papers provide a basis for consultation and discussion before final decisions are taken. The government established the Natural Capital Committee in 2012 and continued it in 2016 (Department of

Environment, Food and Rural Affairs, 2016). The 25 Year Environment Plan in 2018 includes a commitment "to become the first generation to leave the environment in a better state than we found it" (May 2018, p. 4).

Arguably, the UK Government response gave it the moral high ground at subsequent international meetings (Burnett, 2021).

There is more detail about these United Kingdom developments in Attachment 1.3, as they are all significant as we explore action needed in Australia.

Part 4
Lessons for Australia

This section starts with comparing the situation in Australia and its formal position on biodiversity issues, and suggests challenges derived from the *Dasgupta Review* that we need to meet if we are to overcome our biodiversity decline problems.

The challenges and opportunities include changing how we think and act, changing measures of success, transforming institutions and systems, law reform and property rights problems, people issues such as intergenerational equity, managing risk and uncertainty, the need for more effective incentives and disincentives, addressing the problem of trade issues dominating environmental ones, underfunding for biodiversity protection, and the issue of reductionism and the need for holistic approaches to biodiversity and to human activities that affect it. Each is expanded in the following sections, generally identifying specific tasks for Australia.

4.1 Comparison with Australia

Some reactions to the *Dasgupta Review* mirror the situation in Australia. It is disheartening that there is little new in the *Review*, meaning we are not acting on what we know; the evidence is extensive (Chisholm, 2021), and we need concerted, coordinated action, not just good intentions (Johnson, 2021).

Our context is the Commonwealth Government's stated position on biodiversity protection, involving *Australia's Strategy for Nature 2024–2030* (Biodiversity Working Group, 2024) and statements by the former Minister for the Environment and Water. See details in Box 2.

Note that all of the aspirations in *Australia's Strategy for Nature 2024–2030* would be covered by my proposed new National Ecological Integrity and Environment Protection Act elaborated in Attachment 1.4.

The *Strategy for Nature* does recognise biodiversity–economic links; for example, with references to economic dependence on ecosystem services and nature (pp. 5–6), environmental-economic accounting (p. 6), economic activity as a main driver of environmental change (p. 11), undervaluation of nature in financial and business decision making (p. 13), mainstreaming nature into government and business decision making (p. 19), and national environmental accounts (p. 37).

The former Minister for the Environment and Water, the Hon Tanya Plibersek MP, has stated (Bannister, 2023, p. 1):

> We've been presiding over the slow destruction of nature and we can't do that any more. We want to flip our laws so they are nature positive.

However, Australia's most recent biological diversity report has recognised that our economic systems do not yet align with biodiversity protection needs (Commonwealth of Australia, 2020, p. 15):

> Australia's economic system does not fully reflect the value of protecting biodiversity for the benefit of current and future generations.

These statements indicate that there has been little real action in Australia on joining the dots to make the need to protect and restore nature a central tenet of government and business financial decision making despite an awareness of environment–economic links for many years. Examples include conferences (Council of Australasian Weed Societies, 1954), the first ecological economics conference in Australia (Department of Environment, Housing and Community Development, 1979); the enactment of the Commonwealth *Environment Protection (Impact of Proposals) Act 1974*, the establishment of the Resource Assessment Commission in 1989 and the *National Strategy for Ecologically Sustainable Development* (Ecologically Sustainable Development Steering Committee, 1992) as well as many learned publications (e.g. Breckwoldt, 1983; Gunningham & Young, 1997).

Box 2
Australia's Strategy for Nature 2024–2030

Enablers of Change

- Mainstream nature into government and business decision-making, including in financing, policies, regulations and planning processes.
- Ensure equitable representation and participation in decisions relating to nature, particularly for First Nations Peoples.
- Ensure environmental data and information are widely accessible and support decision-making.

Goals and Objectives

Goal 1: Connect all Australians with nature.

Encourage Australians to get out into nature

Empower Australians to be active stewards of nature

Increase Australians' understanding of the value of nature

Respect and maintain traditional ecological knowledge and stewardship of nature

Goal 2: Care for nature in all its diversity.

Improve conservation management of Australia's landscapes, waterways, wetlands and seascapes

Maximise the number of species secured in nature

Reduce threats and risks to nature and build resilience

Use and develop natural resources in an ecological sustainable way

Enrich cities and towns with nature

Goal 3: Share and build knowledge.

Increase knowledge about nature to make better decisions

Share and use information effectively

Measure collective efforts to demonstrate our progress

Extracts from speech to the ACUIN Global Biodiversity Framework Conference
(Plibersek, The Hon Tanya, Minister for the Environment and Water, 1 June 2023)

Protecting 30 percent of our land and water by the end of the decade; restoring 30 percent of land and water that's been degraded or damaged.

Halting the extinction of threatened species; reducing the introduction of invasive species.

Integrating biodiversity into decision-making across business and government.

Revive ecosystems that have been damaged in the past; environmental conservation … needs to be actively managed.

Writing new environmental approval laws; creating a new national EPA.

Reforming the broken offsets system; establishing the nature repair market – to get more private and philanthropic money into restoration.

Investing in good environmental data

Indeed, we have taken backward steps, such as abandoning the Resource Assessment Commission activity in 1993 (Stewart & McColl, 1994) and repealing the potentially very powerful Commonwealth *Environment Protection (Impact of Proposals) Act 1974* in 1999, with the repeal described astonishingly as a 'reform' (Parliament of Australia, 1999). The original Act was intended to be comprehensive in its coverage, as indicated by the Minister in his Second Reading speech (Cass, 1974, p. 4081):

> Proposals to change a tax or subsidy, to change a tariff, to plan and develop a particular construction, to become a party to an international agreement, to build a new city, to purchase equipment or to commence to extend a forestry or agricultural operation, for example, could all be the subject of an impact statement.

There is now no Commonwealth machinery for this.

It appears that we are still in the position described in 2009 when 90 scientists criticised the then draft *Biodiversity Conservation Strategy 2010–2020* for failure to acknowledge the drivers of biodiversity loss, and failure to provide a strong raft of principles, policies and commitments from all levels of government and people generally (Arthington & Nevill, 2009). Apparently, we still prefer basing too many decisions on neoliberal ideology rather than on evidence (Lyster et al., 2022), despite the mounting evidence of problems inherent in the application of neoliberal approaches to agriculture and food security (Lawrence et al., 2013), both of which are closely related to biodiversity issues.

The decision of the Australian Government not to sign the *Pledge for Nature* under Prime Minister Morrison because it was inconsistent with Australia's climate change policies (Cockburn, 2020) is an example of backward steps.

The question for Australia is whether we can move from the good intentions in Australia's ambitions for effective action and meet the challenges that we must tackle, as raised, directly or indirectly, by the *Dasgupta Review*. These include:

- changing how we think, act and measure success, involving our relationship with the rest of nature, communication failures, plurality of values in the community, and counting and valuing nature;
- transforming our institutions and systems, particularly our laws and their administration;
- people issues, including population numbers, intergenerational equity and poverty;
- risk and uncertainty, including application of the precautionary principle;
- financial and economic issues, including incentives, trade and underfunding; and
- the problem of reductionism.

The following analysis includes suggestions if we are to respond to the challenges in the *Dasgupta Review* and in the changes the UK makes while implementing the *Biodiversity Conservation Strategy*.

4.2 Changing How We Think and Act

Here we must consider several issues, including our relationship with the rest of nature, our failure to communicate the issues convincingly, the range of relevant values in the community and how to find common understandings.

Human Relationship to the Rest of Nature

The following reactions to the *Dasgupta Review* indicate that the human relationship with the rest of nature must change if we are to protect and restore biodiversity:

> The message from the Review on the Economics of Biodiversity is loud and clear: we must fix our relationship with the natural world or destroy human prosperity, well-being and our future (Andersen, 2021, p. 1).
>
> This wholesale rethinking, repositioning, reconceptualizing the relationship between the economy and Nature has profound ramifications (Lubchenco, 2021, p. 14).
>
> This extraordinary work in ecological economics is … compelling in showing the embeddedness of society in nature and the responsibilities that entails (McCay, 2021, p. 15).
>
> This study shows clearly that we need to devote a lot more thought and action towards managing our human interaction with the natural world (O'Neill, 2021, p. 17).

As eminent biologist Edward O. Wilson, 'the father of biodiversity', observed in 1992: "Only in the last moment of human history has the delusion arisen that people can flourish apart from the rest of the living world" (p. 349). If we are to overcome this delusion and respond to the many linked issues relevant to protection and restoration of biodiversity covered by the *Dasgupta Review*, we need to combine our knowledge about problems caused by biodiversity decline, the nature of human day-to-day activities, and our values and beliefs, so that outcomes are positive for the environment and human wellbeing. Currently, our activities are all too frequently driven by short-term needs (an anthropocentric perspective) that do not recognise that the Earth system whose elements are drawn upon to meet those needs is a closed system (an ecocentric perspective) and that environmental degradation reduces human options and weakens our resilience in the face of global changes.

The overarching idea is that the interactions of all life systems are needed to sustain the support systems for all of them, mutually and reciprocally. Acceptance of the following propositions derived from consideration by many thinkers about human interaction with the natural world would help to change our ways:

1. Humanity is part of the Earth system and cannot survive on its own.
2. Human needs and ecosystem services are met from natural systems, which cannot provide them if lost or degraded.
3. Options for current and future generations should be increased rather than reduced.
4. The reference frame for policy and action should not be that one species, *Homo sapiens*, is the only centre of value.
5. Other species should not be starved of resources.
6. A sustainable biosphere is necessary for achieving human goals.
7. Nature is an active agent in achieving human welfare and has independent value.
8. Policy and action should foster an enriched understanding of human interests that explicitly acknowledges obligations to, and the value of, natural systems.

This formulation draws on many sources, including Seddon (1972, 1991), Carbon (1992), Kuhlmann (1996), Plumwood (1996, 2007), Grey (1998), Graham (1999), Frodeman & Jamieson (2007), Mathews (2010), Sarkar (2012) and Washington (2013).

We can learn from the First Nations concept of Country: "… a place of origin in spiritual, cultural and literal terms … (that) … encompasses all the knowledge, cultural norms, values, stories and resources within that particular area—that particular Indigenous place" (Fredericks, 2013, p. 3). The Royal Societies of Australia explored approaches to stewardship of land and sea in 2021, bringing together Indigenous experts, industry practitioners and thinkers to discuss an expansive new model for the care and regeneration of damaged ecosystems that bridges Indigenous, agricultural, scientific, economic and social perspectives. Their conclusions included (Quinn, 2021, p. 36):

> … we need a new approach to our land and seascape stewardship if we are to recover from past degradation and prosper in the future. We have to work with history — the Aboriginal foundation, our modern production systems and our laws and institutions. We can succeed if we adopt a custodial approach to land and sea — 'caring for country' — as our highest priority, so we safeguard the effective functioning of our ecosystems. We will need changes to our laws and institutions, and active intervention in our land and seascapes with public support, as we transform our society to reflect this new model of stewardship. There are many things we can do now as part of this transition, as individuals, governments, businesses, educators and land and sea managers.

The new relationship with nature will need practical action that benefits biodiversity while meeting human wellbeing needs. There are plenty of ideas already available for this; for example, Breckwoldt (1986) on remnant forests, the many ideas of Cocks (1992) and the well thought-out rangelands agenda (Foran, 2021), as well as Freudenberger & Stol (2002) on biodiversity and intensive cropping, Gleeson & Piper (2002) on muti-functionality in agriculture, Lindenmayer et al. (2022a) on creating biodiverse farms, Stafford Smith & Cribb (2009)

on drylands, Gleeson (2014) on using environmental management systems with a biodiversity emphasis, Fry (2013) on integrating conservation and agriculture, Soils for Life case studies, and many more sources of advice and information on specific topics from private and public sources. There are sources linking positive action and wider policies; for example, Possingham's (2014) Ten Commitments, Bourke's (2014) Ten Commitments, weed control strategies such as that developed by the Serrated Tussock Working Party for NSW and the ACT (Serrated Tussock Working Party for New South Wales and the ACT, 2012), and Custodianship of Land and Seascapes (Quinn, 2021).

Tasks for Australia

1. Change our historical exploitive relationship with nature so that our day-to-day activities, values and beliefs drive positive outcomes for the environment and human wellbeing.
2. Adopt the Australian Royal Societies' proposals on New Stewardship of Country and implement its supporting action suggestions.

Communication Failures

That there is little new in the *Dasgupta Review* suggests that the significant knowledge we already have has not been successfully communicated to the general public and, assuming it is readily available to private and public decision makers, is largely ignored or its consequences not understood or denied. The *Review* canvasses the need to empower citizens through better understanding of the role of nature in providing for their wellbeing: "… we have to educate ourselves" (Dasgupta, 2021a, p. 497).

We must guard against the dissemination of false information aimed at slowing progress with the protection and restoration of biodiversity. We must learn from our experience with climate change debates. We Australians were regarded as the most informed people in the world about the climate change issues in the early 1990s (Taylor, 2014, p. xii). Taylor has written an excellent description of how, from about 1995 onwards, the Australian narrative changed to one of uncertainty and doubt driven by mining and related vested interests and the Howard government (Taylor, 2014).

The 2021 State of the Environment report's conclusions on our lack of adequate progress with environmental improvement confirm that we need a much-increased investment in new and better ways to engage and energise the whole community.

Any long-term program requiring sustained and continuing action, which is necessary for protection and restoration of biodiversity, will depend on good communication strategies and programs, to ensure all who can or should contribute are constantly reminded and kept up to date with new developments. We need to build pressure from the general public on private and public decision makers, consumers and landholders. Otherwise, we will not inform, engage, persuade, change behaviour or support better decision making.

A study of science communication in Australia (Gascoigne & Metcalfe, 2020, p. 148) concluded:

> The challenge for Australian science communicators and those who supportand employ them is to find the resources to support long-term science communication programs that can help scientists, policy makers and different publics better address the environmental, social and economic issues facing the country.

We also know that access to knowledge does not easily translate into action. Agriculture is important for biodiversity in Australia, as it involves 55% of Australian land and 74% of water consumption (Australian Bureau of Agricultural and Resource Economics and Sciences, 2024). A study of farmer-initiated innovation aimed at understanding and establishing communication and partnerships among innovative farmers, researchers and other resource managers recommended addressing the need to improve the knowledge base within the broader Australian community through a targeted communication effort (Perkins et al., 2003). No doubt similar conclusions would apply for other sectors of Australian society.

We need to learn from social marketing to improve science communication. Effective environmental communication strategies can be based on the Box 3 propositions derived from social marketing (Lynes, 2017).

Lynes' advice is similar to that of Arnold Schwarzenegger, Governor of California when it

was a world leader in the related issue of climate change action. Schwarzenegger is the founder of the Austrian World Summit and the Schwarzenegger Climate Initiative, which support action on climate change. His advocacy for effective communication tactics emphasises the need to shift the attention away from abstract concepts such as climate change to practical concerns like pollution and its negative effects on human health and the environment. This approach may reach a larger audience and get more support (Shahzad, 2023).

Jane Fonda (2020) and Rebecca Huntley (2020) have set out many practical ways to communicate climate change issues that are equally relevant for biodiversity.

A Biodiversity Council involving primarily universities has been established with a mission to "be a trusted expert voice communicating accurate information on all aspects of biodiversity to the Australian people, to ensure biodiversity and Country prosper" (Biodiversity Council, 2024). It faces the same communication issues as any other body with similar aims, such as the Royal Societies in the Australian states, which have been pursuing similar aims since the nineteenth century (The Royal Societies of Australia, 2024).

We need increased investment in communication strategies targeted at different audiences based on proven social marketing principles. We need everybody to understand their impact on biodiversity and where to go to get information they need to make their behaviour consistent with the protection and restoration of biodiversity in Australia and globally (we are a major trading nation).

Today's young people will bear the burden of our mistakes. We need to listen to them and ensure they have easy access to knowledge about environmental and global change issues while ensuring they have civics education from a young age so they can participate confidently in our continuing processes to address these issues.

This problem of science communication and political influence would be helped by young people embarrassing the older generations into action, building on the attitude of influential people like the late Queen Elizabeth II: "… I have been struck by how new generations have brought a … sense of purpose to issues such as protecting our environment and our climate" (HM Queen Elizabeth, 2019, p. 1). She also praised the advocacy of her family in "encouraging people to protect our fragile planet" (HM Queen Elizabeth, 2021, p. 1). Perhaps we should be seriously considering Grayling's (2017, p. 161) proposal that:

> Voting should be a civic responsibility from sixteen years of age for two powerful reasons: that what people learn at school about these matters [making democracy work] can be applied straight away, and that if voting begins at sixteen in the context of civic education there will be a greater chance of responsible and thoughtful voting continuing thereafter.

Box 3

1. Do not assume that acquisition of information leads automatically to action.
2. Messages of hope are stronger in impact than messages of fear or doom and gloom – abandon scare tactics.
3. Understand and acknowledge that not everyone is as concerned as you are (probably only about 10% in Australia) – need to understand individual priorities.
4. Act consistently with the messages you want to convey – 'walk the talk'.
5. Harness the power of social norms, i.e. socially enforced rules or behaviour; fall in with local conformity patterns where consistent with climate change action goals (elaboration at https://www.theguardian.com/sustainable-business/social-norm-behaviour-change).
6. Design and produce cool things that coincidentally are environmentally beneficial – focus on the benefits, not the product (examples are hard to find or ambiguous, e.g. the Tesla car).
7. Make it easier for people to act.

A private Bill to lower the voting age in Federal elections was introduced by the Australian Greens Senator Jordon Steele-John in 2018: the Commonwealth Electoral Amendment (Lowering Voting Age and Increasing Voter Participation) Bill 2018. The Joint Standing Committee on Electoral Matters considered the Bill in 2019, concluding (p. 34) that:

> Despite trends in Europe and Latin America towards lowering the voting age, the Committee is not convinced that it is warranted in Australia.
>
> While the Committee did receive a large volume of submissions in support of lowering the voting age, it does not feel that this necessarily represents the community as a whole. The Committee has seen no evidence that there is a significant concern or trend towards non-voting that justifies extending the franchise. In addition, the Committee takes seriously the views put to it by young people that the Bill should not be passed without much wider consultation, so that it is done in partnership with young people and not imposed on them.

The Bill was discharged in 2023.

Tasks for Australia

1. Keep working on better marketing of science and of problems, learning from successful social marketing, with targeted approaches to help people understand their relationship to the causes and solutions for protection and restoration of biodiversity.
2. Ensure continuous review of voting age rules and improve opportunities for young people to participate in public discourse affecting their futures.

Plurality of Values

Protecting and restoring biodiversity is a typical 'wicked' problem with diversity of interests as well as complexity and uncertainties. It can be difficult even to frame the 'question' in a meaningful way, as its focus could be anything from local to global. There are usually diverse views about the nature of the problem, or even of its existence, who is responsible for acting on it, and the design, funding and operation of solutions.

Any attempt to monetise or price environmental elements faces the problem of different people having different assessments of their value, whether for human wellbeing, economic exploitation or in their own right. Martin-Lopez (2020) provides a good analysis of the issue. We have what we call incommensurability; that is, no common measure or even understanding of nomenclature used by different interests (O'Neill, 2017). Spash & Hache (2022) point out that the *Dasgupta Review* fails to come to grips with this problem. Progress with biodiversity protection and restoration will require procedures that recognise these differences in values; for example, using processes that involve different parties coming together to understand their different perspectives and seek common visions and agreement on steps they can all live with, along the lines of the processes used to consider action on imperilled species in Queensland's Brigalow Belt (Ponce Reyes et al., 2016) and similar processes described by Duff and colleagues (Duff et al., 2008). De Graaf et al. (1995) have argued plausibly for a similar approach based on a socio-environment system approach.

Our experience with many environmental problems, such as global warming, the Murray-Darling Basin, coal seam gas extraction, native vegetation management, as well as the many facets of biodiversity, indicates we must work harder at arriving at acceptance of how to deal with them.

We need to continue and enhance processes that seek common ground about an issue, agreement on acceptable action, and the sharing of benefits and burdens.

Task for Australia

Progress with biodiversity protection and restoration will require consultation and collaboration procedures that recognise differences in values; for example, using processes that involve different parties coming together to understand their different perspectives and seek common visions and agreement on steps they can all live with. Continue and enhance processes to seek common ground about an issue, agreement on acceptable action, and the sharing of benefits and burdens.

4.3 Changing Measures of Success

The *Dasgupta Review* aims at measures of success going beyond the common reliance on Gross

Domestic Product (GDP) measures, as indicated by Dame Fiona Reynolds in Attachment 1.1 to this paper. The Australian Government (2023) has made a start with the introduction of a wellbeing report process. The report (p. 44) indicates that there has been a "5% decline in relative abundance for the 278 species represented since 1985."

Counting and Valuation of Nature

Proposals for accounting for and valuing nature invariably involve speculation, as many species remain undiscovered or little studied, there are uncertainties about the consequences of any particular biodiversity loss, and ecological systems are continuously dynamic (Gunningham & Young, 1997; Wilson, 1986, 2018; Office of Environment and Heritage NSW & Commonwealth Scientific and Industrial Research Organisation, 2019). The latest *Australia State of the Environment* report confirms that any presumption of extensive knowledge about biodiversity is misplaced (Murphy & van Leeuwen, 2021b, p. 154):

> … there are still very large gaps in our understanding of the state and trend of the vast majority of native Australian species, including those that are at most risk of extinction. The absence of reliable data on numerous threatened species severely limits our ability to allocate conservation resources in an informed and effective manner.

The *Dasgupta Review* recognises the issue (Dasgupta 2021a, p. 6):

> Many of the processes that shape our natural world are silent and invisible. The soils are a seat of a bewildering number of processes with all three attributes. Taken together the attributes are the reason it is not possible to trace very many of the harms inflicted on Nature (and by extension, on humanity too) to those who are responsible.

This conclusion by Henry (2010, p. 24) as head of the Commonwealth Treasury arguably is still the case today:

> We have various techniques for estimating the value of the environment, each with its advantages but also significant disadvantages, each offering prospects for further progress. We have the potential for experts to improve the environmental understanding of the wider population, and for experts to gain a better understanding of what matters to the wider population. We can bring together the various estimates of the environment's value from the population and from experts. We've made a start. But it's only a start. Much more needs to be done if we are to be able to say that the wellbeing of future generations is not to be threatened by poor valuation of the environment.

We have not yet reached an agreed satisfactory way to count and value nature. We cannot even do it yet in urban settings, where we would normally have considerable measurable biodiversity and now well-recognised community benefits (Daniels et al., 2020); hence the attempts to develop and use surrogates and indicators (Saunders et al., 1998; Lindenmayer et al., 2015; Office of Environment and Heritage NSW & Commonwealth Scientific and Industrial Research Organisation, 2019). Therefore, guides for nature accounting, such as the *SEEA Central Framework* (United Nations, 2014), the Bureau of Meteorology's *Guide to Environmental Accounting in Australia* (2013) and the Wentworth Group of Concerned Scientists' *Accounting for Nature* (2016) may provide unwarranted confidence in what we can measure (Wilson, 1992, 2018; Sarkar, 2012; Jones & Solomon, 2013; Vardon et al., 2015; Creswell & Murphy, 2016; Helm, 2019).

As Dasgupta has pointed out (Dasgupta & Besley, 2023, p. 13):

> … the accounting prices of many forms of natural capital will prove impossible to pin down. … It may even be that the best that national statistic offices can do is record whether the quality of current unpriceable ecosystems has improved or has deteriorated. Such information is valuable; it concentrates the public's mind.

The guides tend to resolve the knowledge problem by falling back on the concept of ecosystem services, an anthropocentric rather than holistic approach to natural systems and their biodiversity. Reliance on ecosystem services is problematic where biodiversity is the issue. Ecosystem services over time support a great array of changing human economic,

social and amenity activities. The anthropocentric approach limits the term temporally and sometimes spatially, involving the risk that how natural capital is assessed today may diminish its value for a successor purpose. Just look at the vast environmental, industry, financial, economic and social changes in Australia's dairy farming and irrigation areas since 1900. These changes have had dramatic impacts on biodiversity.

We need to develop less anthropocentric nature accounting approaches if we are to accommodate long-term biodiversity needs. These approaches need to accommodate intergenerational equity rather than just current choices as the foundation for policy and action. We can continue to develop improved approaches by trialling and testing ways of measuring the conditions of our natural assets.

The *Dasgupta Review* (2021b, p. 5) points out that we do not have a mechanism to overcome the fact that we cannot trace the origin of many harms or identify who is responsible. This suggests that rather than pretend we can measure nature and its processes accurately, we need an approach that integrates the human and natural elements by emphasising the human impact on natural resources; for example:

> The management of the potential and realised impacts of people on the environment with the purpose of attaining ecologically sustainable development; that is, using, conserving and enhancing the community's resources so that ecological processes, upon which life depends, are maintained and the total quality of life now and in the future can be increased.

We could also use natural resource inventories like that established in Queensland in 2019 (Truii, 2020) but abandoned in 2021 on a change of administrative arrangements, supported by continuing State of the Environment reporting used with environmental management systems and environmental charters (Rowland, 2009; Quinn, 2011) to produce more holistic outcomes while maintaining or restoring priority elements of an ecosystem. The Burnett Mary Regional Group in Queensland has prepared a Burnett Mary Regional Environment Account, claimed to be a world first on a regional scale (Burnett Mary Regional Group, 2022).

The Australian and United States governments have agreed to work together to better measure the economic value of nature, with emphasis on natural capital accounting, environmental-economic statistics and better measuring the value of nature-based solutions relating to climate change, reducing disaster risk, improved human health, and food and water security (Plibersek, 2022c).

Task for Australia

Continue to develop ways to identify, measure and account for biodiversity and other natural assets, while recognising, as the *Dasgupta Review* does, that many ecological phenomena are dynamic, silent and invisible. Complement any nature-measuring arrangement with monitoring the human activities that affect the environment, using, for example, management processes based on continuous improvement principles with verifiable outcomes.

4.4 Transforming Institutions and Systems

The *Dasgupta Review* points out that public, private, local, national and international institutions have impacts for the economics/biodiversity relationship. (Dasgupta, 2021b, p. 5). The *Review* acknowledges that 'institutions' include laws (Dasgupta, 2021a, p. 167) and refers to matters normally associated with laws, such as property rights, contracts, taxes, pollution controls, tradeable permit systems, payments for ecosystem services, and laws to protect endangered species.

The *Dasgupta Review* does not canvass explicitly the need for law reform in its suggestions about transforming institutions, mentioning only managing public goods, financial systems and education. This is not surprising, given the stated aim of influencing private and public financial decision making.

Law Reform

History surely tells us that changing laws can help drive the community in the direction of a relationship with nature and personal behaviour that can achieve improved protection and restoration of biodiversity (Friedman, 2016). The item on trade in 4.8 below illustrates the serious conflict problem whereby laws on specific topics are used to negate environmental laws.

Bosselmann's observation (2010, p. 2425) encapsulates the problem if we attempt to deal with

environmental problems without fundamental law reforms:

> … modern legislation to protect the natural environment has developed in a compartmentalized, fragmented, economistic, and anthropocentric manner. For environmental legislation to become effective, broader coverage and better enforcement are not enough. The inherent design flaw in these laws is the absence of a fundamental rule prohibiting harm to the integrity of ecosystems. Such a rule requires the acceptance of sustainability as an overarching ethical and legal principle.

A great number of Commonwealth, state and territory laws aim at protecting the environment, along with others that are inconsistent with good environmental management or are able to be administered easily in ways that are inconsistent with the environment laws; for example, planning, tax, native vegetation management, biosecurity, forestry, mining. The New South Wales review of its Biodiversity Act found that the Act's effectiveness was undermined by the laws for native vegetation management, land-use planning and approvals, and native forestry (Henry et al., 2023).

The conflict of laws and policies was well encapsulated by Cathy Wilcox's cartoon response (2022) to Minister Plibersek's announcement on a threatened species action plan). See Figure 1 below.

There is also the problem that it can be easier to get a permit to destroy nature than to restore it, as current laws support development processes rather than environmental protection (Slezak, 2024).

FIGURE 1. Commentary on Minister Plibersek's threatened species action plan (published with permission).

Notwithstanding these obvious problems, *Australia's Strategy for Nature 2024–2030* stated that "Prioritising nature in decision-making is essential to [sic] tackling the drivers of environmental decline and creating circumstances in which nature can regenerate and repair" (Biodiversity Working Group, 2024, p. 19).

There is a commitment to introduce new Commonwealth legislation to replace the *Environment Protection and Biodiversity Conservation Act 1999* following the Samuel review of the EPBC Act (Plibersek, 2022a).

New laws based on the Samuel review's recommendations (Samuel, 2020) would not overcome the current problem of too many laws and practices being inconsistent with good environmental outcomes or the inadequacy of the ecologically sustainable development concept as it operates (or, rather, fails to operate) in Australia (Quinn, 2020b).

My proposal to the Samuel review for new laws giving primacy to the environment (Quinn, 2020b) was not taken up by the review. My outline of a suggested new national environmental law is in Attachment 1.4 to this paper. Note that it includes a right to environment protection, as recommended in the Fitzgerald report in Queensland in 1993 (Electoral and Administrative Review Commission, 1993). The ACT Government has amended the ACT's Human Rights Act to provide an express statutory right to a clean, healthy and sustainable environment (Cheyne, 2024). The sky has not fallen in.

My outline is easily adaptable to state and territory law. It would be impossible under that law to mount the arguments used by the Morrison government to deny a duty of care to young people (Federal Court of Australia, 2022b) and Torres Strait people (United Nations Human Rights Committee, 2022) about responses to climate change needs – used by the Albanese government in a recent case about the potential impact of new coal mines: the 'drug dealer's defence' (if I don't, someone else will) – and ignoring of cumulative effects of new coal mines (*Environment Council of Central Queensland Inc v Minister for the Environment and Water (No 2)* [2023]).

Detailed development of a new law based on my outline could incorporate any consistent relevant elements and suggestions from other current environmental law proposals; for example, by Burnett and colleagues (2020), Bridgewater (2020), the Environmental Defenders Office (2022), the Australian Panel of Experts on Environmental Law (2017), and the National Environmental Law Association (2023).

The Henry review of the New South Wales *Biodiversity Conservation Act 2016* provided a glimmer of hope by arguing for new biodiversity conservation law with primacy over competing laws in its Recommendation 55 (Henry et al., 2023). The Henry review cites the *Dasgupta Review* in support of its analysis and conclusions. The New South Wales Government has sidestepped the issue, merely saying that the relevant recommendations are subject to further consideration (NSW Government, 2024).

We also need a major law reform exercise to identify the laws whose terms or administration are antithetical to good environmental management. The Henry review in New South Wales made a similar recommendation (Recommendation 56). The New South Wales Government claimed to support this, but its response was only to review laws to strengthen biodiversity outcomes, a much weaker position (NSW Government, 2024).

Task for Australia

Develop and implement substantial law reform going beyond the limited proposals in the Samuel report to make the environment front and centre in policy making and to overcome the current conflicts in laws and in their administration.

Property Rights

The *Dasgupta Review* has considerable material about property rights, seemingly accepting the common view that enhanced and certain private property rights favour better environmental protection, but does recognise that there are wider property issues: "By property rights we do not simply mean 'private' property rights, we include community and state property rights" (Dasgupta, 2021a, p. 191). There is also recognition of the difference between ownership and rights to the products of an ecosystem (Dasgupta, 2021a, p. 218):

> Property rights to an ecosystem – perhaps distinct sets of property rights to the various goods and services produced by the ecosystem – are

> the rights, restrictions and privileges with regard to its use. Management of an ecosystem, we may call it a resource-base, is a different (though related) matter. … Ownership is yet another matter.

Property laws are a problem for effective environmental management and the protection of the community from harm arising from exercise of individual property rights, as that encourages individual, short-term perspectives at the expense of wider landscape, ecological, regional and community interests and neglect of the needs for intergenerational equity. There are serious misunderstandings among many about exactly what property title entitlements are (Edwards, 2003). History shows that none of the modern property systems reflect ecological reality as we now understand it (Metzger, 1976). This is well documented in Australia (Galloway, 2012; Graham, 2014). It is not surprising that there are examples from many other jurisdictions, including the United States (Harte, 2001), New Zealand (Taylor & Grinlinton, 2011) and the United Kingdom (Helm, 2019) illustrating that property rights can hamper environmental progress. The flaws in belief in the value of property rights to solve environmental problems or environmental justice problems have been well documented (Horton, 2000; Beder, 2009).

The *Dasgupta Review* does not come to grips with the need for property law reform to help resolve tensions between private rights and obligations to those affected by exercise of private property rights, although the *Review* does recognise that "Property rights to Nature's processes are thus difficult to define and difficult to enforce even when they have been instituted" (Dasgupta, 2021b, p. 39).

We need property law reform to recognise that property rights are integral to modern society values and culture (Martin & Verbeek, 2002; Linklater, 2014). Property law reform needs to:

- take advantage of the concept of property (the right to have access to resources, to exploit them, and to dispose of them);
- avoid individual traditional property holders being able to act inconsistently with wider ecological needs;
- help overcome the problem of fragmentation of ecosystems by legal boundaries (Graham & Bartel, 2017); and
- extend environmental justice,

all this in a changing world.

A conservation property rights approach in property law is an option. It could establish a base for potential cooperation on the basis of shared interests. The concept recognises that there can be overlapping rights in relation to a single article of property; for example, in Queensland, mining interests may have rights in respect of what landowners see as their private property (Galloway, 2012). Farmers, researchers, local communities, infrastructure managers, tourism operators and Indigenous groups will have an interest in some attributes or functions of an ecosystem. These interests may differ in emphasis but inevitably will overlap.

The conservation property rights concept recognises that the interested public should have increased opportunities to influence planning and enforcement arrangements (Tan, 2002). The aim is to address Galloway's call for "a re-thinking of the very foundation of property so that it encompasses concepts of connection of ecological systems, of communities and people with the environment" (Galloway, 2012, p. 81). One interesting example of this line of thinking is Barker's ideas for 'biosecure citizenship' to democratise decision making about biosecurity (Barker, 2002).

The aim of a conservation property rights approach is to disseminate power over ecosystems across society, so that those with a genuine interest can have their values taken into account about the use of property so that the protection of the environment cannot be simply overridden by short-term economic (or other) decisions of traditional property holders (Ubilla, 2016).

> **Task for Australia**
> Enact property law reform to reflect ecological reality and to help resolve tensions between private rights and obligations to those affected by exercise of private property rights; for example, by introducing conservation property rights.

4.5 People Issues

The *Dasgupta Review* canvasses several people issues: human population numbers, intergenerational equity, and poverty.

In 2022, Dasgupta, while indicating his pleasure at acceptance of most of the ideas in his *Review*, lamented that the human population pressure issue was "politically too sensitive even to acknowledge in public" (Dasgupta, 2022, p. 1017). This denialist problem is all too common around the world, not just in the United Kingdom and Australia (O'Sullivan, 2023).

Human Population

David Attenborough states that humans and their livestock constitute 96% of the mass of all mammals on Earth (Attenborough, 2021). About 50% of habitable land on Earth (that is, the 71% not covered by oceans and glaciers, and not deserts, dry salt flats, beaches, sand dunes and exposed rocks) is used for agriculture supporting humans, including for their livestock (Ritchie & Roser, 2019). This figure does not include land used for forestry, whether native or planted.

In Australia, the equivalent figures are: about 86% of our land is habitable; and about 60% of our total land is used for agriculture and forestry, with about 75% of that for grazing (Australian Bureau of Agricultural and Resource Economics and Sciences, 2023).

It is claimed that the greatest threat to biodiversity in Australia is the size and rate of growth of human population because of associated habitat changes for agricultural, urban and industrial development, pollution and waste, overharvesting of resources, introduction of exotic species, and global warming from use of fossil fuels (Australian Museum, 2023; Convention on Biological Diversity, 2023).

The *Dasgupta Review* accepts human population growth as one of the causes of biodiversity decline and associates it with inequality issues (Dasgupta, 2021b, p. 36). The *Review* cites the failure to address the population question in significant relevant contexts, such as sustainable development goals and climate change, while pointing out that continuing human population increase is likely to have adverse effects on the environment, contribute to societal conflicts and to greater attempted population movements (Dasgupta, 2021b, p. 37). The most common migration estimate has been 200 million environmental migrants by 2050 (Brown, 2008), but this is only an estimate (The Government Office for Science, 2011); there could be more from cascading effects of global environmental and from geopolitical impacts (Piguet & Laczko, 2014). The failure in international discourse about the environment–human population connection is despite the fact that without new ways and behaviours, threats to biodiversity such as habitat loss, pollution and overexploitation will intensify as human population increases. Here is a good summary of the official Australian position since European settlement (Clews, 2022):

> For the past 234 years, that which has denied all governments traction on the environmental front has been their relentless determination to grow our population to grow our consumption. The causal and correlative links between this policy and our environment's decline, the staggering loss of diversity, abundance, and wellbeing of our natural world, is beyond reasonable dispute.
>
> And this Plibersek and her government intend to continue as earnestly as ever. Despite the bluster, expect even more decline.

There is no end in sight to this Pollyanna approach to population growth, with its emphasis on meeting short-term employment needs, on covering for neglect of training, on maintaining inadequate pay and conditions, and on international aggrandisement for 'Big Australia' – former Prime Minister Rudd argued for a Big Australia to support future national security, health, aged care and retirement income needs (Rudd, 2021). The economic case for continued population increase has long since been debunked (Cocks, 1992; Lowe, 2012; Goldie & Betts, 2014; Quiggin, 2021; Sustainable Population Australia, 2022; Williams, 2023). Notwithstanding this, economists and commentators have continued to support increased migration beyond humanitarian cases without even canvassing the negative environmental impacts (Productivity Commission, 2022; Muroi, 2023; Yardney, 2025; Madgavkar, 2025) or offering only a token reference to possible negative environmental impacts (Muroi, 2025). The Commonwealth Government has supported the proposition that we must increase population for 'economic growth' reasons (Tudge, 2019). The Commonwealth's *2024 Population Statement* claims economic benefits from population increase, without any references to its environmental impacts (Centre for Population, 2024). The reality is that any

increase in population without significant changes to our patterns of production and consumption will lead to added pressure on biodiversity (Lindenmayer et al., 2014; Dasgupta, 2022).

The problem is illustrated well by an anonymous reviewer of an earlier version of this population discussion. The reviewer asserted that the discussion was largely opinion, with some of it misguided. Surely it would be better for us to accept the cited work, including the *Dasgupta Review*, and Edward O. Wilson's conclusion (Wilson, 2002, p. 164):

> Support population planning. Help guide humanity everywhere to a smaller biomass, a lighter footstep, and a more secure and enjoyable future with biodiversity flourishing around it.

At the same time, we must accommodate the possibility of longer-term population decline in our programs for overcoming environmental (and other) problems (Mounk, 2025).

> **Tasks for Australia**
> On the basis of present knowledge, here are two tasks if we are to succeed with protection and restoration of biodiversity:
>
> 1. Stabilise, and slowly reduce, our population, with our immigration policies restricted as far as possible to humanitarian situations such as refugees from conflicts and from the impacts of global changes (subject to accepting our fair share in any international agreement for resettling displaced people).
> 2. Foster changing patterns of production and consumption and trade that reduce our impact on the environment.

Intergenerational Equity

The *Dasgupta Review* is concerned with intergenerational equity (Dasgupta, 2021a, Chapter 10), relying on acceptance of the concept of inclusive wealth to deliver this. Inclusive wealth is the sum of produced, human and natural capital (Dasgupta, 2021a, p. 326), based on previous work by UNEP and others, leading to *The Inclusive Wealth Report 2012* (United Nations University – International Human Dimensions Programme & United Nations Environment Programme, 2012). Dasgupta was its Science Advisor. The *Review* connects inclusive wealth with intergenerational equity:

> If the inclusive wealth per capita we bequeath to our descendants is greater than the inclusive wealth per capita we ourselves inherited, we would be leaving behind a larger productive base for each of our descendants (Dasgupta, 2012b, p. 64).
>
> How can a measure that is designed to reflect an economy's productive capacity also reflect well-being across the generations? The answer is that in estimating inclusive wealth, accounting prices are used to value capital good (Dasgupta, 2021b, p. 66).

Intergenerational equity may need more than this, noting that good ideas are not self-implementing. It can be linked to sustainability, using the following basic indicators:

- No net loss of soil, soil condition and health, and biodiversity as a result of human activity.
- Maintenance of atmospheric stability.
- Future generations having access to at least the same or equivalent, or better, level of resources, quality of environment, and amenities as we enjoy now.
- Restoration of degraded environments or, at least, reversing of causes of degradation, within a generation; say, about 40 years.

These tests are equally relevant for current and immediately overlapping generations.

> **Task for Australia**
> Entrench in law and practice the concept of intergenerational equity: future generations should have access to at least the same or equivalent, or better, level of resources, quality of environment, and amenities as we enjoy now, and restoration of degraded environments or, at least, reversing of causes of degradation within a generation; say, about 40 years.

Poverty

The *Dasgupta Review* recognises that success with biodiversity protection and restoration requires improved material standards of living in low-income countries and regions (Dasgupta, 2021b, p. 67) and argues for a concept of inclusive wealth (the sum of produced, human and natural capital) as a measure of economic and societal progress (Dasgupta, 2021b, p. 75).

We have recognised the link between available resources and individual action affecting the environment in Australia (Serrated Tussock Working Party for New South Wales and the ACT, 2012; Marshall et al., 2016; Martin et al., 2020a; Quinn, 2021). We can expect the public to be more likely to behave consistently with protection and restoration of biodiversity (and their surroundings generally) and to benefit from success if we provide the necessary social foundation.

One conclusion from the combined Royal Societies webinar series on new stewardship was "fix poverty first", recognising that otherwise too many would not be able to be active participants in protecting and restoring our environment (Quinn, 2021). The lack of resources symbolised by poverty hinders action on issues such as weed and pest control, and inhibits investment in electrification of household systems, which slows climate changes that are accelerating biodiversity decline. Fixing poverty and the problems it causes will require attention to our income support, health, housing, and education policies and programs.

Task for Australia

Ensure continuing reduction of poverty: welfare, education, health and housing policies and programs need to be enhanced to eliminate poverty if we want everyone to contribute and to avoid harmful activities driven by immediate necessity.

4.6 Risk and Uncertainty

The *Dasgupta Review* has 21 pages on risk and uncertainty. It does not elaborate on the value of the precautionary principle for seeking to avoid decisions that may adversely affect biodiversity and other planetary boundary issues. This is an odd omission, given there is little doubt it applies to global change issues (Beer & Zilkowski, 1995; Beer, 2000) and other risk management situations (Tosun, 2013). The need for a precautionary approach to biodiversity conservation has long been recognised in Australia (Glanznig,1995; Gunningham & Young, 1997).

Risk

The following discussion uses this definition of risk (Cross, 2000, p. 2):

> Risk is associated with uncertainty. It is the chance of some gain or loss arising out of action or inaction associated with enterprise. The size of a risk is described by combining the magnitude of the potential adverse consequences and the likelihood that those consequences will occur.

Current debates about the consequences of extreme natural events such as floods and bushfires confirm that we have not been applying precaution or appropriate risk factors in decision making about urban settlements and infrastructure. The dimensions and seriousness of the problem have been well documented (SGS Economics & Planning, 2016; Queensland Reconstruction Authority, 2021). New South Wales provides a glaring example. We have known about the frequency and severity of floods in the Hawkesbury-Nepean river catchments since the 1790s (and far longer for the local First Nations people) (Karskens, 2016). We could react responsibly to the well-known risks and act with precaution by basing decisions on a proposition like that in the Scottish planning policy (Scottish Government, 2014, para. 256):

> … the planning system should prevent development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere. Piecemeal reduction of the functional floodplain should be avoided given the cumulative effects of reducing storage capacity.

We could accept the advice of experts (McGowan, 2022, quoting Pittock; Dominey-Howes, 2022, p. 3; Fuller & O'Kane, 2022, p. 4):

> Professor Jamie Pittock: "It is stark raving, barking mad to build below the PMF (probable maximum flood level) in the Hawkesbury-Nepean Valley … The Hawkesbury-Nepean valley in the flood of 1867 was 20m deep. Nothing is going to save a house in a 20m flood and it's the height of stupidity to allow development in that sort of place."
>
> Professor Dominey-Howes: "… in an ideal world, nothing would be built on a floodplain."
>
> M. Fuller and M. O'Kane, Flood Inquiry Co-leaders: "New buildings must be out of harm's way."

Fuller and O'Kane (p. 3) also observed that "we have minimal ability to predict flood … too much already built, being built or planned to be built in areas exposed to flood risk" and that there are uncertainties from climate change. They echo Governor Lachlan Macquarie's observations in 1817 on Hawkesbury-Nepean floods (p. 325):

> … it does not fall within the Reach of human Foresight or Precaution to be able to guard effectually against the baneful Recurrence of such awful Visitations, or to avoid being more or less involved therein.

He hoped (p. 326):

> … that the Calamities which have befallen the Settlers will produce at least the good Effect of stimulating them to the highly expedient and indispensable Measure of proceeding to establish their FUTURE RESIDENCES in the TOWNSHIPS allotted for the Preservation of themselves, their Families, and their Property; and that they will, one and all, adopt the firm Resolution of forthwith erecting their Habitations on the High Lands.

Unbelievably, the previous New South Wales Government remained committed to increasing the population in the flood-prone areas: "Yes, we need to develop … in western Sydney. We also need to build homes so young people can get into the property market. It's a balancing act. We can't stop development, we need development" (Perottet, 2022). That government easily meets Governor Macquarie's description, aimed at the time at settlers (Macquarie, 1817, p. 326):

> Those who, notwithstanding, shall perversely neglect the present Admonition and Exhortation to their own Benefit, must be considered wilfully and obstinately blind to their true Interests.

Implementing the previous government's plan to increase the height of the Warragamba Dam to lessen risk to people living on the floodplain would have serious negative biodiversity consequences (Snowy Mountains Engineering Corporation, 2021a,b), bound to be amplified by climate change and any increase in pollution and the impact of pest plants, animals, pathogens and diseases.

In Queensland (Hall, 2023, p. 3), "… the Gold and Sunshine coasts have had enormous population growth over 40 years now and have 'very exposed communities' to wind damage, storm surge and flooding."

I suggest below that one practical way to implement the precautionary principle is to base decisions on preferred futures. Surely a preferred future for the Hawkesbury-Nepean catchment would include:

- making space for its waters, including at flood times;
- avoiding risks, now and in the future, to people, their enterprises and their possessions from extreme natural events, including floods and bushfires; and
- avoiding risks to ecosystems, their biodiversity and their ecological integrity.

This preferred futures approach accommodates the two key principles (precaution and intergenerational equity) that need to be included in assessing and managing risks from global changes, including biodiversity decline. Otherwise, we miss the boat by relying on past risk assessment techniques that have basically been extrapolations from past behaviour (Beer, 2000). Ideally, we should build risk scenarios that take account of how an issue or problem may develop over time. We should at least review risk assessments as circumstances change.

> **Task for Australia**
> Modify decision-making processes so that shorter-term socio-political risks (governments) and profit (businesses) do not overwhelm longer-term risks to the environment.

Precautionary Principle

Interpretations of the precautionary principle are varied. It is easy to criticise, but its application to assist with decision making can be simplified by thinking of it as a positive approach, particularly by using guidelines (Lentz, 1995; Peterson, 2006; Aven, 2023; Union of International Associations, 2024). We can apply the principle by pursuing the least-risk pathways to preferred futures, preferably with a 100-year time horizon in mind (Watanabe, 1997; Fearnside, 2002; O'Mahony, 2021):

- Seek the pathways to the preferred futures for biodiversity protection and restoration that are judged to have the lowest levels of risk

for adverse consequences for the environment as well as for production and amenity (Indrawan et al., 2014; Kok et al., 2023).
- Explicitly consider the potential environmental impact of the options available to achieve preferred futures (Cameron & Abourchar, 1991; Goepel, 2011).
- Where possible, use well-established measures (for example, through demonstrated application, studies or surveys) with the highest degree of certainty about the avoidance, reduction or amelioration of adverse environmental impacts.
- Seek and use 'cleaner production' techniques to minimise negative impacts on the environment (Cameron & Abourchar, 1991; United Nations, 1993; Lentz, 1995; International Maritime Organization, 1995; Robinson, 1995),
- Integrate environmental protection and management of enterprise activities (Quinn, 2011; McNab, 2017).
- Avoid decisions and actions with irreversible consequences (McDonald, 2011).
- Where irreversible outcomes are unavoidable, choose an option that avoids unacceptably large impacts or is judged to have the least impact (Department of Infrastructure, Local Government and Planning, 2017),
- monitor the outcomes of the decisions to detect early warnings of consequential problems (Schindler & Hilborn, 2015).
- Use continuous improvement (Carruthers, 2012; Department of Agriculture and Fisheries, 2024) or adaptive management processes (McDonald, 2011; Department of Agriculture and Fisheries, 2024) to facilitate early detection and corrective action as needed in a timely, cost-effective and environmentally effective way (Department of Agriculture and Fisheries, 2024).
- Include a commitment to a precautionary approach in enterprise business and enterprise charters (Quinn, 2011).
- Require proponents to show evidence of risk or lack of risk of harm indicating reasonable grounds for believing that an activity will not be harmful (Quiggin, 2007).
- Assign liability for any consequential harm to the proponent.
- Show that the activity or product will generate net environmental gain (Helm, 2019).

Until now, application of the precautionary principle has been left to decision makers and interpretations to the judiciary. The only guidance from the latter in relation to New South Wales and Commonwealth law is that the principle is triggered by a threat of serious or irreversible damage and by scientific uncertainty as to the environmental damage (Land and Environment Court of New South Wales, 2006; Federal Court of Australia, 2022a). This guidance will have limited usefulness in many situations. There are some specialist systems with features that in effect apply the principle without saying so; for example, for regulating gene technology (Office of the Gene Technology Regulator, 2013).

Peterson (2006, p. 33), after analysing the situation in Australia, concluded that:

> … the development of clear guidelines for applying the precautionary principle nevertheless has major benefits. Placing the principle within the context of good regulatory practice helps to ensure that decision-making is transparent, consistent and accountable; that it utilises all relevant information; that costs, benefits and risks are identified, assessed and compared; and that measures are targeted at, and proportionate to, the problem. This decision-making framework will help to avoid many of the potential problems arising from application of the precautionary principle, including the risk of perverse outcomes, over-reaction to trivial risks, and misuse as a rent-seeking (or protectionist) measure.

The idea of guidelines is not new. For example, the International Maritime Organization (IMO) adopted its guidelines in 1995 after consideration of proposals from Australia and Greenpeace (International Maritime Organization, 1995; Lentz, 1995). They are applicable in Australia, as a member of the Organization. I prepared the Australian proposal, basing it on the ideas above about a preferred futures approach.

The preferred futures approach implicitly underlies the Committee for Sydney's advocacy of adaptive planning as a response to population and global warming challenges (Kernaghan et al., 2023). The

guidelines content is based on many existing principles and practices. For example, Agenda 21 links cleaner production with precaution (United Nations, 1992). Cleaner production is included in the IMO's resolution on applying the precautionary principle (International Maritime Organization, 1995). Continuous improvement has already been incorporated in Queensland policy: the *Queensland Biosecurity Strategy: Our next Five Years 2018–2023* (Department of Agriculture and Fisheries, 2018) proposes "fostering a culture of continuous learning" (p. 7) and includes an aspiration for "A biosecurity system that embraces continuous improvement" (p. 14). Carruthers (2012) found that use of continuous improvement environmental management systems improved natural resource conditions and enhanced knowledge of risks, including knowledge of compliance requirements.

Law reform will be needed to entrench the precautionary approach, as the way it is included in legislation now has had no discernible useful impact.

Tasks for Australia

1. Develop guidelines for application of the precautionary principle in private and public decision making, using preferred futures and net environmental gains approaches.
2. Entrench the precautionary approach in law as a dominant consideration in risk assessment and management and in private and public decision making.

4.7 Incentives

The *Dasgupta Review* points out that market forces will not suffice to protect biodiversity, a view consistent with the history of capitalist societies and taken for granted a long time ago by prominent observers such as Adam Smith (1776) and Hayek (1944). The *Review* (Dasgupta 2021a, p. 6) identifies a major complexity involved in dealing with this issue: "Just who is responsible for a particular harm is often neither observable nor verifiable."

The *Dasgupta Review* mentions several ways to overcome the market failure problem: taxes, removal of 'harmful' subsidies, property rights, regulations for restricting pollution and for prohibiting harmful activities, tradeable permit schemes, payments for ecosystem services, and auctions for providing designated services (Dasgupta, 2021a, Chapter 7). Unfortunately, in the case of payments for ecosystem services it fails to distinguish between natural systems and the services humans derive from them. Thinking based on ecosystem services rather than a holistic approach to the natural systems is limiting and can be yet another source of bio-perversity (Lindenmayer et al., 2012), as these systems over time support a great array of changing human economic, social and amenity activities. Just consider the vast environmental, industry, financial, economic and social changes in Australia's dairy farming and irrigation areas since 1900.

Most policy and program developers would get more practical help from the analysis and suggestions in Gunningham and Young's work in 1997 (Gunningham & Young, 1997). They point out that in most circumstances the need will be for a mix of informational, educational, voluntary, price-based property rights and institutional arrangements. They provide a comprehensive list of possible instruments.

We do not have a satisfactory situation in Australia with incentives and disincentives, despite the issue being under notice for more than 30 years (Rossiter et al., 2020). There is still wishing and hoping that there are market solutions for environmental problems; for example, by the Albanese government in its nature-positive proposals (Department of Climate Change, Energy, the Environment and Water, 2022, 2024) and by reviewers of the native vegetation provisions in the New South Wales *Local Land Services Act 2013* (Local Land Services, 2023). The latter was despite the *Dasgupta Review* conclusions being available, and contrasts with the recognition of those conclusions in the review of the New South Wales *Biodiversity Conservation Act 2016* (Henry et al., 2023) carried out at the same time.

The place of landholders in environmental management is a good example. Now there is wishing and hoping that landholders will look after their land in a way that will benefit future generations, even though at the same time we recognise that this may require them to make financially disadvantageous decisions. Activities with the greatest environmental externalities may not provide sufficient private benefits for landholders to fund their elimination. It is unrealistic to expect landholders

to finance environmental restoration where it will not be profitable for them to do so, or where it will increase their costs without obvious benefit for their enterprises (Martin et al., 2020a). Inconsistences among industry sustainability frameworks and the lack of independent verification systems have hampered increased support from the finance industry (KPMG Australia, 2023), even though these problems have been well documented for many years (Quinn, 2009; Rowland, 2009).

Hence, we need to recognise the need to pay landholders for public goods generated by these factors; for example, when private investment alone is unlikely to provide a desired public benefit, which may often be distant from the site, such as atmospheric changes leading to global warming and its consequences, or where others benefit without making any contribution. Another situation in Queensland could be where the activity is aimed at environmental restoration that is necessary because of past laws and government programs, such as requirements to clear land. Any payments system should also avoid the high transaction costs and fragmentation common with many past programs (Quinn, 2014), and avoid the serious problems besetting some current systems such as carbon credits and offsetting (Green, 2021; Macintosh, 2022; Macintosh et al., 2022; Audit Office of New South Wales, 2022; Henry et al., 2023; Department of Climate Change, Energy, the Environment and Water, 2024).

We may get some inspiration from overseas experience (Dart, England & Quinn, 2022). There are also some suggestions by the Queensland Native Vegetation Scientific Expert Panel aimed at recognising the different interests and starting points of landholders by offering low to high obligation options (Native Vegetation Scientific Expert Panel, 2023). The Expert Panel's recommendations on improving extension, information and demonstration services for landholders and on environmental stewardship look much like a revisit of how Landcare and weed and pest animal control schemes worked in the increasingly distant past.

We need support for group activities as well as individual incentives. The Landcare movement as originally envisaged needs revival, along with investment in supporting information, research and extension (Hawke, 1989; Vanclay & Lawrence, 1995; Alexander, 1995) as well as in credible action plans developed by community groups such as that developed by the Serrated Tussock Working Group for NSW and the ACT (2012).

Tasks for Australia

1. Development of systems to encourage improved environment behaviour and to reward those who go beyond their normal personal or business requirements without the high transaction costs, complexities and narrow focuses of many past schemes.
2. Empower individuals; for example, by revitalisation of Landcare (Bridgewater, 2019; Keith, 2020) and extended use of environmental management schemes.

4.8 Domination of Trade Over the Environment

The *Dasgupta Review* recognises links between trade and environmental issues, with much about the benefits of trade for spreading environmentally friendly technology and potentially encouraging more sustainable production of many commodities. It is, however, quite naïve about the reality that trade inevitably spreads pests, pathogens and diseases as well as causing pollution because of the preference of trade over environment enshrined in international trade law and practice. This observation is not intended as a criticism of the *Review*, as these issues are probably of greater concern in Australia than in the United Kingdom.

The *Dasgupta Review* frequently refers to a World Trade Organization & United Nations (2018) environment report that paints a rosy picture of trade and environment issues. That document includes some statements that seem to be quite inconsistent with what happens in the real world, such as:

> … what matters is not whether, in reaching the final consumer, goods and their components have crossed borders, but rather what the environmental impact of those goods is at every stage of their life cycle, from production and packaging to transport, use and disposal (p. 31).
>
> … trade and environmental policies must be coherent and aligned with the overarching principle of sustainable development to avoid undermining each other (p. 43).

> … the recognition that multilateral trade rules can and do accommodate coherent policies adopted for legitimate environmental purposes (p. 61).

The Australian situation with biosecurity indicates that these positive conclusions are not applied in practice and cannot be, with current World Trade Organization practices accepted by Australian governments (Quinn, 2018).

There is the associated trade law problem of trade agreements, including investor–state dispute settlement provisions, that give foreign-owned companies legal rights to sue the Australian Government if a change in law or policy reduces their profits, even if the change is in the public interest. These provisions can be used to inhibit environmental improvement law and decision making (Ghori, 2022; Ranald, 2022). One bizarre consequence of these provisions is that an Australian investor in an overseas business can seek to bypass Australian decisions about activities in Australia, as mining magnate Clive Palmer has been attempting to do (Bonnitcha, 2021; Clarke, 2024).

It is not easy for Australia to overcome this trade problem as long as entrenched international laws and practices supported by Australia continue to favour trade over the environment. Law reform as I have proposed would, however, require environmental impact assessments of proposed Australian bilateral and multilateral trade agreements.

> **Task for Australia**
> Law reform proposals should include a requirement for strong and comprehensive environmental impact assessments of proposed Australian bilateral and multilateral trade agreements. Australia should negotiate to remove investor–state dispute settlement provisions from trade agreements.

4.9 Finance

The *Dasgupta Review* observes that investment in conservation and restoration of ecosystems and their biodiversity is too small, and that investment in activities harmful to biodiversity are up to five times greater (Dasgupta 2021a, p. 467). The *Review* suggests investment in extension and management of Protected Areas, in incentives to farmers to adopt practices that support biodiversity and ecosystem services, in natural capital activities as part of fiscal stimulus programs, and in nature-based solutions to environmental problems (Dasgupta 2021a, p. 489).

Underfunding in Australia

Underfunding of investment in biodiversity conservation (and spending on other environmental issues) has been a recurring problem in Australia (Martin et al., 2020b). It seems that total spending on biodiversity programs by the Commonwealth Government declined by 28% in the 2013–2021 period. The Albanese government has begun increasing funding for the environment. The states and territories contribute most overall to biodiversity and other environmental investment. That declined relative to total budgets in every jurisdiction except the Northern Territory in the period 2013–2014 to 2017–2018 (Australian Conservation Foundation, 2021).

Germaine Greer's experience is a striking example of the underfunding problem (2014, p. 341). She handed her rehabilitated Gondwana Gold Coast hinterland property to a charitable trust, indicating that:

> Once I might have thought of handing (Caves Creek Rainforest Rehabilitation Scheme) over to the Queensland Parks and Wildlife Service, in the hope that they would begin to take their responsibilities seriously and set about conserving and protecting habitat, but that was before state governments all over Australia decided that, if they were to grow revenue to run the parks, they would have to allow luxury resort developments in them.

It has been common for interested parties, such as neighbours, to complain about inadequate resources for protected areas; for example, when the outcome is the spread of pest plant and animal problems. I know this from personal experience with consultation processes for financing and managing protected areas in New South Wales, extensive Landcare activities in New South Wales and the Australian Capital Territory, and from participation in developing control strategies for persistent perennial weeds.

The *Dasgupta Review* is consistent with the conclusions of the 2002 report to the Prime Minister's Science, Engineering and Innovation Council (Morton et al., 2002):

Four areas of investment above all others are likely to return greatest impact in heading off the diminishing value of Australia's natural systems and biodiversity:

- Redressing the absence of economic signals, to urban and rural Australians
- Reducing land clearing
- Limiting over-extraction of waters from our rivers
- Limiting the spread of pests, weeds and imported diseases.

The *Review* proposals for increased investment are all relevant in Australia:

> … extension and management of Protected Areas, in incentives to farmers to adopt practices that support biodiversity and ecosystem service, in natural capital activities as part of fiscal stimulus programs, and in nature based solutions to environmental problems (Dasgupta, 2021a, p. 489).

Task for Australia

Governments, businesses and other organisations along with individuals need to increase their investments in activities that protect and restore biodiversity.

4.10 Reductionism

The *Dasgupta Review* alerts us to one aspect of the problem of reductionism; that is, acting on segments of problems separately (Dasgupta, 2021b, p. 71):

> There is the fear though that biodiversity conservation afforded by marine and terrestrial protected areas would be neutralised by disruptions caused by climate change. And that should remind us that Nature's regulating and maintenance services are complementary to one another. Neither climate change nor biodiversity loss can be tempered on its own and the efforts designed to temper them should recognise that.

This statement is reinforced in a recent planetary boundaries study (Richardson et al., 2023, p. 1):

> Currently, anthropogenic perturbations of the global environment are primarily addressed as if they were separate issues, e.g., climate change, biodiversity loss, or pollution. This approach, however, ignores these perturbations' nonlinear interactions and resulting aggregate effects on the overall state of Earth system. Planetary boundaries bring a scientific understanding of anthropogenic global environmental impacts into a framework that calls for considering the state of Earth system as a whole.

We cannot change one thing in an ecosystem without an effect on everything else in it. We need to guard against bio-perversity – negative biodiversity and environmental outcomes arising from a narrow policy and management focus on single environmental problems without consideration of the broader ecological context (Lindenmayer et al., 2012).

A preoccupation with any one segment, commonly now climate change, can lead to downplaying or ignoring the other major global changes or to environmental burden shifting (relating to biodiversity, landforms, hydrology and pollution). There is a tendency to concentrate on climate change at the expense of other global change issues, including biodiversity, although some of these, including biodiversity decline, are already having major negative impacts that may be greater than those from climate change and associated ocean changes (Sheppard & Glanznig, 2021; Cribb, 2021; The Royal Society of Victoria, 2021; Persson et al., 2022). We also need to recognise the compounding and cascading effects of the interactions among these overlapping global changes (Glasser, 2019; Lopez-Claros et al., 2020).

Aguirre-Gutierrez et al. (2023, p. 1111) have argued that "maintaining original ecosystem functioning and maximising as many ecosystem services as possible should be prioritised above the ongoing economic carbon capture processes" to avoid the biodiversity decline driven by monoculture 'carbon farming'. Dasgupta (Dasgupta & Besley, 2023. p. 17) has reinforced this point: "We do not have that luxury (of reducing the economics of climate change to ways of controlling a single scalar number, carbon concentration) in the economics of biodiversity."

The excellent work on planetary boundaries (one of the foundations of the *Dasgupta Review*)

is yet to sink in, so distortions, fragmentation and wishing and hoping, rather than creativity and innovation, continue. The *Review* (Dasgupta, 2021a, p. 107) mentions that biosphere integrity, biogeochemical processes, land use and climate change have already crossed boundaries for safe operating spaces for Earth system functioning as we enjoyed it in the Holocene Epoch. Now it is argued that the planetary boundaries for freshwater change, and the introduction of novel entities, have been crossed, with ocean acidification being at risk (Caesar et al., 2024).

One issue that may help people understand the need for a broad-based approach is avoiding or dealing with the impacts of natural events that are often linked or overlap and that have profound environmental, social, financial and economic consequences; for example, floods, cyclones, storms, droughts, ocean surges, bushfires, unchecked spread of pest plants and animals, pathogens and diseases, earthquakes, volcanic eruptions.

Fragmented, ephemeral and reductionist approaches (for example, carbon farming or engineering solutions to flooding and coastal erosion) do not help in this context. Basing risk reduction and avoidance of floods on catchment-wide and nature-based solutions (making space for water) rather than continuing with engineering solutions (flood defence) has become increasingly common in Europe (Warner et al., 2012; Environment Agency, 2022).

Some ecosystems will involve large areas. Fire risk zones may be extensive. Pest-affected areas may also be extensive. Strategies and programs dealing with these kinds of issues will not work if they are based only on disconnected action. They need landscape scale, or greater, foundations.

Weeds are a good example. They are a particular problem for biodiversity. It is no use just killing the weed; weed management requires containing the spread of existing weeds, managing the environment to prevent new invasions, and restoring the disturbed ecosystem as far as possible (Vranjic et al., 2000).

See the example under '4.4 Transforming Institutions and Systems' above, where Bosselmann comments on the reductionist problem in environmental law. Failing to pursue environmental research and policy on an interdisciplinary basis is another form of reductionism leading to less than optimal results (Passmore, 1974; Rigg & Mason, 2018).

Fortunately, there is growing recognition of the reductionist problem by Australian landholders, whose actions have a major impact on biodiversity; for example (Guerin, 2023):

> Let's stop talking carbon. Let's start talking natural capital. Let's understand the value and potential of that on property, and let's go about leveraging that for business, social, environmental and community benefit. Then we all win.

Despite this progressive approach, there can be understandable immediate and shorter-term commitments to existing reductionist approaches; for example, the Queensland Government's acceptance of recommendations by its Native Vegetation Scientific Expert Panel supporting current attempts at carbon and biodiversity markets (Queensland Government, 2023).

The reductionism problem has been long recognised. The socio-ecosystem approach suggested by de Graaf et al. (1996) was aimed expressly at avoiding the risks of failure to deal with environmental problems where fragmented efforts are used.

These points are not arguments against the research practice of identifying constituent parts of complex interactions and entities in order to make them easier to study.

Tasks for Australia

1. Work against reductionist rather than holistic approaches to environmental management; for example, as is occurring now with narrowly conceived carbon trading practices.
2. Invest in more Earth system science.
3. Foster the widespread use of management systems based on continuing improvement processes, which would help as they require attention to all impacts of the person's or organisation's activities. Organisations using these processes will attract less regulatory attention (Robinson, 1995; Anton et al., 2004).

Part 5
Conclusions

These conclusions include suggestions on positive action that can be pursued now in relation to vegetation management, control of pests and diseases,

waste and pollution, law reform, incentives, immigration, and budget processes, noting that progress is hampered by lack of political will, inadequate engagement of the public and lack of investment

The *Dasgupta Review* should be required reading for all economic and financial decision makers. They can then begin to understand and react to the proposition that failure to account for impacts on biodiversity in decision making can have short- and long-term negative financial, economic and social wellbeing consequences.

The issues canvassed in this paper indicate the holistic nature of environmental issues and their overlap. For example, the *Dasgupta Review* points out the overlap of climate change and biodiversity. The *Australia State of the Environment 2021* report highlights this point (Murphy & Leeuwen, 2021a). The impact of waste and pollution on biodiversity is obvious and a function of human population numbers.

We need to argue wherever and whenever possible for the following as the highest priorities for stemming climate change, which also support biodiversity protection and restoration:

- Ceasing extracting and using fossil fuels.
- Stopping, or at least severely curtailing, land clearing, whether for urban, infrastructure, mining or farming purposes.
- Increasing afforestation, including in towns and cities and on public lands such as transport and other infrastructure corridors.
- Increasing soil carbon; for example, by maintaining and increasing organic matter in the soil, avoiding traditional cropping, increasing deep rooted perennial vegetation (Williams, 1995; Jones, 2010).

These priorities are not intended to suggest that at the same time we should not be pursuing other complementary goals, such as better waste management, less food waste, less clothing waste, less travel, more energy efficiency (including less use of energy-intensive social media and artificial intelligence processes) and continuing decoupling of energy and economic processes. Success with these will contribute to biodiversity protection and restoration.

We can say with confidence that Australia has little, if any, hope of meeting its Pledge for Nature commitments without significant changes to our laws and practices, and without substantial investment in conservation and supportive activities. This conclusion is consistent with the *Dasgupta Review*'s conclusions.

We can act now with the available resources and knowledge. For example, here are some recommendations for immediate priorities relating to vegetation, pests and diseases, waste and pollution, law reform, immigration and budget processes.

Vegetation

The high priority for stopping land clearing is well illustrated by studies on biodiversity decline and climate change mitigation (Wilson, 2002; Lindenmayer et al., 2022; Richardson et al., 2023). We must at the same time deal with the burden-sharing problem, whereby private interests should be rewarded in agreed circumstances for providing public goods.

Most land in Australia is managed by private landholders, including Indigenous interests. Therefore, we fail if we do not engage and motivate them. Bourke (2014) suggests this requires improved science communication, understanding of biodiversity/economic links, tax system reform, law reform, government support for good environmental outcomes by philanthropists, and creation of a great, national project in environmental management.

Empowering individuals is important; for example, by public investment in revitalisation of Landcare (Vanclay & Lawrence, 1995; Alexander, 1995; Curtis & de Lacy, 1998; Ottesen, 2019; Keith, 2020) and in extended use of voluntary environmental management schemes.

The land clearing issue also requires urgent consideration of law reform regarding vegetation in some jurisdictions; for example, Queensland (England & Quinn, 2020; Rossiter et al., 2020).

Pests and Diseases

There have been many successful campaigns for weed, pest animal, pathogen and diseases control in the past. Some of these need revival. All need large public investment and encouragement for private investment, including in community-initiated schemes. Landcare and voluntary environmental management schemes are important in this context (Quinn, 2009; Rowland, 2009).

Waste and Pollution

This is another budget issue, as we know what to do, including continuing research, public education, revival of incentive schemes such as 'cleaner production' and continuing development of chain of responsibility schemes (Luther, 2022; Directorate-General for Justice and Consumers, 2024).

Law Reform

We need to influence the promised Commonwealth review of environmental law to achieve priority for the environment, citizens' rights to a good environment, strong environmental impact assessment of all government decision making, custodianship of Country concept, and property laws more aligned with ecological reality and holistic environmental needs.

A review of all laws to test their conformity with good environmental outcomes should be initiated.

Incentives

Introduction of universally applicable environmental management systems with independent verification would help increase private investment, meet trade needs, and simplify government regulation and grants processes.

Immigration

Inputs to migration review processes need to emphasise the desirability of stabilising and reducing our human population, subject to participation in international efforts to deal with the increasing millions of displaced persons. Our businesses have to learn to adopt business plans that accept their resource constraints, whether personal capabilities or access to finance and qualified and available staff.

Budget Processes

Adopting approaches in the *Dasgupta Review* leads to a requirement for budgets to include assessments of their environmental impact.

We know enough to get on with implementing the proposed next steps, so why has there been so little progress? There seem to be three main reasons.

Lack of Political Will

Australia has lacked political leadership supporting environmental improvement. For example, in my personal experience at the Commonwealth level – which started with Sir Robert Menzies – Gough Whitlam, Malcom Fraser and Bob Hawke have been the only Prime Ministers clearly committed to environmental improvement. Fraser's record was uneven, as he supported states' rights at times, leading to decisions that were less than optimal for the environment (Christoff, 2015). We need to build pressure in many different ways on all governments at all levels to tip the balance away from denialists and 'business as usual' interests. Then the leaders will see where their people are going and quickly follow them; or elected leaders may impress us with knowledge and foresight and take the people with them.

Inadequate Engagement of the Public

We will know we have been successful with this when businesses have seen the light, of their own volition or because of consumer pressure and government leadership. Individuals would be going about their daily activities with environmental outcomes in mind.

Lack of Investment

We need greatly increased private and public investment in every facet of biodiversity protection and restoration.

Attachment

1.1 Comments from Dame Fiona Reynolds (Advisory Panel member for the *Dasgupta Review*) (2020)

The Dasgupta Review on the Economics of Biodiversity Is an Exciting Source of Hope

I've served on so many official Dasgupta Reviews over the last twelve months that my head should be spinning. I've loved them all, but the current one – the Dasgupta Review on the Economics of Biodiversity – may prove the most challenging and exciting yet.

To those of us who've worked in the field of nature protection for a long time, and despaired of getting the turnaround we so badly need, this report offers hope. Real hope. But it will only be delivered if it goes with an acceptance of some basic truths, and the adoption of some new principles.

A Crystal-clear Message

The interim report describes the economic analysis that will underpin our final report. It's written in

academic language, but its message is crystal clear. Some of it sounds so obvious that it should not need stressing, but the fact is it does, because we have presided over a terrifying decline in both nature and the systems that underpin it. This, if we do not respond now, will be our collective undoing.

The report's argument goes like this.

All human and other life on earth is dependent on the biosphere and the ecosystems that form it. Ecosystems are assets like any others, and if we viewed them that way we would both understand and look after them better. In fact, we calculate that they give an annual rate of return of +19 per cent, far greater than most conventional assets if only we acknowledged it.

But we don't, because ecosystems, unlike many other assets, don't have a value in our economic system. Nor do we capture the externalities (uncounted costs) of many of the things we do. So we have, for too long, taken nature for granted and exploited it.

A key reason for this is that the economic models we use today don't recognise that humans are embedded within nature, viewing us instead as something apart and somehow independent.

In fact, ecosystems have an astonishing capacity for regeneration, but since around 1950 (the beginning of what we call the Anthropocene) the rate of our exploitation has overtaken their regenerative ability. They are now declining dangerously. Planetary boundaries are being breached, and we are reaching tipping points from which we cannot return. Our current pattern of living globally requires 1.7 Earths.

If we accept this analysis, if we are to restore nature and live within its capacity to regenerate and secure our long-term future, we have to change our economic models and systems; and our mindsets and institutions; and our behaviour. So, what must we do?

The main drivers of our exploitation (there are others) are population growth and human consumption, which have outstripped both the stock and the capacity of our ecosystems to regenerate and thus produce what humans need to survive. We won't succeed unless we address these factors. And what we describe in the interim report as the 'Impact Inequality' shows just how far adrift we are from a sustainable state.

It will be the task of the full report to explain what we need to do, but there are some clear signals in this interim report.

Three Areas of Action Are Needed

Fundamentally, we have to get to a point where we operate within the limits of the regenerative capacity of earth's ecosystems. We suggest action in three areas:

1. **Change the Trajectory.** We must change the trajectory of the metrics that are driving the most damaging changes. Education, especially of women, has been shown to reduce family size and population growth, but there is less evidence of effective measures to reduce consumption and better manage waste. These are urgent priorities.
2. **Change Our Models and Systems.** We need to change our economic and institutional models to recognise that we operate within and not independently from nature. For example, we will need to:
   - stop using perverse subsidies, which fund, however indirectly, the loss or damage of ecosystems to achieve short term economic goals (for example many agricultural subsidies are perverse);
   - as a first step, change the metrics we use to indicate success; for example, GDP has no balance sheet; a new measure of NDP (Net Domestic Product) would at least include, crucially, depreciation;
   - adopt the ambition of sustaining, for the long term, inclusive wealth. This concept embraces all our capital goods: produced, human and natural, and needs to be built into our economic systems and institutional rules, including accounting systems.
3. **Value Nature.** Finally, we must all learn to value nature for the intrinsic benefits it offers us, by giving everyone access to nature and green space, and educating our children about its importance culturally, emotionally and spiritually.

This is a radical analysis and there will be radical recommendations which flow from it. But perhaps the very moment when we are reeling from the impacts of a pandemic caused at least in part by our

exploitation of natural systems, is the best time of us all to rethink our priorities and embrace a future where we realise, and embrace, the centrality of natural systems to our collective future

1.2 Dasgupta Elaborates

Dasgupta on release of the *Dasgupta Review* (Smith, 2021, p. 4):

> This is for the hard-nosed economists of the UK Treasury whose jobs demand they treat GDP with religious devotion. To advise governments to move beyond the simplicity of GDP as the most important measure, and growth economics more generally, is certainly not original, but it is radical and another sign of a turn in the general common sense.

Dasgupta reinforced this at the *Review*'s launch event. When asked to pinpoint the number one change his *Review* should bring about, Dasgupta asserted: "A change in the way economics teaches about nature" (Steele, 2021, p. 2). He elaborated on the emphasis on financial and economic decision making in a subsequent interview (Stefancic, 2021, p. 3):

> The overarching idea is to bring actions motivated by private aspirations to align themselves with actions that promote the common good. Economic theory has long shown that under ideal circumstances that would be achieved by a system of perfect markets for all goods and services and a system of wealth transfers to correct for inequality. The Dasgupta Review shows why that ideal cannot ever be reached. It then tries to find ways to bring the real world nearer to the ideal. Today firms base their investment decisions on current prices, forecasts of future prices, and government regulations. Forecasts of what the future holds are based on forecasts on consumer behaviour and government regulations. Firms face increasing uncertainty about the future in part because the biosphere is under increasing pressure (e.g. there could be tipping points at the source of supply chains – e.g. the tropics) and partly because of uncertainty in consumer concerns about the biosphere, and hence firms' shareholders' views. Furthermore, reputation matters to firms. The Review suggests that one way to create a greater alignment between company incentives and the common good is for consumers to insist that firms disclose the character at each stage of their entire supply chains. Government insistence that they do so would make that happen, as it happens today over personal health (food products come with labels on nutrient content). The Review recommends 'disclosure' as a substitute for 'forward markets.' Firms that anticipate consumer insistence in the future and take the plunge to behave in a green manner and disclose that will enjoy an early reputation advantage over rivals.

1.3 United Kingdom Government Responses

From the United Kingdom government response to the *Dasgupta Review* (Badenoch & Eustace, 2021, p. 4):

> The Government agrees with the Dasgupta Review's fundamental conclusion: nature, and the biodiversity that underpins it, ultimately sustains our economies, livelihoods and well-being, and so our decisions must take into account the true value of the goods and services we derive from it.
>
> In line with this ambition, and in response to the Review, the Government commits to: (1) delivering a 'nature positive' future, in which we leave the environment in a better state than we found it, and reverse biodiversity loss globally by 2030; and (2) ensuring economic and financial decision-making, and the systems and institutions that underpin it, supports the delivery of the nature positive future.

Specific action in response included an amendment to its Environment Bill "to require a new, historic legally binding target on species abundance in England for 2030, aiming to halt the decline of nature." The government's response included these key messages (Badenoch & Eustace, 2021, p. 6):

- A nature positive future in which we leave our environment in a better state than we found it and reverse biodiversity loss globally by 2030, requires protecting and enhancing our natural environment and its supply of goods and services on which we all rely. It also requires ensuring that our collective demands on the natural environment are sustainable.

- The Government has an ambitious agenda to this end, including committing to protect at least 30% of our land and ocean by 2030; promoting sustainable agriculture by paying farmers for work that protects the environment; taking action to clamp down on illegal deforestation by requiring greater due diligence from businesses; and committing £3 billion of international climate finance on nature and biodiversity over five years.
- In response to the Dasgupta Review, the Government will go further, including by legislating for a framework for setting new legally-binding environmental targets and have tabled an amendment to require a new world-leading target on species abundance for 2030, aiming to halt the decline of nature; legislating in England through an amendment to the Environment Bill for 'Biodiversity Net Gain' for Nationally Significant Infrastructure Projects; and ensuring all new UK bilateral aid is spent in a way that does no harm to nature.

and (p. 19):

- Delivering a nature positive future requires integrating the natural environment – and its goods and services on which we all rely – into our economic and financial decision-making, and the institutions and systems that underpin and drive those decisions.
- The Government already has an ambitious agenda to this end, including the development of a world-leading green gilt; work to improve the way in which decision-makers within Government account for natural capital when appraising policies, programmes and projects; and leveraging our COP26 Presidency to accelerate the transition towards more sustainable supply chains and international trade.
- In response to the Review, the Government will go further to deliver a nature positive economy, including by working with the Office for National Statistics to improve the way nature is incorporated into our national accounts; further improving Government guidance for embedding environmental considerations into policy-making processes; and incorporating biodiversity into the UK Government Green Financing Framework.

Previous positive government action included:

- The release in 2011 of the White Paper, *The Natural Choice: securing the value of nature* with proposals to place "the value of nature at the centre of the choices our nation must make: to enhance our environment, economic growth and personal wellbeing." (Spelman, 2011a, p. 2). Environment Secretary Caroline Spelman (2011b, p. 2) said: "The true value of nature should be built in to the decisions we make – as individuals, organisations, businesses and governments – so that we become the first generation to leave the environment in a better condition than we found it."
- The establishment of the Natural Capital Committee in 2012 and its continuation in 2016 (Department of Environment, Food and Rural Affairs, 2016, p. 1) "to provide (the government) with independent advice on protecting and improving natural capital. The Government's ambition is to improve the environment within a generation so that England has the best environment and is one of the most beautiful places in the world to live, to work and to bring up a family."
- The 25 Year Environment Plan in 2018 with its commitment "to become the first generation to leave the environment in a better state than we found it" (Badenoch & Eustace, 2021, p.4).

1.4 Outline of a New Environmental Act

Title: National Ecological Integrity and Environment Protection Act

Outline of Provisions

Purpose:

- Effective maintenance and restoration of ecological integrity of Australia's ecosystems, landscapes and oceans.
- Effective implementation of Australia's international obligations affecting the environment.
- Reversal of the continuing decline in Australia's natural resources and capital.
- Ensuring the conservation, sustainable use in perpetuity and sharing of benefits of biodiversity.
- Responses (mitigation and adaptation) to the changes to the environment from global changes

(to biodiversity, atmosphere, oceans, landforms, hydrology and from pollution and waste).

How Primarily Achieved. For example, general obligations, regulation of some activities, application of precaution, flexible means of avoiding or mitigating environmental damage, basing decisions on ecological integrity, management systems and charters, guidelines, environment impact and risk assessments, monitoring and reporting, research.

Right to Environmental Protection and Peaceful Enjoyment of the Environment. For example, environment protected by government from excessive, undue or unreasonable human interference, right to object to decisions inconsistent with this right, right to object to infringement by near and distant 'neighbours'.

Binds All. Including making all decisions by government agencies and their contractors subject to meeting ecological integrity tests.

Inconsistent Laws. The Act takes precedence over other Commonwealth laws.

Resolution of Conflicts. For example, between competing provisions in two or more Commonwealth laws, policies or programs.

Key Concepts. For example, custodianship, ecological integrity, precaution, intergenerational equity, continuous improvement, net environmental gain, public good, holistic.

General Obligations. On individuals and organisations, including government entities and contractors to government.

Prohibited Activity. That is, no activity where it has been determined that it would or is considered likely to have unacceptable irreversible negative impacts on ecological integrity.

Restricted activity. That is, where limits or conditions are applied to ameliorate impacts on ecological integrity.

National Environment Protection Commission. Role, administration, membership.

Independence of the Commission

Functions and powers of the Commission. For example, issue guidelines and risk assessments and notices, make orders, arrange inquiries, establish programs to pursue purpose of Act, commission research, establish monitoring and reporting programs, organise regional and ecosystem plans and risk assessments.

Cooperation. With states, territories, local government and the public.

Support for Community-driven Organisations. Pursuing the purpose of the Act, including Indigenous groups.

Community Awareness and Citizen Science. Including Indigenous knowledge.

Foster the Development and Use of Management Plans and Charters

Incentives. Develop proposals and manage arrangements to support public investment in public good outcomes and the application of the polluter pays principle.

Administer Environmental Impact Assessment Processes. For government decisions, policies and programs and defined private activities.

Research. Including monitoring and reporting processes and citizen science.

Review Commonwealth Legislation. To test consistency with the Act and make proposals for changes as necessary.

Review Entitlement of All. To seek review of decisions by individuals, organisations and government agencies (Commonwealth, state, territory and local and their contractors) potentially inconsistent with the purposes of the Act.

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