Chapter 6 – Rights Markets

In chapter 5 we considered to reshape existing markets for goods and services towards sustainability. We reviewed how changing information flows, the relative price of less harmful products or services, adjusting the decision-making criteria of purchasers, and facilitating beneficial transactions can harness market mechanisms to promote sustainability. These mechanisms change the existing market structure. An alternative set of market mechanisms involve the creation of markets in the right to access natural resources. Creation of a market implies that there will be a restriction on the supply of these rights (generally through government licensing of access) and a freedom to trade these rights between potential users of the right.

These mechanisms further harness profit-seeking to the aim of resource conservation, and open up the potential for entrepreneurs to use their creative forces in the interest of sustainability as well as profit. A user who can meet their productive needs with less of the resource than their entitlement allows them can now obtain an additional profit, by trading that right to others who are not as efficient. As there is now both a benefit for relative efficiency and a cost for relative inefficiency, there is an incentive for profitable natural resources uses which increase the productivity of natural resource use (including the elimination of costed harm to the unused environment). The incentive to innovate is further leveraged if supply becomes constrained and price increases. Provided that the supply constraint does reflect the underlying natural resource condition, it is possible for pricing to increase, innovation to increase, and the pressure on the resource to be limited.

Rights markets replace government pricing and resource allocation with market rationing through price that is set by supply and demand. Frequently the price that is set through the market will be greater than the price that might be set through politics. The greater the cost of natural resource use, the stronger will be the profit incentive to increase productivity. An interesting observation is that price increases imposed by the market seem to be far more acceptable in the community than price increase imposed by government. Perhaps this is a reflection of the acceptance of the legitimacy of the profit motive, and the right of businesses to maximise this.

Governments also feel there is a benefit in reliance on the market. By using markets, they can avoid decisions that require the reallocation of funds from other public expenditures, or increases in taxes. That is not to say that those who are given resource access through markets, or who are denied what they consider to be traditional use rights, will not at times call on the public purse to compensate them for changes to their entitlements. Entitlements provided at one point in time may need to be amended under changed circumstances, giving rise to calls for compensation.

Prices perform two other important beneficial functions in rights markets. Firstly, they are the mechanism to allocate resources to users who most value the resource. Generally this will be the most productive use as a result of either the value of the output being high or innovation leading to greater output efficiency for a given unit of the costly inputs. Secondly, price can compensate for volume changes. Since price increases with reduced supply, reduction in supply give a price advantage to rights holders. This can wholly or partially compensate for reducing the amount of available resource without having to draw on public funds to do so.

The effective operation of markets enables more options to maximise resource productivity without environmental injury. Many farming and industrial resource use decisions are attempts to manage business risk by transferring this to the environment. For example, the decision to pump water from a drought-affected river is also a decision to try to protect the wealth available from a crop or livestock. By creating a market value for the river, the farmer needs to consider the run down of that asset together with those of other wealth-producing assets. Finance mechanisms like insurance, futures, options or other derived instruments become viable means of protecting the asset and reduces the farmer's reliance on the environment to be the financier of last resort.

There is sufficient flexibility in market instruments to link the right to a resource with custodial responsibility for the resource. Just as it is possible for a bank to say that it will only lend to companies that meet certain accounting standards, or an investor to say they they will only invest in firms that meet certain social performance criteria, so to it is possible to say that a natural resource entitlement will only be maintained for so long as the resource user meets defined resource use and management criteria. This opens up a role for governments to impose penalties (such as loss of rights) for misuse of the right. Creating a rights market does not inherently remove the power of government to control abuse (otherwise the financial markets would be even more chaotic than they are today). Peer groups with a shared interest in the responsible use of the resource may also help in policing its sustainable use. Many fisheries resources operate on this basis. We will provide examples of how they operate later in this chapter. Again this is analogous to the financial rights markets. Stock exchanges are typically privately owned markets, but they impose strict governance requirements on all those firms which wish to take advantage of the shared benefits of the reputation of the market.

What is the disadvantage?

Although market instruments do offer many benefits, the fact that in order to operate they must restrict open access potentially increases social inequities, reducing the opportunities of those who do not have sufficient wealth and power to buy what they value. This is not a problem that is fundamentally caused by the choice of market instruments over regulation. Declining resource availability, coupled with growing demands, means that the amount of resources available for free or low cost must diminish. When this is further reduced by the (necessary) "locking up" of reserves of resources to allow for protection or replenishment of natural capital, the result will always be increased wealth for the successful in society and diminished opportunities for the less powerful. Privatisation is not the cause of this serious problem, but it is an instrument of it. Doctrinaire opponents of market mechanisms tend to mistakenly see the cause of declining access to resources at the feet of the market, instead of seeing the more fundamental cause in the decline of the resources themselves.

They are right however in pointing to the fact that social inequity is a companion of markets. Markets operate to reallocate resources to those who are best able to maximise profitability, and virtually by definition this will be the successful. Advocates of free markets tend to see this social equity problem with market instruments as a distinct category of policy problems, or to believe that the market will provide a more effective solution than intervention in a market. There are few reasons

to believe this to be the case. Any market mechanism will reallocate resources and therefore have secondary impacts (positive and negative) elsewhere within the social, economic and natural system. One of these effects is to create conditions of exclusion, in effect locking in resource access rights at a point in time, and creating the power to exclude those whose use is not locked in. This is precisely the effect of the creation of a European property rights regime in Australia with settlement, and it is not hard to find the social justice consequences for Aboriginal people.

Another problem with using market instruments is that it is difficult to predict how entrepreneurs will use the rights they have gained. Entrepreneurs seek opportunity wherever it exists, and exploit it. Whatever the framework, they will test its limits. If a market is created, we can expect that the behavioural incentive embedded in that market will be taken to the extreme over time, and that the outcomes will outstrip any imagining of its designers. This will almost always result in undesirable outcomes alongside the desired ones.

Such undesirable outcomes may arise when markets are operating effectively to restrict demand by increasing the value of a resource that is declining in availability. This circumstance provides some with the incentive to bypass the controls. It is a reality that if wealth can be achieved by expanding exploitation of a resource that has been made more valuable by artificial markets, then this will occur. There are more than enough examples of poaching and smuggling to demonstrate this truism.

Such an undesirable outcome may also arise when rights are traded away from traditional beneficiaries. People who used to have access rights will lose them, but may still want to have them (as with the sale of any desirable asset). Those with tradeable rights will try to maximise their interest – achieve the best price. This is good because it encourages resource productivity, but it may not necessarily achieve resource conservation or social justice and equity. Resource use rights will flow to the economically powerful for that is the path to efficiency. But what of the places from where the rights are shifted? What if all the farmers, or all the fishers, or all the small factories in a community sell their resource use rights? The effects on employment or on the surrounding communities are part of the cost of that “efficient” use of resources.

We provide this discussion of the disadvantages of market instruments to dispel any naïve notion that they can solve the social justice issues inherent in achieving sustainability. Market instruments have an important role to play, but we should keep in mind their limitations. We will address some of the social justice issues later in this book.

Creating markets

There are many variations in how market rights instruments define interests, limit or facilitate trading, reduce or increase permissible environmental use, and manage the security and interests of rights owners.

To create markets, all that is needed is the ability to control access to some valued resource, and create a right (usually tradeable) for a share of that restricted access resource. Broadly, there are three ways restrictions are imposed:

1. The creation of a "cap and trade" instrument. The level of total exploitation is set, and shares in that capped exploitation are issued. Anyone wishing to increase their use beyond their share must purchase another's right to do so. An example is water rights on regulated rivers.
2. The creation of a tradeable credits scheme, under which those engaging in resource depletion or use are limited in their activity, unless they purchase the use rights from some other person. For example the imposition of emissions limits on electricity generators or on mine discharge within a tradeable credits program.
3. The "natural" development of a market as a result of restriction on access to resources. For example, the markets for sand, clay or soil were once open access but are now constrained by environmental protection rules and licenses.

Capped demand instruments

"Capping" a resource prescribes that only a limited amount of it may be harvested or otherwise utilised. For example a cap may determine how much water can be drawn from a river (harvesting cap). A cap may also determine the level of pollutants allowable into the environment (discharge cap). A cap places a limit on supply, or environmental capacity (in term of receiving pollutants) and in doing so creates a potential market for the rights to access.

All capping mechanisms have two initial requirements to enable them to operate:

1. The capability to define the natural resource; and
2. A monitoring and control mechanism to ensure the cap is not exceeded.

These requirements mean that both technology and regulations play important roles in the success of capping programs. Technology is important for defining the natural resource and its capacity, measuring the overall use and metering the right-holder use, and monitoring the total program. Regulations set the standards for the operation of the system and ensure that the cap is respected.

Using a market structure to implement the cap means that a group of people, apart from the regulator, has a strong incentive to make the control work. If a share of the capped exploitation is owned and can be traded, all who are sellers of exploitation rights have a reason to ensure that the cap is credible as this is fundamental to them maximising the value of their interest. As the available supply diminishes, the value of their interest increases. This increases the likelihood of private enforcement of controls on unlicensed access, aligning the interests of at least some of the more powerful in the community with the interests of the government.

Capping instruments have an ancient history and have been utilised by many communities around the world. The CATO institute. a non-profit public policy research foundation headquartered in Washington, D.C., provides a wonderful example of the operation of an ancient capping system:

> Muang faai *is a 1000-year-old community river water regulation system, which still operates in many areas of Thailand. River communities negotiate rules governing who receives how much water and when, and they implement those rules through adjustable weirs made of bamboo and teak poles. By adding or removing poles, by raising or lowering the weir's*

height, by scouring the river and irrigation beds they ration water to all users. Upkeep of the system is proportional to landholding. Taxes to maintain the system are paid in the form of labour.

The system is frequently conflict-ridden, and constantly adapting through trial and error and discussion. The system recognises that each community living along the river needs the river to irrigate its crops, water its animals, and provide for its members' personal needs. The system also enshrines the reality that land-use practices along the river are everybody's business because land-use affects rates of erosion, and thus contamination of the river and irrigation systems. In places where Muang faai *operates, upland forests, vital to bringing the rains each season and controlling runoff, cannot be cut without permission.*

Muan faai *has proven to be the basis of a sustainable agricultural system in Thai river catchments for more than a thousand years. It is successful because people who are directly affect by degradation of that environment make decisions about the environment.*

(http://www.cato.org/pubs/policy_report/prop-pr.html)

Non-tradeable interest

The *Muang faai* is an example of a non-tradeable interest in a capped resource. It is the simplest form of capping and basically imposes a limit on harvesting. This imposition is the same as if there is a physical limit on the resource. It is the regulator rather than the physical environment that creates the restriction.

Non-tradeable interests are useful but there is little incentive to conserve or to innovate to use less than the allowable cap, because you do not achieve any additional benefit through this conservation.

Share of a resource

The *Muan faai* is also an example of an interest based on a share of a resource. If the season is bad, all entitlement holders get a smaller volume, even if they maintain the same percentage of what is available. Where the individual, or group, obtains a share (rather than a fixed volume) of the total resource, the dynamics of use are different to those where the interest is in a fixed volume of the resource. The self interest is in maximising the size of the "pie" in which all will share; of growing the collective resource, to reduce waste, or to "win" in repeated rounds of bargaining among interdependent resource owners. Repeated bargaining is likely to lead to winners emerging mostly through collaboration rather than cheating each other. Just as in the *Muan faai* system, mechanisms or rules of communication and negotiation will emerge among the shareholders.

The draw-back to the non-tradeable system is that the incentive by all stakeholders to cooperate depends upon the degree to which they feel secure that they will benefit from conserving. If they feel that they will lose the benefit of their conserving behaviour they will not conserve. There are basically two ways that conservation can provide a benefit – either the unused interest can be traded, or it can be saved for future years. In the case of a share of river flow, saving the flow is not feasible, but in some other instances it is possible, such as deferring a right to remove vegetation or to

harvest a permanent population of some species. Where it is possible to defer use of the right, this is known as 'banking' that right. Regardless of whether the means to obtain the value from conserving is through trading or banking, to be fully effective a market instrument should provide an appropriate degree of resource security to ensure that the conserver is confident that they will be able to reap the benefit. This is why property rights are so often the catchcry of those who propose market instruments (though as we shall later see this cry is often poorly informed).

Fixed volume allocation

To overcome some of the uncertainty of access to a natural resource, it is possible to allocate a volume (rather than a percentage) of the available resource. This method is extensively used for allocation of water rights, reflecting an understandable desire of water users for certainty of water access.

The behavioural effect of fixed volume allocations is different to a percentage share allocation. Entitlement to fixed volume masks interdependence and community interest. The extractor now has a legal right to a volume, regardless of other users. In the absence of some additional incentive to conserve, an entitlement to volume effectively invites full exploitation of each person's allocated volume regardless of the effect on the total resource.

Natural systems however are rarely sufficiently reliable to ensure that for all time, all entitlements will be able to be met. Entitlement to a particular volume in the face of natural resource fluctuations creates four possibilities:

1. Conflict when the total available resource at any time is less than the sum of entitlements; or
2. Over-exploitation if the total available resource is less than the entitlements and there is no mechanism for imposing an effective cap.
3. Compensation being required if the available volume is less than the allocation. In effect this transfers risk of resource fluctuation to whoever is obliged to compensate; or
4. An incentive for whoever is obliged to compensate or maintain the cap to under- allocate, with the expectation that the under-allocation will be a buffer against fluctuations.

Stepped allocation

One method to overcome the behavioural disadvantages of volume-based sharing is to use "stepped" allocations. This has some of the character of a volume entitlement, but takes into account to some degree the natural characteristic of fluctuating availability of resources. In this approach specified environmental conditions modify the rights holder's absolute entitlement (in terms of volume, or the timing of access, or special conditions). For example, a water user may be prohibited from pumping water in a "cease to pump" condition once the flow in the river falls below a critical level, or fishers use their right to fully harvest if the fish population falls below a threshold. Under some regimes, compensation arrangements come into play when prohibitions occur.

Whilst these approaches reduce the potential for harm from a fixed entitlement, they create an artificial sense that access to the resource is constrained by rules rather than by ecological limits. The behavioural consequence is repeated legal and political re-bargaining, delaying the process of adaptation of use to the ecological context. Rights holders become involved in "gaming" the rules and getting around extraction or use limits believing they are outwitting bureaucracy rather depleting the resource. In this setting rights holders' innovative capacity may be directed at winning the games for access rather than increasing the sustainability of the resource.

Where the entitlement is based on a share of a resource, it is relatively simple to further protect that resource by reducing the volume that may be extracted, which increases the price that may be paid for each entitlement through the automatic operation of supply and demand. Where the instrument is a fixed volume entitlement, this volume/price adjustment is not as easy, for it involves a number of separate negotiations. To accommodate increased protection there is generally a need for some volume entitlements to be either purchased or surrendered (with or without compensation). It is far less accommodating of changes in environmental conditions.

A variation of volume entitlement which overcomes some of these issues is to use time-limited rights (for example, an annual license) coupled with periodic auctions of entitlements, with the level of available entitlements being adjusted to suit policy or environmental needs. Under some arrangements, every rights holder must surrender a predetermined percentage of their allocation each year, and this surrendered share may either be reallocated (perhaps by auction) or held back. The more restricted the supply, the greater will be the price of auctioned entitlements. This allows a stepped adjustment to changed environmental conditions, and does provide a high degree of legal certainty.

Where some clawback of entitlement is needed, a refinement is to link adjustments to the demonstration of behaviour that is desired. To maximise the push towards sustainability it would be possible to have a system under which those rights owners who fail to achieve certain resource management benchmarks will have to surrender a greater percentage of their interest than those who meet it. Those rights-holders who have been most effective in protecting the resource would retain their rights, and those who have been less efficient must surrender their interest. This can be done with or without compensation. The compensation can be in the form of a share of any auction price of whatever entitlement is available after adjustment for the need of the environment. Given the dynamic of competition, and the economic incentive from efficient use of a resource that is scarce, such an approach should be a powerful impetus for conservation.

For the reader who finds this bewildering, the important thing to remember is that once you have moved to create legal entitlements to a share of a natural resource, and excluded those who do not have that entitlement, you have immediately opened up the potential to create a dazzling array of behaviour management tools. The range and variety is truly only limited by imagination. One has only to look at the variety of derivative instruments in finance markets (insurances, swaps, options, futures and the like) to understand the opportunities for creativity that are unleashed once a natural resource interest becomes a financial instrument. This potential lies within every cap system that has the possibility for trading of interests. We will now look at this type of approach more carefully.

Cap and trade

Cap and trade involves an allocation of an interest in a resource to an owner that can be traded, with the total of all allocations being kept below the target level of exploitation. Such systems are particularly useful when a natural system is potentially approaching the limits of exploitation, and when there are many exploiters causing incremental harm. Cap and trade allows direct management of the outcome – protection of the sustainability of the resource – without inhibiting the operation of the market to adjust use to the highest-value opportunities, or to stimulate innovation to reduce resource demands.

Like all cap system, there is the opportunity to adjust the cap to meet environmental challenges or changes in policy – an important factor when there is uncertainty about the level of exploitation that the resource can sustain or when the condition of the resource varies across time periods. The more restricted the cap, the more valuable the share. The market acts to compensate (to at least some degree) the "clawback" of available volume by an increase in the value of what remains – reducing the call for compensation that is sometimes a feature of non-tradeable caps.

In some programs there is a pre-defined cap reduction. For example, an initial level of allowable emissions to the air may be subject to a planned five percent per annum reduction over a defined period. Alternatively, it may be prescribed that some set level of licences will be bought back by the issuing agency over a defined period. This was discussed above.

Tradeable entitlements

The ability of a rights-owner to trade any part of their entitlement adds another dimension to shareholder behaviour in cap markets, strengthening their incentive to conserve and innovate. The incentive exists regardless of whether the entitlement is a share or a volume, though the behavioural differences between these two approaches are relevant even with trading.

A rights owner who cannot achieve a satisfactory return from the use of the resource can trade it to another who is able to make a better economic use of that resource. Resources tend to flow to the most valued and therefore typically the most economically productive use. There is now an incentive to conserve and therefore innovate in conserving natural resources. An innovator who can improve the efficiency of their use of the resource can profit, by reducing their needs and selling the excess, or by purchasing more of that resource on which they are able to make a higher return than other resource users.

A second effect is to automatically allocate resources to allow the least cost resource conserving alternatives to be exploited. Resource users have different abilities to reduce the environmental costs of their consumption. For example, a new factory may have a low cost of adding pollution control, whereas an older facility may have a much higher cost. Under a trading system there is an incentive to exploit low cost opportunities, and an ability of the higher cost producers to purchase entitlements to allow them to stay in operation – though with the higher cost of inputs to penalise them for natural resource inefficiency. This is an impetus for those who create environmental damage to innovate to reduce the total resource cost, and optimise the economic value of the resources that are consumed. Moreover, higher-cost producers

may cut back production (and so resource exploitation), or cease production if their costs – including the cost of rights to exploit – exceed their revenues. This may happen when new, lower-cost entrants have bid down the price of the industry's outputs.

Writing for the New York Times Magazine, John Tierney provides a good example of the effectiveness of the cap and trade system:

> *Because tuna were decimated by the old open system, in the 1980's the US government imposed limits on the annual catch. Now each fisherman owns what is called an individual transferable quota – the right to catch a certain percentage of the yearly haul. These quotas, which can be bought or sold like stock shares, are not cheap, so fishermen have changed their strategy. No longer able to slaughter fish at will, they have looked for ways to make the most of each fish. The result has been the world's premier tuna ranches.*
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> *(Tierney 2000, p)*

An important effect of tradability is to reduce the incentive to cheat on the system. Instead, the strongest incentive for many is to preserve the value of entitlements. Everyone who owns an interest has a reason for making sure that everyone else stays within the rules. If anyone is able to circumvent the rules, it reduces their need to purchase entitlements, reduces demand, and therefore reduces the market value of entitlements.

Pooling and bubbles to modify markets

Similar in effect to simple tradability is a system under which a rights owner who has many activities or sites, or a group of rights owners in an area, may pool their interest. For example, a corporation may have a licence to discharge fumes for each of its factories across a region. It may be able to innovate to reduce discharges for one of its factories, but be unable to satisfy the limit for some other factory without cutting production. Under a 'bubble" approach, the corporation will be allowed to group its discharges and licences. Provided that the total of licenses exceeds the total of discharges, it will be free to operate without penalty. A similar concept would be for a community to operate a bubble for all of the factories in its area, or all of its industrial water users.

The advantage of a bubble over a trading system lies in the reduction of transaction costs, and the ability to negotiate a transition plan towards sustainability. A bubble approach is often part of a strategy for an industry or a region aimed at reducing the total resource use load over an agreed period. The bubble provides a low cost way for better scheduling and managing the transition.

Bubbles can influence behaviour in several advantageous ways:

Firstly, an emissions or resource use bubble creates a shared interest in the resource, and can encourage collaboration. That collaboration can be as simple as trading, but where there are other commonalities of interest, such as similar technology or production processes, a bubble can trigger the sharing of research costs or of technical support. The electricity generation industry in Australia has benefited in this way from the use of a bubbles market. In the Hunter Valley, a discharge bubble scheme is

in operation under which coal miners collaborate closely to optimise the discharge of contaminated mine water.

Secondly, bubbles reduce the export opportunity of resource harm. Competition is not socially benign. In some communities, the underlying problem is that financial returns from the use of a resource are low. The adoption of a trading arrangement can result in transfer of economic opportunity outside that community. Indeed, it is possible that the use of market instruments currently advocated by some rural communities in Australia could hasten their own demise - unless they can better manage the risk of resource transfers. An example would be for a rural area to have a bubble boundary established for trading of water or effluent disposal rights, thereby ensuring that no trader could export that right, which would reduce the amount of employment generating activity in that region. The bubble is really a constraint on the operation of the free market, to avoid adverse impacts of that market on a particular area or activity.

Thirdly, bubbles can be used to limit transferability of risks of impact over time and space. For example, an air quality problem may be more pronounced in an industrial area than a country area, or an emissions problem may be more significant in low flow rather than flood conditions. Unconstrained trading can result in emission rights moving where the impact of these emissions will be greater, resulting in further concentrations of air emissions in an urban area, or different emission onto a stressed river system. Unconstrained trading might result in one area having all of the smelters or piggeries or some other environmentally harmful (but economically important) activity concentrated in its boundaries, leading to an accumulation of harms that could not be readily managed. A bubble arrangement might limit the ability of firms from elsewhere to trade into this area.

In effect bubbles set a boundary around a market to constrain the behaviours or the effects of competition to achieve non-economic policy goals.

Rights banking

Banking of funds allows a time dimension to be added to management. It permits borrowing and lending across time periods, and between individuals. As noted above rights banking does much the same. Natural resources such as clean air, water, or wildlife stocks, change their nature and availability over time. Traditionally, we have managed natural variations by carrying out engineering works, such as building structures to store resources, or to retain contaminants. However, when we start trading rights to natural resources, rather than the resources themselves, we are able to use conventional banking (or other financial) approaches. We can borrow or lend rights, issue options over them, and otherwise threat them as if they were financial instruments.

By banking environmental entitlements, a resource use can conserve in one year to over-exploit in future. For example, a factory may have the right to use 100 units of resource in any one year – whether by way of extracting resources, or an entitlement to emit contaminants. If it is able to reduce its demand on the environment to 50 units, under a banking arrangement it would be able to carry that saved 50 units to the following year, increasing its entitlement to 150 units. Generally banking systems are designed to bring forward conservation measures by providing security in the ability to benefit from doing so.

Banking approaches can be managed in many ways. For example it is possible to have banked rights appreciate (next year you can emit 160 units) or depreciate (you can emit 140 units next year) or made conditional (you can only use your banked entitlement if the total of all other entitlements is less than 500 units). The arrangements can accommodate changes to timing and magnitude of environmental adjustments, and smooth out fluctuations.

Credits: an alternative to capping

Capped allocations have an advantage when the problem is an accumulation of diffuse harms where the harm is approaching a critical point and it is necessary to ensure that the critical point is not reached. Some resource issues are not like that. For example, we may want to encourage improvements in environmental performance but cannot establish a cap level – perhaps because of unreliable data. Or maybe there are political barriers to establishing a cap.

Under a credit scheme, each potential harm-doer is issued a right for a level of harm - a quota to emit or extract. Where the aim is to stimulate improvement in environmental performance, that credit is set in line with best-practice use of the environment. For example, best practice industrial activity might mean an emission of 1 tonne of contaminant for every 10 tonnes of production. In an industry with10000 tonnes production, it would be possible to issue a total of 1000 tonnes worth of credits to contaminate without setting a cap, allocated on the basis of historical production figures. Provided credit holders stay within their quota, they can continue their activity unhindered. If they want to go beyond that level, they must either incur a substantial penalty, or buy credits from rights-holders who can carry on their activities whilst staying below their quota. In some instances, the control on exceeding the quota is not a fine, but loss of access to the resource; for example, automatic loss of license to emit or to extract once they exceed the available credits in their quota.

Credits programs ensure that the total harm to the environment remains at or below that which would apply if every user implemented the desired level of use. It is easy to arrive at this level. Simply multiply the individual use quotas by the total number of users and verify that this is below the acceptable level of environmental harm or resource demand. Those users who are able to do better than a benchmark level can sell their credits to those who cannot reach the desired standards. They profit from their better management, and have an incentive to innovate to further reduce harm. Hopefully those users of natural resources who will cause greater harm than their credit allows have a strong incentive to reduce the level of harm because otherwise they will either have to buy credits, or incur the penalty.

The program depends on the regulator ensuring that the credit allocation approach has integrity: The benchmark set must be scientifically credible, and result in an acceptable net load on the environment; the system for transactions to ensure that the allocations are recorded and enforced must be accurate to maintain the confidence of buyers and sellers; and the regulator must set a sufficiently high price for exceeding the allocation to ensure an incentive to reduce the impacts or purchase credits at a high enough price to create a market for impact reduction.

If a regulator is able to set these conditions, the market can evolve without further intervention. It is not necessary for a regulator to create or operate the market. If the

underlying constraint is credible and tight enough to create an economic reason to trade, a market will evolve. However, that does not preclude the government – or other regulator - from facilitating the market by setting up a trading mechanism or by providing incentives to improve resource management.

It may be possible, for example, to use a system of credits to control pollution into a water-supply catchment. A traditional regulatory approach would ban activities that could reduce water quality, or impose contamination prevention requirements, which restricts commercial activities of all landowners. Proposal for high impact activities - such as a feedlot, an abattoir, or a polluting factory – would probably be prohibited. But under a credits scheme, these uses can be balanced. If the proponents of the high impact activity can show savings in contamination elsewhere (and there is a sufficient profit to justify the purchase of the required credits), they would be able to proceed. The result is relatively low-value environmental harms are replaced by relatively high-value environmental harms, but within the limits of the total available credits.

"Green" offsets

A variation of the credits arrangement is to allow a resource user who will exceed their available credit to compensate for this by an equivalent or better "saving" of the same type of harm elsewhere. For example, if a developer under an offsets program wanted to destroy a wetland to put in place housing, then the developer would have to find a roughly equivalent area of degraded wetland elsewhere to restore or protect as an offset.

In some designs, the offsetting obligation can involve long-term management, which can provide a financial basis for work elsewhere to protect or rehabilitate. This can provide an economic incentive for other resource owners to (for a fee) manage for conservation the offset resource. For example, in the USA, farmers contract with developers to establish or manage wetlands on their property for conservation, as an offset to wetlands that will be removed by developers on their land.

Offsets have also been used to require electrical generators to offset air pollution by (for example) buying back old polluting motorcars. This scheme is not only a cost-effective way of reducing pollution without adverse impacts on energy production, it also has other benefits, enabling greater recycling and discouraging dumping of old vehicles.

The advantage of offset schemes is that they generally attempt to replace like with like[1]. If it is native vegetation or air quality that is harmed, then native vegetation or air quality will be the form of replacement.

The disadvantage of offset schemes is that they do not lend themselves to the same kinds of financial market dealing as other market instruments. Consequently, they do not offer the same economic performance benefits of innovation and compensation. In addition, it is important for the regulator to design the schemes to ensure that the responsibility for ongoing achievement of the desired outcome stays with the harm

[1] There is a scheme in Germany that allows offsets to be made across different classes of environmental harm, but this seems to be an exception.

doer, and not the regulator. For example, the regulator could require that harm doers identify the offset, guarantee the outcomes over time, and report on the performance.

Another issue regulators should consider before deciding on an offsets program is that of equivalence. Ecosystems are not alike. One wetland will not be the same as another; old growth forests are not the same as new growth forests. To promote a system that treats ecosystems as if they were the same would simply contribute to the incremental degradation of the environment. Offsets, therefore, operate better when the physical component, for example chemical pollution, can be well defined.

If we do want to use offsets for ecosystem issues we should consider requiring the offset to be leveraged by a larger volume of conservation than the volume harmed. It is possible to require that the loss of one acre of pristine wetland be compensated with 5 acres of regenerated wetland, or 10 acres of artificial wetland, if that greater volume is necessary to ensure both some ecosystem equivalence, and also to provide a strong disincentive from treated the higher quality resource in a cavalier fashion.

Contracts are forms of private market regulation

Both cap and trade interests, and credits work on the basis that the harm prevented is due to accumulation from a range of sources. If the harm done is of such a critical nature that it absolutely cannot be permitted (such as release of toxins into a drinking catchment) then regulation becomes the tool of choice.

Regulations have some basic processes: rules are set; an inspection system is established; a breach of rules is detected; and a penalty is imposed. Usually we implement this process through an agency of government, but it can also be provided through the market – as long as the parties are identifiable – by using contracts. Generally contracts describe behaviours that will result in a termination of the contract or a financial penalty. For example, it is common for apartment buildings to have leases (contracts) that prohibit pets. In the case of market instruments, as with any type of contract, it is possible for the parties to define and proscribe (or penalise) virtually any behaviour that they consider objectionable. It would be possible to create requirements that parties to a trade all be certified under some collective standard of natural resource management, or that purchasers of an interest use it only under certain conditions (thereby further restricting the formal legal entitlement). It is not the case that once a market instrument is created, the ability to regulate is reduced. In many ways the potential for regulation is increased by the addition of the possibility of private regulation on top of public regulation. What does happen with the creation of a market instrument is that the price of government intervention does increase for intervention reduces confidence in the security of use, and prejudices the property right characteristic of that interest.

Civil Courts have a long history of upholding contracts. The language of contracts is somewhat different from that of regulations – penalties are damages rather than fines – and so are community attitudes. Generally we seem to more readily accept penalties or pricing attached to contracts, than license fees attached to regulations. The potential for private regulation by contract replacing public regulation through legislation exists along with any creation of private market instruments. We shall see in a later chapter that this potential does contain many possibilities for stronger natural resource conservation within a private markets context.

Transaction costs in markets

We have raised transactions costs issues a number of times in the above discussion and think it is worthwhile to remind you of its dimensions. In particular, five aspects of buy and sell processes contain transaction costs:

1. *Specification*: Where there is room for dispute about what has been bought or sold, then parties invest in specification, or the party who is acquiring will bear the risk that what they get turns out to be less than what they sought.
2. *Ensuring security*: If it is possible for some other party or the State to dislodge the owner, then the owner will factor in that risk in the price they are prepared to pay, or take on some other expense - such as insurance or some other transaction that will allow them to accommodate the risk.
3. *Finding transacting parties*: If it is easy to find counter-parties to participate in the transaction, then competition to drive market processes can work well. If counter-parties are difficult to find, the value of the transaction will have to be great to justify the efforts and delay involved, and competition will be weak in the market.
4. *Term setting*: If the process of bargaining about terms is messy, then the costs of transacting will increase. Standard terms can reduce the costs, provided they do not introduce other transaction costs such as uncertainty, or reduction of the value of the interest that is being sold. Standard terms are often the by-product of the creation of tradeable rights through legislation.
5. *Efficient logistics*: the logistics costs of some transactions – for example, transport costs – can be disproportionate to their benefits. This is particularly the case when the transactions are intermittent; the parties are far apart, where the documentation is complex, and where physical handling is cumbersome. A logistics system - such as a specialised transport system backed by automated processes - can have a marked effect on the economics of transaction. Innovations in logistics are important to recycling initiatives such as extended producer responsibility for batteries or oil, or recycling of printer cartridges.

Market programs that do not appropriately factor in transactions costs can be doomed to failure. If transactions costs outweigh the potential for gain, then the net effect will be that no one will use the market. In Eastern Europe, in particular, there are many examples of rights-based instruments that simply failed because the uncertainties or difficulties in specification made the transaction costs so high that trades did not occur.

Transaction costs can be a tool

Manipulating transactions costs can be useful to promote certain activities and discourage others in a market. It is possible to decrease transaction costs for beneficial transactions; increase transaction costs for harmful transactions; and ensure that transaction costs are allocated to discourage transactions that will be harmful.

For example, if a resource such as a wetland has the potential to be exploited for mineral content but the tenure is insecure, then it is less likely that a buyer will be

found to take up the mining opportunity[2]. The transaction cost will have limited exploitation. This tactic needs to be used carefully. Insecurity can have the effect of bringing forward consumption, with harmful effects on the environment. If I anticipate that my opportunity to exploit may be taken away, my incentive is to harvest the maximum value today, perhaps to extinction or exhaustion. This happened in relation to broad-acre clearing in NSW and Queensland as a result of threats of regulations to prevent that clearing.

Another strategy may be to make interests more contestable on the basis of the environmental performance of the rights holder (increasing uncertainty for those who are unprepared to meet the requirements of best environmental management practice). It is increasingly normal for land leases to include environmental management criteria for renewal thereby increasing the risk of failing to manage sustainably. The aim is to ensure that those who wish to exploit resources are forced to compete not only on price but also on reduction of risk to the environment. To some degree this is what is done with the requirements for Environmental Impact Statements (EIS) for major developments. A person wishing to carry out a transaction with potential environmental impact is provided with a strong incentive to put forward the least harmful means they can find to exploit the opportunity, for consideration even before they begin any development. The community is able to debate this, and the resource owner's ability to secure the opportunity depends upon the outcome. From the point of view of the intending developer this entire process is a transaction cost, but it is one that places pressure at the design stage on the need to build in environmental safeguards. This is a trigger for the exercise of private sector initiative to protect the environment, and for rapid uptake of best design practices as these emerge.

Allocation of natural resource interests

In his seminal 1960 article in the Journal of Law and Economics, *The Problem of Social Cost*, Ronald Coase argued that over time (assuming low transaction costs) rights will come to be allocated in ways that will optimise use of the resource. But this is true only if initial allocations have been properly considered. Initial allocations shape power in the market, and also have consequences for equity.

If policy makers are attempting to gain short-term productive efficiency, there is a strong case to make allocations along more or less pre-existing patterns of use of the resource. Existing users will have the capital and knowledge needed to productively use the resource, and there will be limited dislocation. If they are attempting to rapidly achieve a shift from less to more productive uses of the resource, then there is an argument that they should use auctions or some other bid process, through which those who value the resource most will pay the most for their interest. If the aim is to achieve an environmental outcome, we should leave a sufficient margin for the environment and ensure that competition for the resource is focused around efficiency of resource conservation rather than profit alone. Or if the aim is to achieve social

[2] Or the price for that resource will be discounted. This reduces the incentive to sell, but also provides a profit potential for a risk taking buyer to purchase and overcome the barrier to their profit.

equity – such as recognition of Aboriginal people's interest in natural resources – then we should build in those aims in the market tools we use.

The eventual choice of a particular market tool is a political as well as an economic one. In Australia, we have tended to align of political and economic decisions along traditional resource exploitation patterns. This is probably suboptimal in terms of the broader economic and social interest but is less threatening to established interests. However, many of the economists we have quoted in this text suggest that since the resource is likely to end up being controlled by the most productive users in the long run, we are probably wasting opportunities to use allocations to further other social and environmental objectives through the operation of markets. To allocate entitlements to the less advantaged, and allow them to use or trade, is a more radical opportunity to achieve social goals as well as environmental aims.

References

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