THE AUSTRALIAN COLLABORATION

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Living standards, economic growth and environmental pressure

Economic growth is one of the hallmarks of modern society. The relationship between economic growth and environmental pressure is, however, poorly understood. Attitudes towards growth often reflect one's basic position on environmental matters. On one hand, the optimists argue that growth is good – raising living standards and providing both the motivation (due to rising incomes) and the means (through additional resources) to repair any environmental damage that may occur along the way. On the other hand, many concerned about environmental issues believe that economic growth necessarily involves increased resource use and environmental pressure, and ultimately may undermine the ecosystems that underpin human life and wellbeing.

In fact, appropriate government policies could achieve reductions in environmental pressure along with continuing economic growth and improvements in living standards. But the development and adoption of such policies cannot be taken for granted as the outcome of some natural social process or the market's invisible hand. Indeed, most indicators of environmental pressure are rising steadily in Australia, and while there are some signs that attitudes are shifting, achieving sustainability will require much more significant changes in attitudes and policies than those that have occurred over recent decades.

Economic growth and environmental pressure

Economic growth is defined as an increase in the monetary value of economic activity in a nation or region, and is usually measured by Gross Domestic Product (GDP). Short term changes in GDP have important implications for employment, unemployment and inflation (with knock-on effects on wages, interest rates, house prices and other things), and so are regularly reported in the press. Changes in these variables – particularly unemployment – have real social consequences. GDP is not, however, a measure of wellbeing because it simply adds up all economic activity on the basis of market prices and is not adjusted for non-market impacts or changes in the value of economic assets (including the consumption of natural resources). This means, for example, that production of an expensive diamond necklace may make ten times more contribution to GDP than a life saving medical operation or the provision of food for a year for a low income family.

Ecological systems are complex and respond to disturbances in ways that are difficult to predict. Social and economic systems are also complex and are using resources at exponentially increasing rates. The resultant biophysical and socio-economic uncertainties interact.

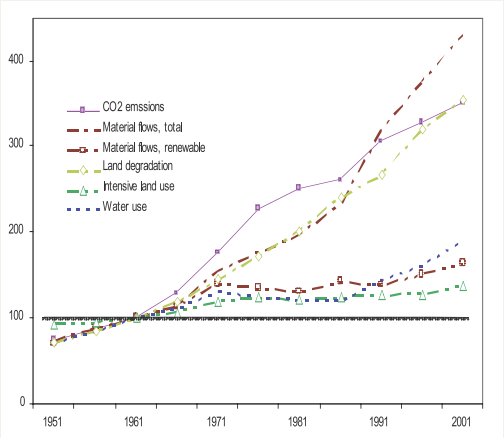
It is clear that the adaptability and resource flows from environmental systems are not infinite – whether at the level of an organism, a local region, or the biosphere as a whole. This implies that the capacity of these systems to regenerate and self organise in the face of increasing resource use and waste disposal must also have limits. Social and economic management practices, however, tend to focus on maintaining key variables (such as crop yields or company profits) within a desired target range, without fully understanding wider system impacts or potential threshold effects. Actions leading to undesirable or catastrophic outcomes – such as famine (due to a loss of crop diversity) or the collapse of major fishery (due to overfishing) – are often only identified in hindsight.

This underlying connection between economic activity and environmental pressure is reflected in Paul and Anne Ehrlich's well known I = P*A*T equation, which defines environmental pressure (referred to as impact, I) as a function of population (P), affluence or consumption levels (A), and technology (T). This implies that increases in population or affluence (measured by GDP per person) will increase environmental impact unless this effect is more than offset by technological change.

Looking back: Australian environmental pressure over the last 50 years

Figure 1 reports six indicators of environmental pressure for Australia: total material use, renewable resource material use, greenhouse gas emissions from fossil fuels, land disturbance, land degradation, and fresh water use. (Ideally the figure would also report biodiversity impacts, but this is more difficult to measure.)

Figure 1: Indicators of Australian environmental pressure, 1951-2001



Notes: Index 1961 = 100. Data from Australian Stocks and Flows Framework, CSIRO

All six environmental pressure indicators have risen significantly over the last fifty years. The three indicators associated with drawing down natural capital (fossil fuels emissions, total material use, and land degradation) increase three-fold to five-fold over the last 50 years. The three indicators linked to resource flows (water use, agricultural production, and intensive land use) increase less than two-fold, ranging from around 50 to 175 percent over fifty years.

Analysis of the relationship between these pressure indicators, economic growth, and the structure of the economy suggests that environmental intensity (or pressure per dollar) of the first three indicators has remained roughly constant over this period, and so these environmental pressures have increased in line with economic growth. (Emissions intensity increased 25 percent by the mid 1970s, and has trended down since.) This contrasts with the second group of indicators, where environmental intensity of resource use has decreased over time. This has moderated these environmental pressures per dollar of economic activity, but total pressure has still increased with economic growth.

While Ehrlich's main focus was on population and global 'carrying capacity', the I=PAT formula implies that understanding what 'technology' means is the key to understanding the relationship between economic activity (= P*A) and environmental pressure. (For the purpose of this fact sheet we will simply note that the impact of a specific environmental pressure is a function of the sensitivity of the environment – the OECD 'pressure-state-response framework explores this in more detail.) The environmental pressure associated with a given value of economic activity will vary with the mix of goods and services produced, the relative size of different sectors (such as mining, manufacturing, banking and so on), and the physical details of how economic activities are conducted. These physical aspects include the extent and nature of ecosystem changes associated with land management and renewable resource extraction, quantities of non-renewable resources extracted, how materials are transformed, and patterns of waste disposal. The bottom line is that 'technology' needs to be interpreted very broadly indeed – including 'soft' factors such as management practices within firms and on farms, social and cultural norms influencing consumption patterns, political systems and policy incentives, and the distribution of income and power, as well as tools and machines and other 'hard' technologies.

What is required to achieve responsive environmental policy?

It is sometimes argued that rising incomes result in improved environmental quality, as more basic needs for food and shelter are satisfied and people put more weight on environmental outcomes. This argument is often illustrated by the example of urban air quality, which tends to deteriorate in the early phases of industrialisation and then improve as economies mature.

The apparent harmony between economic and environmental goals in the urban air quality example is, however, the result of particular physical and social circumstances,

Looking forward: The economic impacts of achieving deep cuts in greenhouse emissions

The potential to reconcile economic growth with sustainability is best illustrated by recent modelling of the economic impacts of deep cuts in emissions. Figures 2 and 3 show projections for Australian economic growth (adjusted for inflation), total energy use, and greenhouse gas emissions with and without deep cuts in emissions over the next 45 years. In a nutshell, policies based on early action to cut emissions lead to a radical 'decarbonising' of the economy, with emissions falling 60 percent by 2050 with such policy action, rather than rising around 75 percent without it. Energy use flattens out (falling in per person terms), rather than rising 50 per cent. Yet average income rises 80 percent above inflation with policy action, despite these massive physical changes. (While this is less than the 90 percent increase in incomes forecast without action, reflecting the large additional investments required to reduce the emissions intensity of energy, it is still very significant growth.)

Energy prices rise less than income and so affordability of energy is projected to improve slightly. These results are broadly consistent with those from similar studies for other countries and the world as a whole.

This suggests that radically reducing emissions is consistent with significant improvements in living standards by decoupling growth and environmental pressure. Future lifestyles would look very different with and without this decoupling, but low emissions production technologies and rising energy efficiency would be likely to result in improved energy and transport services relative to today. In the language of the previous discussion, the introduction of emissions trading is a 'social technology' that results in uptake of a very different set of 'production technologies', so that economic growth is associated with a significant reduction in climate change related environmental pressure.

Figure 2: No policy action to reduce

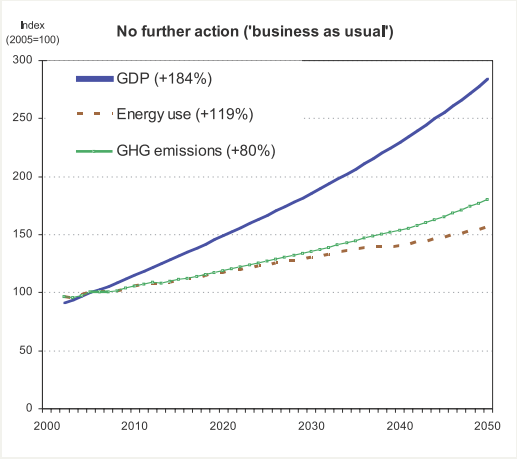
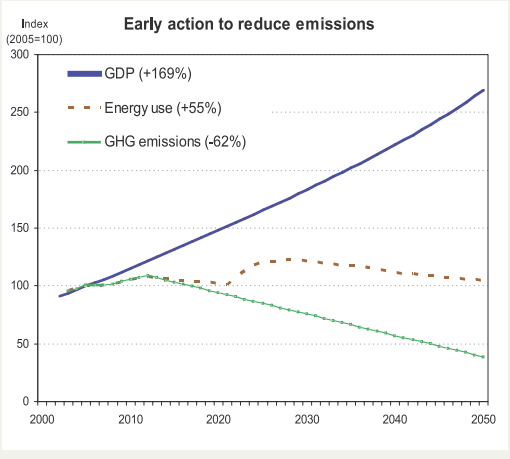


Figure 3: Early action to reduce emissions emissions (business as usual) 60% by 2050



Source: Data from *The Business Case for Early Action*, Australian Business Roundtable on Climate Change (2006).

which do not apply to many important environmental problems. At its most general, the development of constructive environmental policy responses requires three things. First, the underlying causes of environmental damage must be well understood. Second, technologies or resource management practices involving lower impacts must be available. Third, people must want to do something; that is, the expected results of the policy change must be considered valuable by those making the decision.

These conditions are met quite easily in the case of urban air pollution: impacts are local, visible, well understood and easily reversed. Perhaps most importantly, impacts are concentrated and felt by the people who cause the problem, rather than being diffuse or imposed on people far away in time or space. This combination of factors may be contrasted with many of our more serious global environmental problems. In climate change, for example, a clear scientific understanding of climate change processes

has only been recently established, desired technologies are not yet fully available, and we are yet to reach a sufficient global consensus that we really want to act. The situation is even more difficult for the protection of global ecosystems and biodiversity – and the numerous services they provide to people – as documented by the Millennium Ecosystem Services report.

The role of values

A final argument is that achieving sustainability will require 'a change in values': interpreted as less consumer oriented lifestyles (including more use of 'green' products), or some more fundamental moral or ethical shift towards living in harmony with the environment. While changes such as these would generally help reduce environmental pressure, they are not necessary or essential to achieving sustainability. What will be important is to recognise that underlying human needs – such as the needs for subsistence, security, identity and belonging – can be met in a wide variety of ways, most of which are only loosely linked to the value of economic activity or rate of economic growth. Indeed, a less obsessive focus on maximising economic activity might improve wellbeing by allowing more attention to serving this range of needs. Achieving sustainability would also be easier with a clearer recognition that slightly slower increases in average income will have little or no impact on happiness or wellbeing (as these are primarily related to individuals' relative income, which are unlikely to be significantly affected by an increase in average income – see Fact Sheet on 'Wellbeing and Happiness').

Implications for citizens and government policy

Three implications stand out:

- *Environmental limits are real, and they matter to human wellbeing*. The relationship between environmental pressure and impact is difficult to predict. Waiting until all the evidence is accumulated before taking policy action is thus a risky strategy. This is the essence of the precautionary principle.
- *Appropriate environmental policies and institutions will only emerge under certain conditions*, including understanding of environmental processes, identification of feasible technologies and management practices, and a consensus in favour of action. These requirements are not always met, and it cannot be assumed that sensible policy settings will emerge naturally through social and political processes. Instead it is likely that policy will generally lag behind optimal settings from a welfare perspective, and that poor policies may allow (or even cause) environmental impacts that impose long term or irreversible welfare losses.
- *Good environmental policies can reconcile continuing increases in living standards with long-term reductions in environmental pressure*. Indeed, environmental precaution and higher levels of environmental protection have rarely – if ever – led to falls in living standards. Running down natural capital and undermining ecosystem integrity can, however, reduce the viability of resource based industries and communities. Pollution of air, water and soils can also have severe impacts on human health and wellbeing.

Around thirty years ago *The Limits to Growth* argued that decisive action was required to avoid the collapse of crucial global environmental processes, and the human societies that depend on them (see useful sources below). Economists dismissed the report, arguing that markets would respond to increasing scarcity through resource conservation and technological innovation. They were less than half right: markets only work for resources with well defined ownership and control – such as privately owned minerals – and do not work for 'public good' resources such as access to clean water, biological diversity and climate regulation. The evidence of unsustainable development is mounting daily. Changing policy to harness market forces in service of explicit environmental goals is an important part of the solution, by means such as the creation of tradable emissions permits to drive dramatic reductions in greenhouse gas emissions. Done well, this would make economic growth sustainable. In time, however, we might hope that citizens aspire to something more satisfying and significant than mere economic growth.

Useful sources

Arrow, K.J., Bolin, B., Costanza, R., Dasgupta, P., Folke, C., Holling, C.S., Jansson, B.O., Levin, S., Mäler, K.G., Perrings, C., & Pimental, D. (1995). "Economic Growth, Carrying Capacity, and the Environment', *Science,* 268:520-521, http://www.precaution.org/lib/06/econ_growth_and_carrying_capacity.pdf

This article discusses the relationship between economic growth and the environment.

Australian Business Roundtable on Climate Change. (2006). *The Business Case for Early Action*: http://www.businessroundtable.com.au/
Prepared by six of Australia's largest business corporations, this report examines the comparative economic benefits of early or delayed action to deal with climate change.

The International Society for Ecological Economics, *Online Encyclopaedia of Ecological Economics*: http://www.ecoeco.org/education_encyclopedia.php
This online encyclopaedia provides a wide range of information on ecological economics.

Hatfield-Dodds, S., Nelson, R., & Cook, D. (2007). *Adaptive Governance: An Introduction, and Implications for Public Policy*. Paper presented at the Australian Agricultural and Resource Economics Society (AARES) Conference, Queenstown New Zealand, February 2007:

http://agecon.lib.umn.edu/cgi-bin/pdf_view.pl?paperid=25755&ftype=.pdf
Presented at the AARES conference in February 2007, this paper uses adaptive governance as a framework for examining the political economy of policy responses

Meadows, D.H., Randers, J. & Meadows, D.L. (2004). *A Synopsis – The Limits to Growth: The 30 Year Update*. Chelsea Green Earthscan:
http://www.sustainer.org/pubs/limitstogrowth.pdf
As an update on the original 1972 *Limits to Growth*, this publication advises on "how to move the world back to sustainability territory".

Orians, C.E., & Skumanich, M. (1997). *The Population-Environment Connection*, Bateelle Seattle Research Centre, Seattle USA:
http://www.seattle.battelle.org/Services/ES/pop-env/index.htm
This report documents the connection between key demographic trends and environmental policy within the United States.

Author

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