

# **RIGHTS, INSTITUTIONS AND SUSTAINABILITY. HOW CAN WE MAKE IT WORK?<sup>1</sup>**

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## **Abstract**

In developing social and agricultural policy for sustainability, great emphasis is being placed on property rights as a solution. This paper highlights that property is not a solution, it is merely a component in any integrated approach to changing the systems that drive resource use behaviour. The paper outlines some concepts for a more profound approach to shaping that behaviour.

It follows the approach of highlighting the behavioural system that creates our patterns of resource use. It then considers the social implications of sustainability approaches, and the implications of a range of views about property and institutions. Finally the paper suggests some over-arching principles that should be adopted in creating effective behaviour change towards sustainability. In this framework, property rights are re-framed as subservient issues operating within the context of a more comprehensive approach.

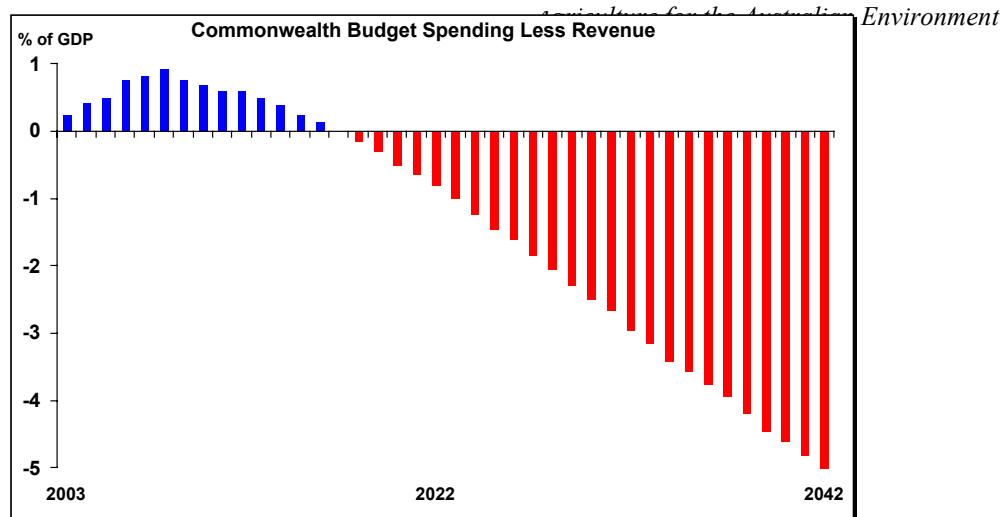
## **Introduction**

In February 2002, a conference was held to discuss possible population outcomes for Australia. Many speakers advocated doubling Australia's population, arguing that without this Australia would be poorer economically and would not act as a good corporate citizen. Australia's demographic structure and population have profound implications for our national capacity to fund expenditures on social equity (such as unemployment benefits, Aboriginal social justice, or support for the disabled), health and aged care (such as the availability of hospitals and nursing homes, or affordable medicines), defence, and even the capacity to fund the protection and rehabilitation of our environment.

The Australian Government has indicated in 2002 a growing difficulty with funding as our population ages, leading to persistent budget deficits unless (either) we have a change in population, or change our policy settings to reduce the demands on the taxation system. It is worthwhile to note that these projections do not include costs for any substantial expenditure by the Commonwealth on the environment, nor any new social justice initiatives (Figure 1).

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<sup>1</sup> The information in this paper draws heavily on research conducted for Land and Water Australia.



**Figure 1.** National fiscal projections. (Source: Commonwealth Government, Intergenerational Report 2002-2003 Budget Paper No. 5. 14 May 2002)

### **The environmental challenge of population.**

The recently published State of the Environment Report (Thom 2002), and the Australian Bureau of Statistics national stock-take (Gittins 2002) summarise Australia’s sustainability performance, even with a small population:

- **Biodiversity:** Over the eight years to 2001, the number of known extinct, endangered or vulnerable bird and mammal species rose by more than a third. Exotic organisms, identified as a major threat to biodiversity in 1996 remain so in 2001.
- **Land degradation:** 5.7 million hectares of Australia are assessed as having a high potential to develop dryland salinity.
- **Land clearing:** Land is still being cleared at an increasing rate, reaching 470,000 hectares in 1999. The clearing of native vegetation is also a major factor in the rise of water tables and increases the probability of salinity.
- **Inland waters:** About a quarter of Australia’s surface water management areas (rivers and dams) are close to, or have exceeded, sustainable extraction limits.
- **Groundwater:** 30% of groundwater is overused.
- **Greenhouse gases:** Emission rose by more that 17% in the nine years to 1999.
- **Coasts and Oceans:** There is increasing loss of coastal habitat through human settlements and pressures in the coastal zone. Pressures on Australia’s coral reefs continue unabated from downstream effects of land use and other human activities.

These statistics reflect the unsustainability of our resource use patterns. These are not farmer-specific problems, for these patterns are pervasive of Australian behaviour.

## The tyrannous equation

At the heart of the polarised perspectives on population and environment is an unacknowledged tyrannous equation. Environmental impact is a function of population numbers, multiplied by environmental impact per head. To achieve whatever is the acceptable level of environmental impact, we can either manage per capita impact, or the number of people.

There will be legitimate debate about the extent of harm to the environment that is acceptable. There will be differences of belief about the degree to which innovation and the march of progress (Simon 1981; Simons 2000) will allow us to reduce the per capita impact, or to replace one source of ecological services with another. But even accepting these divergent views, if the per capita impact we are having today when extrapolated will result in unacceptable harm, then to aim for a larger population without having reliable ways of reducing that per capita impact is to ignore the tyranny of that underpinning equation.

### The tyrannous equation

$\Sigma I = I \times N$ , where

$\Sigma I$  is total impact on the environment

$I$  is the impact per capita

$N$  is the total number of people

If you wish to restrict environmental impact, then you either adjust impact per capita, or population, or both.

## Innovation in the resource-use system is the imperative

The only way in which can achieve sustainability without loss of lifestyle is a shift to a more technology and services intensive economy, and radical improvement in the efficiency with which we:

- i. use materials to produce goods and services;
- ii. consume goods and services where there is an environmental impact; and
- iii. eliminate spillover impacts such as pollution, contamination and waste by-products.

A key sustainability endeavour is the creation, and the adoption, of innovation for reduced resource use. It is a behaviour change, rather than a purely technical, challenge.

Resource use behaviour is a response to flows of information and resources (both to motivate and to empower decision-makers to act on their decisions), mediated through decision-making structures shaped by beliefs and knowledge. These elements feed back into each other in a complex relationship.

Information and resource flows reflect the decision-making situation and the resource-transformation and data-transformation technologies in how we interact with each other and the environment. Changes in situation change the patterns of rewards from action, and the information that flows, and then trigger shifts in decision-making. Technology affects the efficiency with which information can be secured and manipulated, and the efficiency with which resources can be transported, transformed and managed.

Changing this system is a social change challenge. Social and economic change involves a complex negotiation involving many people and organisations, and many interactions and interests. The effectiveness of any intervention depends on the context, on the specifics of

the physical environment and the resource use problem being managed, on the information and resource flow patterns, and on the dynamics of this social negotiation. Taking a solution off the shelf and applying it in a different context is not the optimal way to design strategies for sustainability. Sadly, the political appeal of simplistic adoption of concepts (like stronger property rights) often prevents us considering objectively the interventions that are needed.

There are fundamental ‘drags’ on the efficiency with which any behavioural system (such as a person, an organisation or a society) responds to changes in context. These include delays in receiving and understanding information, barriers to learning because of limits of beliefs and knowledge, political processes of decision making within groups, and lags between decisions and the effective realignment of resources to implement these. The more disruptive the change in context is, the more resisted is likely to be the transition, but also the more powerful will be the information and resource flow signals from that change in context.

It can be expected that major context shifts will trigger significant turbulence and resistance before change occurs, but this does not mean that change will always be slow. Sometimes the change is revolutionary, after resistance is overcome by a build up of pressures and an accumulation of smaller changes within society. This kind of systemic behaviour is well known in nature, with ecological collapse being sudden in response to long term ‘small’ adjustments in a system. It is also well known in history, with revolutions being both unexpected and predictable responses to accumulating pressures for change. The shift to sustainability may be of this kind.

### **Innovation should be the aim of policy**

These observations are foundations for what follows. In deciding what type of sustainability strategy should be favoured, a starting point is to decide by what criteria one should judge. The key criteria are these:

1. any successful strategy has to garner enough support from the community, including resources, to be successfully implemented. The politics of adoption and resourcing are vital.
2. the strategies have to promote the creation and (more particularly) the effective adoption, of innovation. Creating positive conditions for innovation is vital.

Social and industrial technology is how humans maintain the flow of services they enjoy from the environment within the limits of that environment. Innovation is a social process stimulated by patterns of incentives, and its direction is shaped by what is systematically punished or rewarded. There are more possible avenues for innovation (benign or harmful) where there are substantial degrees of freedom to act. Innovation will follow socially perverse paths when incentives are perverse. The blossoming of the tax avoidance industry in the 1960’s, in response to the opportunities opened up by the High Court’s ‘black letter law’ interpretation is an example. Policy to achieve environmentally responsible innovation requires instruments that create high degrees of freedom to innovate, coupled with a pattern of rewards and punishments that direct innovation into positive paths.

## **Guidance from the literature**

Within the literature there is expert opinion, often contradictory, on how to promote sustainability. It is easy to find convincing arguments that support property rights as the key tool for achieving appropriate behaviour, alongside well-supported cases to the contrary. It is possible to find arguments that make ethical responsibility to mankind or nature the core concern, along with papers and books that argue that the only consideration is efficient self-interested behaviour. It is possible to find arguments that technology will resolve the issues, and well-documented predictions of imminent doom if we rely on the potential of technical change to address our sustainability problems.

What is likely is that each of these views contains elements of truth, even when these truths conflict. It is likely that there are multiple ways of arriving at a sustainable solution to current ecological issues. It is also possible that partial implementation of poorly understood competing approaches may be one cause for the ineffectiveness of the quest for sustainability to date.

When one author deals with economic incentives, another deals with improving materials flows, and a third is focused on regulatory enforcement, it is very easy to believe that they are focused on different aspects of behaviour, with tenuous links. Insights about the tradeoffs across program types, or potential synergies between them, are difficult to find. The language of each discipline, and its un-stated understanding about how behaviour is modified, is a barrier to communication outside that discipline.

To overcome these barriers, we use a model that uses systems theory to link concepts from a number of well-researched behavioural models. This is now described.

## **Managing the system, not the symptom**

Systems are made up of elements that interact. In a system it is possible to trace the pattern of the flows, and the structures that shape these are some of the determinants of how the system works. A riverbank shapes water flows, in much the same way as the specialised roles of individuals within an organisation shape how information and resources flow, or the court system shapes some aspects of how citizens and government interact. The riverbanks and structures of a social system are its institutions.

The outcomes of these interactions are shaped by the dynamics of the system. The most powerful demonstration of the effects of dynamics is chaos, the fact that complex systems will often generate results that are unpredictable. In social systems, an illustration is that the assassination of a minor sovereign at the start of the 20<sup>th</sup> century contributed to two world wars, a restructuring of the political landscape of Europe and most of Asia, technologies such as the rocket, and major social changes including the European Community. Interaction, friction, delays in feedback, and other dynamics are the seeds of this type of effect.

There is never only one “right” solution to the question “how can I change the operation or outcomes of this system?” This characteristic is termed “equifinality” (von Bertalanffy 1968). For example, a river threatened by increased levels of nutrients may be restored by reducing its biological complexity (species die) or increasing it (new species arrive which

reduce nutrient load to enable continuation of original ecosystem function), or by changing the mix of species. Similarly, a social system may adapt to changes in resource availability by reducing demands on the resource (say through reduced population) or creating technologies that enable it to use different resource types, or by social re-adjustments.

What this implies is that there is never only one available strategy to change an individual, an organisation or society – there are many equifinal paths to any desired outcome. However, because of complexity it should also be recognised that any strategy for change will have unpredictable impacts, and the interaction of two or more interventions in the same system can readily cancel each other out, or cause surprising effects.

The problem of sustainability occurs at the intersection of the environment and the human society. Instruments for sustainability operate at this intersection. They can act on information or resource flows within society, either directly or through changing structural relationships. They shape beliefs and decision-making. In the practical pursuit of sustainability, a regulatory strategy may be no better (or worse) than a market-based strategy; or an education program be no more or less effective than a peer-group-based management scheme.

The key to effectiveness is often how well any selected tactic is implemented, and whether it integrates well with other dynamics of the system. This is an important observation at a time when much of the debate is focused on the perceived advantage of one type of instrument (market) over another (regulatory). This is a false polarity, and hides the need to focus on choice and use of instruments tailored to the social context.

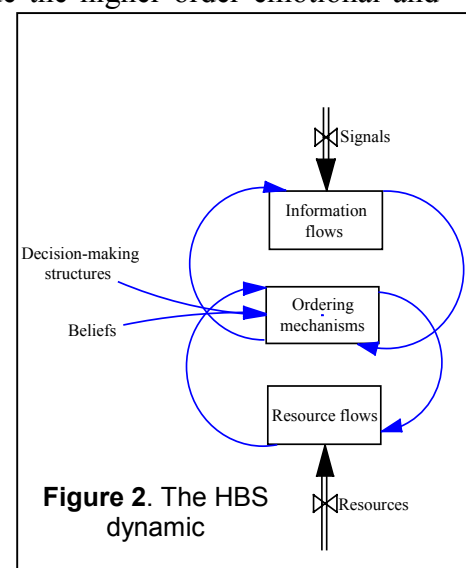
## **Understanding the Human Behavioural System (HBS)**

The model we use, the Human Behavioural System (HBS) model (Figure 2), is based on principles that are well developed in the studies social, organisation, and individual decision-making. The elements within the HBS are many, for it encompasses individuals, organisations and societies. Detailed evaluation of the literature suggests some common threads within each of these subsystems.

All open systems pursue resources to prosper. For the individual these resources include basic inputs of food, shelter, and water, but also include the higher order emotional and intellectual needs of the human. At the level of society, the resources that are needed are all of the physical requirements for the operation of a society. For the organisation, both finances and human inputs are essential resources.

Information flows are also fundamental, and information comes in many forms. Decision-making systems require data, for this is what is processed. Data (or signals), when interpreted, is information. Information is a key element in the HBS.

This data is processed through some structure for decision-making (ordering mechanism). For individuals this mechanism is internal, but for organisations it can



be complex and specialised (such as a management team) and for society even more so. Society uses specialised ordering mechanisms to make decisions, including markets, the law, politics, religion and a host of other means of attaching value to and processing this information to make decisions, and then to allocate resources.

Decision making involves placing different values on different anticipated outcomes, and on the information that is available. That process of valuation within decision-making is informed by the beliefs of the decision-makers. For individuals these are termed attitudes or beliefs, and for organisations and society they are often termed culture.

The beliefs of a society or an organisation are embodied in their cultures. The beliefs of individuals are embodied in their standards and values. Faced with the same information about actions and consequences, people and groups will often arrive at different decisions. For example, provided with information about deteriorating water quality, one person may seek to modify activities to prevent pollution and even improve water quality, another person may install water purifiers in the home, and yet another may deny the problem exists. Similarly, organisations will select different goals and value different types of information in making their choices, depending on whether they regard themselves as existing for the public good, or for private profit.

Only two flows occur. The first is the flow of resources, including money when dealing with economies. The second is the flow of signals, data and information. Beliefs, which are often loosely thought to be transferable between decision-makers, are shaped through these two flows but do not in themselves flow.

This observation is important for the design of change strategies. The HBS model makes it clear that whilst there are many elements in the system the only two that can be manipulated are the flows of information and the flows of resources. It is through adjusting only these two things that every kind of instrument works - regardless of whether it is an economic, regulatory, educational or other strategy that is being addressed.

### **Behavioural systems are not linear**

It should not be surprising given the dynamic and complex nature of the HBS that for any given type of intervention (such as the creation of a property right or a market incentive or regulation) the outcomes can vary widely. Something that works in one context can be a disaster in another, and vice versa. Jurisdictions and markets have sometimes subtle distinctions that result in radically different behaviours in response to any particular stimulus. This is the danger with focusing on the instrument for management, rather than on the system to be managed.

There has been a myriad interventions to improve resource use in the pursuit of sustainability. These include traditional regulation, through real-market interventions like subsidies or preferred purchasing schemes, to complex artificial market interventions like the creation of credit schemes, cap and trade programs, or property rights in water or other fugitive resources.

A matrix of instruments by IISD (2003a) illustrates the range of practical experiments. More information is available at SDCN (2003), or more particularly at UNECE (1998). A compendium of instruments also available at IISD (2003b).

The extensive American experience is thoroughly reviewed in *The U. S. Experience with Economic Incentives for Protecting the Environment*, Office of Policy, Economics, and Innovation, U.S. Environmental Protection Agency, EPA-240-R-01-001, and in *Experience with Market-based Environmental Policy Instruments*, Resources for the Future. The Australian history of use of instruments is reviewed in Environment Australia (1997).

There is much evidence on which to base observations of what happens in practice. One lesson is that the outcome from instruments often varies widely from the predicted result. In a world where relationships are linear, this would be surprising and perhaps a cause of concern. However, in complex open systems the relationships are non-linear, and variation of outcome from prediction is to be expected.

Open systems are complex in part because of feedback loops and unexpected interactions, which act together to create outcomes that could not be expected if the interactions were simple and linear. The social system operates through many transactions. Individuals work with each other or interact socially. They sell their services, make decisions for organisations. Organisations take in and adjust information, move resources around. The broader society transacts, negotiates, decides, acts. The social system is a dynamic, lively and complex place. It is not in the least bit surprising that it throws up its own noise and confusion and friction, and that this in turn impacts on the decisions that are made and the consequences of these decisions. There are four dynamic elements, which have proven to be particularly potent in shaping outcomes.

### **Dynamic element 1: Filtration**

People ‘hear’ only a small part of the information that is available, and will filter out the rest. One basis for this filtration is whether the information is believable. In effect, belief systems filter the information used in social systems.

As well as informal filters to information contained in belief systems, organisations and society also set up formal structures to ensure that “relevant” information is collected and analysed and used as a basis of decision making. Organisations invest in technologies and design organisational structures such as procedures and reporting relationships to manage information flow. Societies have specialised functions such courts, parliament, or the media to deliver relevant information, and process and distribute it. All of these are designed to select from the pool of information that which is deemed relevant and to filter out all other (even if in the end result what is filtered out proves to be ultimately relevant).

### **Dynamic element 2 :Transaction costs**

Transactions occur constantly between the subsystems of HBS, and to and from the environment. Transactions are never cost-free. The costs result from the need to identify with whom to transact, deciding how to carry out the transaction, executing the transaction and guaranteeing the outcomes. These transaction costs ‘tax’ the flow of information and resources. These costs can make some transactions impossible, and so act in part to

determine what transactions actually do occur. This has a marked effect on outcomes.

### **Dynamic element 3: Time**

It takes time for information to be captured, filtered and transferred. When dealing with natural systems, learning can be delayed by the subtlety of changes, coupled with the unwillingness of people to see deterioration which can interfere with established use. Organisations often learn through slow processes such as committees, reviews, studies and bureaucracy. Society often has even slower processes. It takes further time to make decisions and, even more so, to act on them and have an effect. The more profound the disturbance to past patterns, the more likely it is that decision making and action will take a long time.

### **Dynamic element 4 : Technology**

Monitoring, analysis, production, distribution and decision making all have embedded technologies, and these technologies are hidden shapers of our decision making. Technology also plays a part in shaping belief systems. There is a flimsy line between what we are able to do technologically, and what we ought do ethically or practically. The past few decades have seen abundant technological innovations, enabling humans to access resources and process information in ways that prior generations could not envisage. These successes have led to trust in continued advances in technology to overcome current environmental problems. In reality, the types of technological solutions necessary to solve such problem are likely themselves to cause significant changes to the institutional frameworks and culture of society

Both experience and theory show that whilst the choice of instrument is of tactical importance, the choice of strategy should be based on a more situation-specific examination of the behavioural context. Experience shows that the best results are achieved when there is an appropriate fit of instrument to context, and when the instrument is deployed along with comprehensive programs to address information flows and resourcing issues, as well as when the 'soft' aspects of attitude and capacity to decide. Debating the choice of instrument in isolation is much like a house-builder debating the relative advantages of hammers over trowels without first having decided what it is that one wants to build, and how one wishes to construct it.

### **Interventions have systemic effects**

Policy choices for sustainability are also choices about the type of society we want. In open systems, change in one part will eventually affect the whole. The way we manage resource use impacts on the patterns of relationship and wealth-sharing in society, as is illustrated in table 1.

**Table 1.** Mechanisms, costs and behaviour

<b>Instrument type</b>	<b>How does the instrument work?</b>	<b>What behaviours are promoted?</b>	<b>Who bears the cost?</b>
Markets	Through market transactions - The price of scarce resources increases; - Consumption is therefore curtailed by choice or inability to pay.	Market entrepreneurship - arbitrage or - improve resource access or value.	Consumer of resource bears the cost of consumption
Private Regulation (civil litigation)	Through private litigation, - Harmful effects are compensated for. - Harm to third parties is therefore curtailed by the choice to avoid risk.	Avoidance of third party harm or 'neighbourly' negotiation of interests	Offending user bears costs of avoidance of harm. Affected neighbour may bear costs of unavoided harm. Both bear negotiated costs.
Public Regulation	Through penalisation, - specified behaviours are made expensive. - Consumption is therefore curtailed by choice to avoid risk.	Compliance, focused on least cost to avoid the risk.	Regulator bears the costs of enforcement. User bears the cost of compliance.
Incentives	Through contract - Desired behaviours are rewarded; Conserving behaviour is thereby promoted.	Administrative entrepreneurship to - Win grants - Satisfy requirements	The granting agency plus grant applicants under cost sharing.
Education	Through communication, - Attitude or knowledge change leading to conserving behaviour.	Civic responsibility	Volunteers who adopt the learning.

Cumulatively, the choice of instrument has important secondary effects on:

- Culture, such as perceptions of freedom and restraint within society, or attitudes to authority and neighbourly relations.
- The pattern of the flow of funds and the accumulation of wealth, the degree of social equity which prevails, and economic growth.
- The extent to which innovation and entrepreneurship will be rewarded and encouraged, and the degree of investment that will be made in environmental entrepreneurship.
- The amount of pressure on the public purse to pursue both sustainability and other competing resource demands.

There are reasons to be attracted to instruments which relieve the demands on taxation, and which promote innovation. However, civil regulation and volunteerism offer some of the same advantages, and there are costs to the civil society from private ownership of once public or open access resource. If we do not take these into account, we can create secondary impacts that we do not want, including injustice and perhaps the breakdown of social cohesion.

**Intervention is a decision about social justice**

Incremental improvement in resource use efficiency will not achieve sustainability. Non-use will have to become more valuable, reflecting declining availability of non-used environment, and as a means for disciplining resource waste. Environmental uses once considered to be discretionary have become priced. Water contamination or waste dumping

carries an increasing financial cost (either risk of penalty or a price for disposal). Private land erosion is no longer a matter of private concern alone. Riparian areas are becoming valued for their non-use values, and the price for their production use is increasing as controls become tighter. These are not one-off tendencies, they reflect a market imperative to increase the price of unexploited resources, as their supply diminishes (and as we become aware of this).

One effect of our past consumption and our increasing population is less resources freely available for anyone to use. The strategies we use to conserve and promote more efficient use of this declining resource, coupled with the fact of overall decline, further reduce this availability and embed potential problems of social justice and equity. We are faced with an inevitability of reduced public access to resource, and further privatisation through property rights will accelerate this pressure.

In most jurisdictions, including ours, pursuit of sustainability requires controlling access to and the use of natural resources, through combinations of regulation and market-based exclusion. This means restricting economic or social use, and in many cases reallocating opportunity to the wealthy, who can afford the increasing costs of access as supply is constrained.

Competition shifts resources from those unable to maximise wealth, to those who can. Those who can are often those with the capital to invest to allow technological solutions to be implemented, and with the information access and education to manage a more technologically and capital intensive production process. Growing inequality is an undesirable but not an accidental by-product of a thrusting and competitive market, and regulation accelerates the problem of reducing resources available to the less well-endowed.

In capitalist systems, pursuit of social equity however generally requires redistribution of resources from the most economically productive, to uses that will not be as productive. In turn, this must reduce the total wealth that is available to support the disadvantaged, reward the advantaged, and invest in protecting and developing our natural capital.

This underlying equity/productivity problem gives rise to a further pathway where radical innovation will be essential: strengthening social equity and justice within an increasing technology and capital intensive resource use regime, where free access to natural resources is constrained.

The challenges, of sustainability, economic growth and social equity, each are important but each places different demands on natural resources. Sloppy thinking about the relationship between these demands can result in counterproductive interventions.

### **Misapplication: Using water rights to sustain communities**

It is not unusual to try to support economically marginal regional communities, whilst contributing to conservation of environmental flows, by implementing tradeable water allocations untied to land. If traditional farming is of marginal economic value, a percentage of local farmers may choose to sell their water interest, lease it, or hold it as an asset for later sale. If banking of water extraction is possible, the problem may be

compounded. As the value of water rights increases, the extent of this problem may also increase. As the land use and management activity of these landowners reduces, the regional economy suffers. The solution increases the problem.

An analogous problem of perverse consequences is illustrated in the US Farm Bills, where some commentators highlight that increasing subsidies lead to increased land prices and accelerates the hollowing out of rural towns. See for example San Francisco Chronicle *Farm bill kills farming* Carolyn Lochhead, Monday, May 20, 2002 *As costs rise, bigger farms buy up smaller farms. Small family farms begin to disappear. Agriculture consolidates into enormous industrialized operations covering thousands of acres. The countryside depopulates. Towns vanish*

If the policy aim is community development (as distinct from individual enrichment), then a different instrument design may be needed than that required for optimal water use efficiency. This could include the use of regional ‘bubbles’, or limits to trading outside geographic boundaries, or restriction of trading to short term leasing of water. Alternatively pursuit of social equity may require a distinct strategy, accepting that the water trading instrument will add to regional viability problems. Reliance on the one instrument to achieve all three aims is often naive strategy.

Significant innovation will be essential in the distribution of the fruits of natural resources, and to the ownership of these resources. This has three aspects.

- Achieving integrity in the way in which Aboriginal rights and interest are reflected in our natural resource use system, as in other aspects of society;
- Creating opportunities for less advantaged individuals to live out meaningful and enjoyable lives; and
- ensuring that communities which might otherwise be disadvantaged, have sufficiently robust economic and social infrastructures to support the people living within them.
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It is within this overlapping framework that the choice of natural resource management instruments needs to be made. Property right per se will not address these needs.

### **Property right myths**

In a strict sense property rights are community, individual, or organisational interests in goods and services that the law (society) will protect. Property responds to social changes, as is evident in property concepts like moral rights for artists, intellectual property in plants, and the call for ownership of one’s genetic information. Property is always a matter of degree (Dragun 1999; Becker 1977; Reeve 1987; Meltz 1995). The term is mistakenly but commonly taken to refer to ‘full blooded ownership’, with complete rights of exclusion, transfer and use. This reflects the social myth, rather than a legal or historical or philosophic truth. Because property rights are central to capitalism, they are often seen as optimal policy responses to environmental problems (Bromley 1991).

In political usage the concept is overlaid by the expectation that property rights should be or are un-attenuated (complete and beyond direct political interference). This is true neither in practice nor historically. All ownership concepts are constructs of society, constrained by society through government. The same political structure which defines and protects

property also attenuates it. This poses no insurmountable problem in the creation of markets, provided that there are sufficient perceived gains from trading to overcome any political uncertainty that may exist.

Property rights are not limited to rights in land (real property). Most market instruments involve the legal right to some thing (whether an interest in a resource, or a right to compensation relating to a resource). The clearest forms of property comprise:

- legally enforced rights to use and enjoyment;
- which allows the owner to exclude others from that use and enjoyment;
- which are freely tradeable; and
- legally secure.

The incentive for private conservation of resources, and the pursuit of innovation to reduce demands on resources, lies in the expectation of future profit. The greater that expected profit, and the greater the likelihood of it being secured, then the greater is that incentive. This is an argument for strong private rights to resources.

Rights-holders have an interest in strong legal mechanisms to protect or extend their rights, to control resource access by those who do not have formal rights, and to limit other people's entitlement (thereby increasing the value of their rights). That behavioural fact lies at the heart of the argument for 'property rights', and the pressure for the extension of these.

However misconceptions are common about property rights and the environment.

### **The common property myth**

Common property regimes are said to lead to degradation of the commons because those using the commons will maximise their gains without regard to the needs of others, including future users. Whilst it is behavioural fact that open access is often accompanied by over exploitation, this argument confuses common property with an open access regime. There are strong critiques of Hardin's observation of the Tragedy of the Commons (see box), both in terms of historical validity (Berkes 1989) and practical implications (Ojwang 1996).

Properly constituted common property regimes (unlike open access regimes) are able to define:

- Members of the group;
- The rules of agreement – unanimity, consensus or majority;
- The basis of right over time, i.e. annually or seasonally;
- Transmission of rights between generations;
- The unit of control – is it vested in a community board, in village, district elders, in households or other entity;
- Means for maintaining compliance with agreed rules and conventions;
- How departures from rules are to be corrected and sanctions imposed; and
- How disputes are settled.

Common property is demonstrably effective in some societies. Even in our own, the corporation is a common property structure that is highly effective for resource management and wealth production.

A well-functioning common-property regime is distinguished by Berkes (1989):

- A minimum (or absence) of disputes and limited effort necessary to maintain compliance: the regime will be efficient;
- A capacity to cope with progressive changes through adaptation, such as the arrival of new production techniques: the regime will be stable;
- A capacity to accommodate surprise or sudden shocks: the regime will be resilient; and
- A shared perception of fairness among the members with respect to inputs and outcomes: the regime will be equitable.

### **The non-attenuation myth**

The second myth is that for market instruments to work, property rights must not be subject to some condition that may reduce the ability of the owner to deal freely with that property (property that is subject to condition is “attenuated”). If the rights holder feels that their share cannot be protected, or that in future what they conserve will be taken away from them, their incentive is to maximise short-term use and to discount the value of future use. The result is harm to the resource

In a world where ‘derivatives’ of transactions such as options, futures, swaps and the like represent multiples of the underlying transactions, it is hard to see how this view can hold. All such instruments are subject to preconditions for the owner obtaining value (other by transferring to someone who has a different view of that same risk). The argument against attenuation also flies in the face of history. The fact that the crown could at will take away any property interest does not seem to have prevented the development of the institution of property, nor to have prevented active markets, resource conservation, and

### **The mythical Tragedy of the Commons**

The total loss of trees on Easter Island, and the extinction of large land birds on New Zealand with the coming of the Maori and then European settlers highlight the danger of sharing a constrained resource without effective rules to limit harvesting. The behavioural effect, unless other structures are in place, is increased competition to consume rather than conserve a running down of the resource to the limit – a dynamic referred to as ‘the tragedy of the commons’.

Hardin explained the “tragedy of the commons” as the situation where each person has an incentive to exploit the resource more rapidly than any other, to obtain the maximum of what is available before it runs out. The main motivation to innovate is to maximise capacity to exploit the resource, or to develop social institutions that will limit exploitation.

Solutions to the potential for tragedy include:

- Ethical codes or religious practice, which limit exploitation; or require resource sharing by those who exploit;
- Rules and sanctions against over-exploitation or inequitable allocation;
- Private or group property rights to provide the capacity to exclude, and an incentive to maintain the resource for future exploitation.
- The creation of specialised functions, where the role (such as hunter or harvester or wise man) carries with it the capacity to control exploitation, coupled with custodianship skills and beliefs.

In western capitalist societies, many of these elements are embodied in private property, including belief systems of respect for property, sanctions for breach of these beliefs, the capacity to exclude for longer term use, and specialized functions which go with ownership and exploitation rights<sup>1</sup>. It is for this reason (rather than because of any magic associated with property right *per se*) that private property is such a powerful behavioural tool for resource management under conditions of (real or artificially created) scarcity.

all of the other behaviours which are said to follow only from un-attenuated property interests.

The behavioural conclusion based on the HBS model is that market instruments will provide an incentive (to trade or conserve) when the perceived degree of opportunity to win resources, factoring in the perceived risk of not being able to realise that opportunity, is greater than the total cost (including the transaction costs), bearing in mind the potential of other opportunities available from the entrepreneur's context. Because 'political risk' (the risk that government will prevent the entrepreneur from realising their profit) is sometimes perceived more highly than other risks, it may be desirable to reduce the possibility of government intervention, but this is far from a precondition to the operation of market instruments.

This theoretical discussion has practical implications:

- Agencies with the responsibility for creating market instruments tend to be influenced by putative need to create absolute certainty for individuals. This pushes the debate towards full property right, rather than triggering a (more complex and uncertain) debate about relative incentives and costs of different forms of attenuation; and
- The challenge of sustainability is about inter-dependence. Western property theory evolved under conditions of resource abundance where individuals could exercise their interest with (relatively) less impact on their neighbours. The modern challenge is to manage resources where impact on others and future generations is a real concern. Attempts to embed un-attenuated rights may inhibit innovation in recognising and managing that collective responsibility and interdependence.

The HBS model highlights that when looking at decision-making, we are not dealing with fixed rules and principles, beyond some fundamental rules about how systems work. The pursuit of resources, the importance of information, the role of beliefs and perceived context, these are relatively immutable elements. But beyond that, the game is fluid, and the ways in which it can be played infinitely variable. To restrict our innovation by creating non-existent constraints will not be to our advantage.

It is at least possible that overburdening the concept of property will result in higher transaction costs, less resource use flexibility, and probably less economic incentive to many resource owners. This view needs some explaining.

### **The private interest problem**

Different societies treat 'betterment' and 'takings' from changes (increase or decrease) in owner rights in widely different ways. In many jurisdictions a gain in value is shared by the community rather than appropriated by the property owner (Bryant 1973). Every society applies its concepts of property within a complex cultural, legal and political framework. It is through these that property right is used to manage the shifting balance between individual and collective interests in resources.

American political history elevates property ownership to a paramount value (Pilon 1995), (Staves 1995). It is assumed by advocates of more extensive property rights in Australia that the adoption of these concepts will rectify problems of balancing individual and

collective interests and ensuring equity. There is little evidence to suggest that this is other than a naive wish. The same challenges in balancing the interests of the individual and society over resources are occurring in the USA (Rowley 1993; Meltz 1995; Pilon 1995). Different states have adopted different philosophic and practical responses to managing these conflicts (Siegan 1976). The key to the differing outcomes is not the selection of property as the core organising principle, but rather differences in beliefs, institutions and management strategies.

Advocates of clearer specification suggest that this is essential to the use of market instruments. It is true that the less the available gains from transacting and the higher the risk of loss of these gains, then the less interest there will be in trading. The inverse is also true – markets will emerge for valuable resources even when there is some risk of loss of these gains through chance or expropriation. Traders can accommodate uncertainty (even if they dislike it), provided that there are sufficient opportunities to gain from taking that risk.

A part of the political case (particularly among rural politicians) for strong property rights is the belief that better specification must lead to more generous payments for loss of use of a resource, or constraints on that use. This reflects a misperception of legal compensation. Compensation for ‘takings’ is based on valuing what is lost. The unfortunately low economic returns achieved by many Australian resource managers suggests that a rights-based compensation approach may be less than could be obtained from a political adjustment mechanisms. If the political value of votes is higher than the economic value of resource use activities of the voters, then moving to an economic valuation of loss of use interests may reduce the compensation for those losses.

### **Why ask for a rethink?**

The authors of this paper are not anti-property, and certainly have a lot of sympathy for the plight of resource users. We share the concern about the confusion, complexity and unfairness in the regulatory system. However these problems will not be corrected by a misapplication of property concepts.

We stress these issues not to downplay the importance of ownership, trading and compensation, which are all associated with property rights and the use of markets to support sustainability. Rather, we wish to highlight that this association is not the same as causation. ‘Property’ and ‘rights’ (the words) do not by themselves bespeak any necessary improvement in the mechanisms or outcomes of the constant adjustments that occur between private and collective interests in society. Placing too heavy an emphasis on property right specification as a solution may result in at least disappointment, and possibly make the achievement of some of the outcomes desired by its advocates more difficult.

Will a change in venue from the political arena to the courts assist those who are seeing ‘property’ and ‘rights’ as the key to a better deal? It seems likely that it will provide more work for lawyers, but it is far from certain that it will make the situation better for resource users who want to improve their lot. Only if the advocates believe that the courts will value their interests far more highly than the political system will, does the pursuit of more rigid right definition make sense.

## **The public interest problems**

Overburdening the property concept will raise significant public interest problems, whilst at the same time not being any guarantee of the better protection of the most disadvantaged private interests. Concepts of property work within a legal and economic institutional framework. These frameworks are slow to develop, and do not transfer well (and certainly not immediately) from one jurisdiction to another (Meltz 1995; Ojwang 1996). There are risks associated with attaching too much importance to these concepts:

- a. There will be legal and administrative uncertainty and confusion whilst institutions and understanding develops. This will be reflected in transaction costs, and variability in outcomes. As learning develops, these problems will be resolved but the evolution may take decades.
- b. Litigation is the mechanism for property right protection. We have seen with the explosion of liability actions, the inefficiencies associated with litigation as a means of achieving desired social outcomes. There is no guarantee that the use of property right litigation will serve us any better

Entrenching some resource use interests above others, in effect freezing the status quo, will create greater difficulty in the future in reorganising interests and responding to community interests and changed environmental circumstances. A more legalistic approach to such adjustments may result in delay, and higher total cost (including legal costs as well as compensation) whenever administrative changes to natural resource access are needed to meet sustainability requirements.

It is important that the approach we use to pursue sustainable resource use is fair, flexible and that it provides strong incentives. Overloading the property concept with the expectation that it will provide us with the 'magic bullet' solution is a mistake that will probably embed higher transaction costs and inflexibility, without necessarily benefiting those who have such faith in its power. Property rights are important, and they should not be lightly interfered with. Neither should they be elevated as a solution to issues of sustainability and equity, which they are not.

## **Path dependence – a different view of the sustainability problem**

Our ability to use resource sustainably is constrained. Experiments involving experienced fishers and herd managers have demonstrated that even with the intent of sustainable use, and access to reliable information, the outcome is more often than not over-use. Why? The causes are found in all aspects of decision making.

### **1. Information flows, affected by complexity, filters and time.**

Natural resource yields are the result of many factors, and vary widely from season to season. Weather patterns, complex intersections of natural conditions, changes in management practice or the technology that is applied. The causes of yield fluctuation are many. Even as a resource declines, the periodic yields will go up and down depending on other factors. Declining yield can also be masked by changes in the management of the resource. New technology is applied; holdings are restructured, different management approaches used. Nature rarely provides neat linear signals for resource managers to respond to. Collapse of ecosystems comes in

a rush, only after the accumulating injury is so great that the system cannot compensate.

**2. Capital commitments**

In pursuit of improved yields, use is intensified with the application of more capital and technology. Bigger, more sophisticated vessels, sophisticated herd management and genetic manipulation, increasing investment in land to allow for a scale that makes technology investment viable. These investments increase yield even as the underpinning resource declines. They increase the fixed capital commitment of the resource user, as borrowing locks in their financial obligations. Decline in the resource triggers more intense use, as repayment of the capital becomes the driving concern. For many resource users the freedom to reduce pressure on the underlying ecosystem is available only at enormous financial and social cost, such as through bankruptcy.

**3. Beliefs**

Beliefs are the heart of the resource overuse problem. As demonstrated through the HBS model, beliefs are formed through repeated interactions with the environment, and the pattern of rewards that this gives. Changes in beliefs occur slowly in response to new information and patterns of reward. Beliefs form filters against disconfirming information (Doyle 1997). The belief that declines in yield from the natural world is likely to be temporary, and that the key to success is to intensify the technology and capital inputs to increase that yield, is a response to the experience of resource use. The belief in hard work and more investment as a solution is normal with farmers, fishermen and others who work directly with nature. Such beliefs combine with the lack of economic rewards from ‘non-use’, and the funding pressure of past investment, to provide a powerful barrier to reducing demands on the natural system.

**4. Decision-making structures**

The decision-making structures of resource users are not always well suited to making the complex linkages and difficult choices to change their relationship with the natural world. Even ignoring the sometimes limited educational opportunity for resource use communities like farmers or fishers or miners, such decisions are not ones that can be readily made even with good education and information. The signals are confused, the strategies far from certain, and the requirements to achieve change are not easy to accommodate. System problems require appropriate thinking frameworks, and even among well-educated people dealing with less complex problems these frameworks are not common, (Babu 2000).

**Earth Sanctuaries: Demonstrating the pioneer problem**

Earth Sanctuaries Ltd is the world's first publicly listed company with the core business of conservation. Listed on the Australian Stock Exchange in 2000, ESL restores and manages natural environments to conserve Australian wildlife.

In its brief life it has encountered legal problems in being allowed to keep and conserve endangered species, major stock market compliance issues in achieving listing, and has been engaged in ongoing debates over proper accounting methods for valuing its wildlife ‘assets’. Recently it has undergone a restructure in the face of financing difficulties, but it still survives as an illustration of the coming together of markets and conservation.

[www.esl.com.au](http://www.esl.com.au)

## 5. Time to learn and respond

The reasons for delay in deciding a response to an ecosystem under pressure are evident from the above description of the difficulty for resource users changing their minds about that use. There is a further cause of delay embedded in these problems.

*In reality, there is an additional and time-consuming process of developing and agreeing on institutional arrangements. This process is likely to further delay the necessary actions, hence worsening over investment and overexploitation. In addition, the double-loop learning required to develop institutions to solve the commons problem is likely to be weak. New institutions depend on agreement among resource users, politicians, and in many cases the electorate. Many of these actors have limited knowledge, and in many cases weak incentives to spend time and money on learning. Thus they are likely candidates to suffer considerably from the misperceptions revealed in my studies. With threatened interests at stake, considerable frustration, and incongruent views of the problem, it is no wonder that the process can take too long, be violent, and lead to less than perfect policies (Moxnes 2000).*

What is being described by Moxnes is the challenges at the level of individual decision-making and group decision making, to change resource use even when the harm from that use is increasingly evident. It makes no difference in substance whether we are talking about boat-owners dragging up seagrasses as they anchor over an increasingly rare *Posidonia* bed, a farmer continuing to clear lands even as the economic return from those lands declines, or a city person choosing to water their garden while the lands in the catchment suffer from drought. We are on a resource use path that locks us into unsustainable use. Changing that is the core challenge of sustainability.

That path dependence can lock a society into economic structures that do not satisfy either its economic or social goals, is well documented. Changing the path requires a lot more than the decision to do so. At the individual or organisational choice level, the decision to do so is no small thing. It often means:

- flying in the face of conventional wisdom;
- putting up with the ridicule of being seen as impractical;
- taking on the risks of innovation;
- not being able to access appropriate local knowledge and expertise; and
- doing so without the infrastructures that others who follow the main path enjoy.

It should not be surprising that pioneering efforts are often unsuccessful. What is more surprising is when they are.

The extent of the investment required to shift to a new path is demonstrated by Australia's sustained investment in R&D and support for technological industries, in an attempt to transform the economy towards greater intellectual property intensity and higher profit industrial sectors. It is doubtful that such fundamental changes can be efficiently induced by command and control, as the experience of communism demonstrates.

## **Heading towards solutions**

Having explained why a naive adoption of property rights as a solution to sustainability issues in resource use is inadvisable, it is incumbent upon us to put forward some constructive concepts for resolving these matters. Within these concepts, property is a potential tool to implement strategies, but it is not seen as a strategy in itself.

The key to changing the path of a society and an economy lies in adjusting the resource and knowledge structures of the economy, and shifting the emphasis from the old to the preferred economic structure. It also lies in building up a stock of complementary assets like appropriate capital structures, investment mechanisms, educational institutions and markets to ensure that those who do begin to make the change do have access to what they need to be successful. Above all, it requires that there be sufficient incentives to individuals to overcome the risks that are perceived in any change.

### **The advantage of market solutions**

Regulation or taxation are instruments of government, and restrict what people might do, or divert some of their resource. A market instrument involves restriction, or redirection of resources, but it has the advantage of someone winning increased opportunities. Action by government is an exercise of political power, private market activity is an exercise of the right of an owner to set price how they wish, and to control access as a privilege of ownership. This is an activity in which most people have a personal interest, as owners of property who wish to see their own rights respected. Violation of an owner's right is not undertaken lightly, whereas 'beating the government' can be the subject of pride and hero worship, much celebrated in our history.

Regulation relies on technical description, through law, of the rights and wrongs and mechanisms in use. It is complex, wordy, and subject to debate and interpretation. For the most part ownership is culturally understood and rights and obligations widely accepted as part of the natural order of society. As a result, regulation is far less intuitive, and often intimidating to the general public. Criticism and resistance are a result.

The uptake of government incentives can also be constrained by suspicion, and/or the unwillingness or inability to cooperate with administrative requirements. Many incentive schemes require documentation and qualification steps, and these can be unwieldy or discomforting to those who are unused to or intolerant of bureaucracy. Government incentive schemes are tax-dependent for their funding, and therefore will always, directly or indirectly, encounter resistance to increasing the share of total wealth that is distributed through government.

A further consideration is capacity to fund whatever instrument is selected. Regulation is not self funding for government, neither are incentive schemes. Government investments in sustainability compete with national defence, social security, healthcare, the arts, industry development and the entire myriad of competing demands on the public purse.

Market instruments involve a balance of 'wins' and 'loses' within the market, since for every seller there must be a buyer, and for every expense to someone there is an income for

someone else. There is always someone who will fight for the right to win. This is not always the case for government initiatives, since it seems that to promote green taxes or increased expenditure on the environment is not a recipe for political success, and whilst to vote in a regulation is always possible, to vote for the expenditures to make a regulation effective seems to be far more difficult.

The final consideration will seem trivial to those who discount the importance of what they see as artificial economic measures which do not really measure welfare and sustainable quality of life, but will be seen as powerful for those who understand the power of artificial numbers that govern much of our lives. Government action does not produce wealth. By definition, it is a consumer of wealth.

The creation of a market instrument is by definition a creation of wealth. Every transaction that follows is a further input into the measured economy, it is GDP. The resulting effort for protection of the environment is assessed indirectly by international credit agencies and comparative charts of economic performance as a positive. Company accounts of those firms which are able to take advantage show the benefit of doing so.

It is important to make the distinction, however, between use of markets and a commitment to a full-blown private ownership regime. Attenuated property interests, or common property, or simply the adjustment of pricing of inputs and outputs, are all market approaches but they do not require the wholesale extension of pure private property concepts to public or unowned resources.

### **Shaping our institutions**

A simple example of the effects of institutional shaping is a team in a ball sport. The allocation of roles and positions, and the role of the umpire, interacts with the team communications, learning and capabilities (as well as the physical arena and the ball), to shape the eventual outcomes.

Institutions are made up of tangible and intangible elements. For example, the institution of marriage involves laws which shape economic relations between the parties (and their dependents) together with beliefs about the nature of these relations, alongside the civil and religious frameworks that create with this special social relationship. To term something as an institution is not to define its boundaries, but to declare its function of ordering the flows of information and resources in society. It is a loose term, for things that can be conceptually re-assembled in many different ways.

Since resource use occurs throughout society, it is not surprising that there are many institutions which shape resource use. Some of the institutions that are involved, and their tangible and non-tangible elements are outlined in the table 2.

Instruments are inter-dependent with institutions. New instruments will trigger change in the institutions that underpin them, whether as changes to tangible structures (like establishing a new market, or a new policing body) or intangibles (like changed skill sets of those who work with the new instrument). Since beliefs and knowledge are partially responses to repeated experience, changes to either institutions or instruments will eventually feed back into the intangible character of all institutions.

This is a two way street. A change to an institution will also lead to changes in the instruments that are applied. For example, new scientific knowledge about natural resource issues will feed over time into the arrangements for managing that resource (subject to transaction costs and filtration effects).

**Table 2.** Institutional arrangements relevant to sustainability

Institutional arrangements	Tangible aspects	Intangible aspects
Law	Courts Lawyers Judges Police forces	Judicial culture Concepts of justice Decision-making through precedent
Politics	Parliaments Political parties 3 levels of government Commentators Elections	Political beliefs Social philosophies Alliances and arrangements Lobbying
Economics	Markets Businesses Analysts Interest groups Production resources	Capitalist beliefs Value Economic techniques Aspiration Trust in institutions
Information	Media Educational organisations Industry associations	Professional beliefs Decision methodologies
Knowledge	Scientific organisations Engineering organisations Professions	Scientific method Knowledge diffusion processes

Institutions also interact. We have already seen that the market, politics, and law interact along with the state of knowledge and the available information, in the ways in which resources are used and protected. Change in one institution in society will eventually lead to some other change in another institution. Equifinality is a fact of the social system, and therefore of institutional change.

### **The HBS and institutional reform**

The underpinning requirement for instruments to be fully effective (regardless of whether they are market or regulatory in nature) is that they align with the institutions of society. Where this is the case it can be expected that the turbulence associated with transaction costs, filtration and delay will be minimised. Where there is a misalignment, this turbulence can be expected to play a far greater role in the outcomes that are achieved.

Institutional arrangements shape the two flows that lead to change in societal decision-making. The first is the pattern of resource flows, and the second is the flow of information. These two patterns interact.

## **Shaping force 1: The direction, strength and duration of resource flows**

The institutional arrangements that allocate resources are central to the operation of the HBS and the pattern of choices that are made within society, by organisations and by individuals. There are two aspects to this.

### **1. The reward pattern**

The expression “what gets rewarded is what gets done” encapsulates the basic mechanism through which rewards are linked to behaviour.

### **2. The capacity to implement**

It is not sufficient that good decisions be made; the decision-makers have to be able to give proper effect to them. A well-meaning decision maker can do harm through poor implementation, because of inability to access resources or because the wrong resources are applied to the task.

The institutional arrangements that shape resource flows are the market, and government (regulation). The justice system is part of this framework, as are government policy-making processes.

## **Shaping force 2: The content and duration of information flows**

Information flows shape choice at a number of levels. The power of these flows is a function of their content, the ‘weight’ and credibility of the message, and its continuity. There is a number of aspects to information flow that relate to sustainability

### **1. Signals of benefit/dis-benefit**

If the available information suggests that resource-conserving behaviour will be rewarded then it will shape decisions towards that behaviour. Sustainability will be enhanced by patterns of signals that highlight relevant benefits from resource conservation, and delayed by signals that stress consumption.

### **2. Signals of feasibility**

If a sustainability choice is presented as unfeasible, or there is no credible information about how to make the choice feasible (such as where and how to access supports) then the likelihood of decisions in this direction being pursued is reduced. Information which leads decision-makers to the resources they need to implement will also support sustainable choices.

### **3. Knowledge and decision ability**

The decision making abilities and approach of the resource user or manager will determine the information they can use, and the way that they will process it. Education is needed to make it feasible for decision makers to use available information, and structure it in ways that will support sustainability.

### **4. Persuasion and motivation**

Persuasive information comes in many forms, with differing degrees of effectiveness. The consistency of the message with self-interest, existing beliefs, and the credibility of the source, will substantially determine its persuasive effectiveness. Credible information from credible sources, that promotes ‘pro-sustainability’ beliefs, is needed to accelerate the societal adjustment to resource use efficiency and conservation.

### **5. Data for decisions**

It is not sufficient to have a desire to make the right decisions, nor even to have the

analytical ‘tools’ to do so. If reliable data are not available, the end result will be inability to make the right choices. Data about the economic and social impacts of unsustainable use, or about the state of natural resources, is needed in forms that are directly applicable to decisions, at a time when those decisions are being made.

**6. Transaction cost reducing information.**

Sustainability will typically be enhanced by reducing the transaction costs of conservation (and increasing the costs of exploitation). Transaction costs are often failures of information. This may be information about the full costs (externalities) of resource use behaviour, or information to make markets or regulation effective, or information to bring those with problems and those with solutions together.

**7. Time lag reducing information**

Latency is an information problem that delays effective response to environmental issues. It affects all parts of the HBS, from the initial capturing of information from and about the environment, through the processing and decision-making steps (which can involve complex negotiations with many participants), and eventual allocation of resources in response to decisions. Mechanisms to speed up these processes include better natural resource monitoring, improved communications, more effective education, and more efficient giving and receiving of instructions.

## **Intervention design principles**

The foregoing analysis defines the performance criteria for institutions and instruments that will be needed to deliver sustainable resource use in Australia. It is the size of the sustainability gap, the impact of the tyrannous equation, and the limitations of the capacity for sufficiently effective action by government, that determine these requirements. We have no choice but to pursue a path of innovation above all, and within that framework to put in place more efficient institutions and more effective safeguards than we have today.

First. The approach must stimulate and allow significant innovation in the economically productive efficiency of resource use, at two levels

1. A transition to a technology and services intensive economy, reducing the strain on natural resources to produce wealth.
2. Achievement of far greater services value from the resources that we do harness for productive use, including more sustainable consumption patterns as well as more efficient use of natural resources in production.

Second. The approach must stimulate and allow significant innovation in the protection of resources that are not essential to efficient and profitable production, at four levels

1. Reducing perverse subsidies and preventing inadequately priced spillover effects of both production and consumption;
2. Reinvesting substantial resources in the protection and rehabilitation of environmental capital, to allow future natural service benefits to flow;
3. Creating effective safeguards against undesirable uses of the environment, including:
  - i. Unpriced or insufficiently priced use of resources;
  - ii. Mismanagement or catastrophic accident;
  - iii. Cumulative incremental harm to the environment.

4. Institutional failure by those agencies charged with protecting and/or rehabilitating our natural capital.

Third. The approach must minimise the cost of government, by

1. To the greatest extent possible making the role of government that of ensuring the integrity of the natural resource management system including:
  - i. Managing population, industrial development, social support and other policy settings within a framework of sustainable resource use, not as independent considerations.
  - ii. Integrating into all government communications and resourcing, and into resource use by government, a central emphasis on practical action on sustainability.
  - iii. Ensuring that the public have unambiguous information about the condition of our natural capital, the rate of its depletion, the implications of that depletion, and the directions for change that are required to ensure sustainability;
  - iv. Ensuring that there is a powerful safety net against failure of voluntary and market instruments, and against increased harm to the environment, and that this net strengthens as the pressure on these resources increases;
  - v. Ensuring that the agencies responsible for managing and controlling resource use activities are sufficiently resourced, with clear incentives and accountability, to fully ensure that the underlying limits to use are respected regardless of other political or financial pressures.
2. Ensuring that regulation has integrity, by ensuring that funds available for implementation match the demands of implementation, and that as funds availability shifts regulatory instruments are adapted to fit with the available implementation capacity.
3. Managing transaction costs as intrinsic in the mix of instruments that shape resource use behaviour, by
  - i. Designing regulatory instruments to allocate the transaction costs (including the default cost of failure of regulation) to discourage environmental harm,
  - ii. Ensuring that transaction costs systematically discourage those activities that have the potential to harm the environment.

Fourth. The approach should be designed so that information can be readily accessed and understood by those whose behaviour it is sought to change. This requires

1. Reducing administrative complexity including rationalisation of the range of regulations and administrative bodies, consultative bodies and others.
2. Redesign of processes using quality system concepts to minimise waste and confusion.
3. Investment in transparency and providing real access to natural resource, policy and regulatory information for the community.
4. Full public accountability for outcomes relative to policy, which in turn requires that natural resource policy have clear outcomes specified and measured and reported.

Fifth. Innovation and investment in the delivery of social equity. This requires

1. Acceptance that the operation of markets, and the needs of sustainability, can cause inequity, coupled with a firm commitment to pursue social equity as a distinct and important aspect of natural resource management.
2. Social equity objectives for natural resource use be clearly defined, including specification of national goals for
  - a. Embracing Aboriginal interests in natural resources;
  - b. Ensuring access and use opportunities for all Australians; and
  - c. The health and welfare and opportunities of disadvantaged communities, including regional towns and villages.
3. Development of funding mechanisms, associated whenever possible with market initiatives for sustainability, and economic opportunities through natural resource use, to provide an economic base for achieving these objectives; and
4. Modification of natural resource management instruments, both regulatory and market, to ensure that they do not compound the challenges of achieving these stated objectives.

Whilst the focus on particular instruments, or the entertaining debate about regulation versus markets, are understandable as clumsy early attempts to come to grips with the changes required, they are in the end result pretty flimsy forms of addressing the challenge we face. Institutional change, to create a context for systematic change in behaviour which efficiently harnesses both market and regulatory elements, is essential. This is a major endeavour, and one that cannot be achieved without a more serious tackling of the fundamental issues of human social behaviour.

This paper is a call to tackle the challenge in a much more serious and comprehensive way than we have to date.

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