CHAPTER 7: MANAGEMENT INTERVENTION FRAMEWORK

7.1 Introduction

7.1.1 Poverty and conservation in the developing world

Deliberations on where to focus biodiversity conservation in the developing world (see e.g. Myers *et al.* 2000 on hotspots, Olson and Dinerstein 1998 on ecoregions, Fishpool and Evans 2001 on IBAs; see Ferraro 2003, Kareiva and Marvier 2003, and O'Connor *et al.* 2003 for arguments on including non-biological factors) are largely irrelevant if we cannot determine how to effectively achieve conservation in developing countries. In recent years, there has been a pervasive assumption amongst those involved in international and bilateral conservation projects that poverty is the predominant ultimate cause of conservation problems, and hence that poverty alleviation should be the principle approach to conservation. The World Bank is "the world's largest financier of biodiversity" and has a "poverty-focussed environmental agenda" (www.worldbank.org). Although the remit of the GEF is environmental protection, two of its three implementing agencies, the World Bank and UNDP, are primarily concerned with poverty alleviation. One of the three guiding principles of forest conservation shared by IUCN and WWF is "human well-being" (www.panda.org), and the IUCN Forest Conservation Programme states that "poverty is unacceptable to IUCN's vision of a just world that values and conserves nature. . . Conservationists . . . cannot simply walk away from the issue of poverty and advocate preserving species and ecosystems disregarding the wider social and economic context within which they exist" (www.iucn.org).

The roots of this largely exclusive focus lie in the politics of conservation and the recent revolution in the orientation of conservation agencies. Observations, largely from Africa, that traditional protectionist approaches were unpopular with and failed to restrain local communities (Indamar *et al.* 1999) and were intrinsically unfair (Neumann 1998), married to the more holistic approach to conservation mentioned in chapter 1, fomented the idea that improvements in local community welfare are good for conservation and vice-versa. During the 1980s, the corollary, that integrated conservation and development (ICAD) offered the key to conservation success in the developing world, was enthusiastically adopted by almost all mainstream conservation organizations, and certainly the most wealthy ones. The revolution has been so complete, that in many cases it has been adopted not as a means to achieve an end, but rather as a philosophy or mission statement. In the new political environment, conservation programs have been dismissed as failures if they engendered any element of social conflict**.**

The appeal of ICAD is utterly understandable in that it implies a win-win situation for managers and local communities. Conservationists do not operate in a social vacuum, and especially those working at the field level in poor countries would prefer to benefit the communities around them, rather than penalize them. This consideration is all the more acute for reserve staff who come from those

communities themselves. Donors have been willing to buy into the proposition that conservation benefits local communities, as it implies that a short-term input of funds, enabling communities to appreciate and act upon this, is sufficient to achieve a long-term conservation (and welfare) gain. The ICAD revolution owes much to the nebulous positivism of sustainability. Crucially, ICAD has allowed conservationists to tap into the vastly greater pool of money available for development projects, from which even a modest transfer represents a major injection of funding, prompting Struhsaker (1998) to retort that "funding, rather than conservation, has become the predominant objective of the implementing organizations." Whether or not organizations have been blinded by money, the involvement of development organizations at the inception of a project guarantees that an ICAD approach must be adopted, regardless of any later considerations.

Academic debate over the validity of this approach has been after the fact, and thus far has had little impression on the dominance of ICAD. Nevertheless, criticism has been building over the last few years, based on the general observation that the battle for conservation in the tropics is being lost (Whitten *et al.* 2001), the frequently perceived failure, often at enormous expense, of individual ICAD projects to produce tangible results (e.g. Oates 1999; Wells *et al.* 1999), and comparative data suggesting that development activities and community involvement have little impact on conservation effectiveness of protected areas (Bruner *et al.* 2001).

Some authors have attacked the general complexity, convolution and naivety of ICAD (Ferraro 2001; MacKinnon unpublished; Kiss 2004, specifically on eco-tourism, a component of the majority of ICAD projects), but rather than identifying inherent weaknesses, the concerns of many others have been with general aspects of development project management or simple common sense indications of feasibility, which would seem obvious but have apparently been lacking from many projects. There must be sufficient human capacity and financial sustainability in regard to local implementing agencies, attention to gender issues, and care taken not to raise unrealistic expectations; where sustainable use is a key component there must be a resource that can return a sustainable profit and which depends on biodiversity values (Adams & Hulme 2001; Salafsky *et al.* 2001; Browder 2002). More analytical surveys highlight socio-economic limitations; ICAD cannot combat external threats and is limited in the population it can encompass; tenure over resources and community coherence are needed; and large-scale in-migration is likely to undercut gains (Barrett and Arcese 1995; Noss 1997; Oates 1999; Salafsky *et al.* 2001; Scholte 2003). The proponents of ICAD have responded to a perceived rise in "neo-protectionism" by re-affirming their position that fences and fines ignore social and political complexities and are inherently unjust (Wilshusen *et al.* 2002).

The foundation of ICAD, that poverty is the root cause of overexploitation of the environment, cannot in simple form be true. Poverty influences the effectiveness of certain conservation tactics under certain circumstances.

1) Poverty implies a low opportunity cost to labour, which reduces the costs of resource extraction, but this is only a contributing factor if the depletion of natural resources is

necessarily more labour-intensive than alternate forms of employment. Extraction of natural resources can still be profitable in rich countries. Increasing wages may simply lead to the adoption of more capital-intensive methods of extraction, and may lead to greater local demand for the resources.

2) It is commonly assumed that extreme poverty produces very high discount rates, and hence unsustainable resource use, because people have to supply their immediate needs. But this simple assumption is starting to be challenged on the basis of the actual behaviour of extremely poor people at times of shortage (Moseley 2001). Even if this were the root cause of all conservation ills, then it would imply that they could be relatively easily solved by the establishment of functional credit markets.
3) Extreme poverty may compromise the enforcement of conservation rules, because penalties may not deter someone on the margin of survival. The typical assumption is that very poor people have a high risk preference, and follows the same logic as the poverty time preference assumption. As with the time preference assumption, it probably contains some kernel of truth, but is overly simplistic. Conventional economic analysis views risk preferences as a simple non-linearity in the relationship between utility and income; if relative utility increases faster than relative income there will be a preference for risk, and in the opposite case an aversion to it (Ray 1998), i.e. risk preference is an artefact of the use of a monetary currency in a behavioural model. The real psychology of risk-taking is more complex; an addiction to gambling, for instance, cannot be explained in terms of a skewed income preference. There is no clear theory of how deterrence varies with wealth, and poor people slightly above the level of absolute desperation may be more deterred because they cannot afford to risk the small amount of assets they own.

The first point above is an absolute effect of poverty. The latter two are psychological effects, and hence are much more likely to be relative effects. This means that the analysis not only of their impacts, but also of the appropriate response is far more complex, as market-based development may exacerbate inequality and therefore relative poverty (Bennett and Robinson 2002).

Poverty commonly has a role in environmental degradation in developing countries simply because these countries are poor, and therefore it is almost always a part of the context in which overexploitation of resources occurs. But it is not the root cause of all problems and neither is poverty reduction a general solution. Poverty is also part of the context within which a solution must be found, and can be highly beneficial to conservation in that it is often cheaper to change the incentives of the poor than of the rich.

7.1.2 Introducing plurality

The failure of poverty to explain conservation problems in general has led some to try to replace one glib generalization with another, and often these are diametrically opposed. Some blame poverty, others greed; some a lack of economic alternatives, others increased access to habitats and the means to exploit them. The problem with all of these causal generalizations is that they focus on an external condition which leads people to behave in a manner adverse to conservation in certain cases, rather than focusing on the fundamental drivers of human behaviour, and then evaluating which conditions will lead this to benefit or prejudice conservation (see e.g. 3.5.2 and 3.6 for an explanation of why the common assumption that increased access is harmful to wildlife is not universally true). Treating individuals and groups as rational agents according to a bioeconomic perspective, the problem is not a single condition, but the availability of resource use options which yield a greater net return to the agent concerned than conservation. In order to stabilise or reduce hunting, for instance, it is necessary to remove the net positive incentive to hunt. The balance of incentives is affected by many conditions and can be effected by several interventions.

The need for plurality is beginning to be recognized at least in the conservation literature (Adams and Hulme 2001; Western 2001; Zhang and Flick 2001; Salafsky *et al.* 2002; Doremus 2003), but this is turn raises the problem of selecting the most appropriate approach in individual situations. There is scant literature on the suitability of alternate conservation approaches to different setting; the relevant discussion that has taken place has been within the context of improving, or replacing a single approach, and has almost exclusively concerned ICAD, whose catholic definition hides a further layer of confusion. The variable success of individual approaches and the multiplicity of relevant factors have led some to abandon all attempts to generalize and declare a need for 'unique solutions tailored to site-specific conditions' (Rao & McGowan 2002).

Tailoring to local conditions is critical; a multitude of grey literature manuals and handbooks provide frameworks for identifying problems, priorities and strategies (e.g. IUCN 1997; World Bank 1998; Worah *et al.* 1999) and the most developed and widely applied of these put great emphasis on adaptive management through monitoring and evaluation across repeated project cycles (Margoluis and Salafsky 1998; TNC 2000). But conservation practitioners need more *a priori* guidance than this; the irreversibility of many environmental changes means that we cannot simply rely on trial and error to arrive at a functional solution. Moreover, in the absence of an ability to dissect the causes of a problem, the lessons of monitoring are obscure. If local hunting does not decrease after the implementation of an ecotourism project, what is the appropriate conclusion? Is more time required to see results? Are the incentives from the project simply too small, or reaching the wrong people or not enough people? Are perverse incentives being created which need to be controlled? Or is the basic underlying assumption that the project will produce a genuine and locally recognized link between income and wildlife populations false? Bioeconomic analyses reveal that interactions between conditions and resource-use

outcomes are complex, and erroneous implicit assumptions provide considerable scope for misinterpretation of results. The simple bioeconomic model in chapter 3 shows that expectations of demand would impact conclusions about outcomes in a multi-species harvest, and the impact of increased access is not stereotypical. Muller and Albers (1994) showed that managers' assumptions of the completeness of factor markets should influence their expectations of the effectiveness of different management strategies. These assumptions are often not explicit, even to those making them.

7.1.3 Incentive-based framework

Since they began to be used in an explicitly behavioural context, bioeconomic models have calculated the magnitude of the incentive to degrade a resource and the cost that can be imposed on resource harvesters by enforcement of harvesting controls, in order to determine the size of the investment in enforcement needed to regulate the resource (Anderson and Lee 1986; Milliman 1986; Mazany *et al.* 1989; Milner-Gulland and Leader-Williams 1992). More recently, instead of halting at the purely tactical question of setting enforcement budgets, bioeconomic models have been used to address the strategic question of the relative efficiencies of different interventions (Milner-Gulland 1999b; Zhang and Flick 2001; Ferraro and Simpson 2002; Muller and Albers 2004; Bulte and Damania in prep.). The options they have covered, and the factors they have included have been highly restricted, however.

This chapter provides a framework for designing intervention according to bioeconomic principles by quantifying incentives. Note that many authors use "incentive-based conservation" to refer only to positive incentive schemes (e.g. Zhang and Flick 2001; Hutton and Leader-Williams 2003), but any inducement, positive or negative is referred to as an incentive here. Any type of intervention must operate by changing the incentives of those involved in the exploitation of the resource, so the narrower use of the term is misleading, and a wider definition of "incentive-based conservation" would be redundant.

The aim is to evaluate the size and cost of the necessary incentive change to maintain to an identified stock at a predetermined level according to different types of interventions. The focus is therefore more specific than some other frameworks for conservation action. Within Salafsky *et al.*'s (2002) typology of conservation actions, it includes those characterised under protection, law and policy, and changing incentives, although education and awareness actions are discussed in section 7.7. The framework concerns one step in the project cycle (Margoluis and Salafsky 1998; TNC 2000; 2003), the identification of appropriate strategies. It presupposes that management goals have already been determined and does not obviate monitoring and evaluation, although it should improve its focus.

The advantage over these previous, more general frameworks is that the incentive-based approach encourages an explicit, quantitative comparison and an explicit statement of assumptions and uncertainty. Given these emphases, it has much in common with decision theory methodologies (Shea

et al. 1998; Possingham *et al.* 2002). In focussing on incentives, it utilizes the logic of strategic bio-economic models, but aims to be more accessible and comprehensive. By showing how all relevant management interventions can be understood in terms of the manipulation of incentives, it encourages the full range of options to be considered. Where feasible, specific bioeconomic models could form part of the analysis, just as detailed quantitative models can be used within decision analysis, but are not essential for its application.

The framework is relevant to the thesis as it provides a logical extension of the bioeconomic analysis of resource exploitation. Given a model of how incentives influence resource extraction, the obvious next question is to ask how managers may influence those incentives in order to regulate it. Naturally this could be the focus of extensive modelling, but at this stage the intention is simply to point out some general principles and illustrate the usefulness of a systematic approach. As a worked example, this chapter will again make use of the North Tien Shan case study. The aim is not to make detailed, concrete recommendations for the management of the ibex population in the area, but rather to illustrate the way in which the process might be put into practice. In order to accomplish the former much more information than is currently available would certainly be desirable. More profoundly, in the absence of a dedicated implementing agency, it is of limited value to explore management options in detail, because the remit, ethos and capacity of that agency will be a key factor in shaping the choice of strategy.

7.2 Framework structure

Decision-makers are referred to as agents, which include any individual or organisation with has an incentive to exploit the resource. Only those directly capable of exploiting the resource are included, not the downstream consumers of products or services produced, whose demand incentivises agents. Agents are arranged into a hierarchy depending on their capacity to directly incentivise those at lower levels. Position in the hierarchy also correlates with the two most important characteristics of agent classes; the number of members and the resource ownership structure within that class. At each level of agents, tactics must be selected to ensure a favourable balance of incentives. Each tactic must be assessed not only in terms of its primary or desired impact on incentives, but also secondary impacts, which are often indirect and risk being overlooked. A strategy comprises the suite of tactics employed at all individual levels.

Although the conservation asset, be it a population, area of habitat, etc., is referred to as a resource, this does not imply that the focus is on maximising resource-use efficiency. The objective is to maximise the efficiency of conservation, and although the principles are the same as for maximising the flow of rents, and in certain cases the outcome too may be identical, the criterion of selection is different.

7.3 Agents

For a single conservation area, the total number of potential agents can and commonly will be huge, and may be drawn from a broad region that spans international borders. To be effective, conservation intervention must remove the incentives for resource degradation from at least the large majority of them.

At the first, coarsest level of division, agents encompass:

- **Authorities**, i.e. government and its agencies. They act as sole owners, although several different government agencies with differing priorities may be involved.
- **Locals** are represented by a limited number of decision-makers, each with limited ownership. Ownership is limited geographically; typically each individual agent will enjoy rights to a small portion of the area, and often for a limited range of uses.
- **Outsiders** have no ownership. Their numbers are typically very large, and in most cases the precise figure is of little importance.

The concentration of ownership and decision-making decrease down the levels.

Estimating the incentives of authorities may be far from straightforward. They may or may not act as simple rational economic agents, depending on their institutional philosophy and accountability. In some areas maximizing local social welfare might be the most important consideration, in others the generation of cash revenues.

Structurally, however, locals are usually the most complex level due to the existence of different systems of ownership. Resources may be individually and/or community owned (Ostrom 1990). In the latter case there are two distinct levels of decision-making; the community and individual level, which therefore represent different agents. It is not logically inconsistent for a single person to make opposing decisions at the community and individual levels, acting in their capacity as a ‘citizen’ or ‘individual’ (Sen 1981). For example, those who vote for a party of higher taxation are not immune from tax evasion. The analysis of individual decision-making in groups of limited size may necessitate game theoretic models, although often simpler approximations can be found. The system of ownership may be imposed by the prevailing conditions, or it may itself be amenable to design or manipulation. In addition, there may be disenfranchised locals who have no ownership. The difference between disenfranchised locals and outsiders may be somewhat arbitrary, but is based on numbers. In practical terms, outsiders are typically those for whom group size makes positive incentives unworkable. For some areas, there will be parallel groups of locals with entirely different histories and community structures and for whom different hierarchies and tactics are appropriate, e.g. indigenous and settler communities.

7.4 Management interventions

There are two reasons for the sustainable management of a resource to fail:

1. Alternative uses are more profitable; which includes cases where the productivity of the resource is too low and hence higher returns can be gained from converting the stock into a different form of capital even if there is no alternative economic use of the resource itself.
2. A management issue that results in the potential flow of rents from the resource not being realised.

The two can of course be related; in the face of a persistent management failure, alternative uses may become more profitable where they would otherwise not be.

Management failures are of concern to conservation where a high potential stock equilibrium under ideal management is instead replaced with a lower realised stock equilibrium. If the cause is a technical fault on the part of managers themselves, then improved resource management systems or technologies should be able rescue the situation. Management failure does not automatically equate to poor management, however. Often the divergence between the realised and potential equilibria stems from the fact that the theoretically optimal state fails to take transaction costs into account. I.e. an equilibrium which produces the MSY from the stock does not necessarily produce the maximum net return once the costs of monitoring stock levels, and the actions of others in communally managed resources, coping with fluctuations in stock level and productivity, and enforcement against outsiders and cheaters are accounted for. In the case of large, mobile wildlife in closed habitats, these costs are likely to be very high. The most obvious management failure in the case of renewable resources is open access harvesting, but simply because this is known to represent an inefficient form of exploitation does not mean that a socially superior solution is practically achievable once wider costs are taken into account. Open access may be institutional or *de facto*. In the former case, a resource could potentially be managed so as to restrict access, but the necessary exclusive use rights have not been established. In the latter, the costs of defending use rights to a mobile or cryptic resource outweigh the potential benefits.

Management failures associated with insurmountable transaction costs are effectively the same as other cases where alternate uses are more profitable. Indeed some may object to these being labelled as management ‘failures’, but the point is that it is the failure which is initially obvious, and the distinction between technically poor management and an inherent incapacity of management is a further step. Rectifying poor management depends on identifying a specific tractable problem. It may often involve some of the measures discussed below, but it is not a generalisable process.

Where other uses are more profitable, incentives must be manipulated either so that a more conservation-friendly equilibrium is reached within the context of the existing chosen use, or so that a more conservation-friendly use (including the possibility of no productive use at all) becomes the preferred option. Changing incentives can be understood within the context of the bioeconomic

equilibrium. The Golden Rule of bioeconomics (Clark 1990) implies that the optimal level of depletion of a renewable resource occurs where the immediate gain from removing one more unit is equal to the present value of the marginal future loss from reducing the stock by one unit, or:

$$p(x) - c(x) = \frac{1}{\delta}\frac{d\pi}{dx} \qquad \textbf{Eqn 7-1.}$$

where p(x) and c(x) are the unit return and harvesting cost at equilibrium stock size x,
δ is the discount rate,
and $\frac{d\pi}{dx}$ *is the change in annual equilibrium profit with stock size, i.e. the marginal return of the stock.*

Although this relationship is usually expressed as a social optimum, it equally applies to the incentives experienced by any individual agent, as long as the parameters reflect the private values experienced by that agent.

Eqn 7-1 applies to renewable resources whose only value is associated with their harvest. Hence, $\frac{d\pi}{dx}$ refers to the rent generated by harvesting the reproductive excess of the stock. If we accept that a renewable resource can generate rent that is not associated with its harvest, then we should introduce another marginal return term:

$$p(x) - c(x) = \frac{1}{\delta}\left(\frac{d\pi_h}{dx} + \frac{d\pi_s}{dx}\right) \qquad \textbf{Eqn 7-2.}$$

where $\frac{d\pi_h}{dx}$ *is the marginal future return from harvesting, and* $\frac{d\pi_s}{dx}$ *is the marginal future return generated by the presence of the standing stock.*

For non-renewable resources, such as land, or resources that reproduce so slowly that they are treated as non-renewable in practice, such as tropical hardwoods, the $\frac{d\pi_h}{dx}$ term can be ignored:

$$p(x) - c(x) = \frac{1}{\delta}\frac{d\pi_s}{dx} \qquad \textbf{Eqn 7-3.}$$

It may appear strange to express *c*, and to a lesser extent *p*, as functions of *x* for a non-renewable resource, but value and cost are associated with variables such as quality and location, and the most profitable resources will be exploited first. Encroachment occurs around the edge of national parks because that land has a higher net worth to the people converting it.

There are only three broad categories of tactics for changing the incentives to deplete a resource. The first two act by altering the balance on the LHS of eqns. 7-2 & 7-3, and the third concerns the RHS.

7.4.1 Incentive-based tactics

7.4.1.1 Sticks

Imposing a penalty for depleting the resource increases the direct expected cost of harvesting or conversion relative to the return at any given stock level. Regulation could involve a ban and prohibitive fine, or taxation of the activity, and could be total, or apply to a certain set of spatial or temporal conditions or class of resources. Although enforcement has been distinctly unfashionable in recent conservation orthodoxy, the fact is that any system of management in which the stock retains some extractive value must involve a system for restricting removal rights to it. Hence the question is virtually never one of whether to enforce or not, but rather whether enforcement alone is appropriate and what form enforcement should take. In assessing the cost-effectiveness of conservation interventions, assumptions concerning the capacity and economies of enforcement by different levels of agents are critical. E.g.;

- Is passive monitoring of others' activities and social opprobrium sufficient to regulate use by locals, or do specific patrolling and penalty systems need to be established?
- If enforcement regimes are established to prevent access by outsiders, will these function just as well in enforcing rules applied to locals?
- To what extent would local approval of, and hence cooperation with, external enforcement regimes increase their cost effectiveness?

7.4.1.2 Diversions

Provision of economic alternatives can raise opportunity costs or decrease demand for exploitation for the resource by supplying more profitable sources of employment or substitutes for the products derived from it.

The equation of income with opportunity cost provides the most direct appeal for the proposition that development in general is the most effective conservation tool. It is only valid, however, to the extent that increased incomes are derived from labour, rather than other factors, flow to the labourers themselves, and that those responsible for resource degradation are amongst the group whose labour value is augmented. Modern rural development initiatives do not typically rely on Keynesian injections through large-scale construction and infrastructure projects, and the direct employment that they produce is extremely limited. Instead they commonly focus on providing advice on or working models of specific agricultural technologies aimed at increasing productivity, and on tackling specific market failures which inhibit the exploitation of existing economic incentives, e.g. the lack of functional credit or insurance markets.

Hence an income-based approach to conservation must specify the precise tactics that will be used to increase incomes as these can have profoundly different effects on the opportunity costs and other incentives experienced by those responsible for depletion of natural resources.

7.4.1.3 Carrots

Increasing the expected marginal future return from the stock, i.e. increasing the value of the RHS of the equations above, provides a positive incentive for investing in a higher stock level.

Future returns from an existing stock are only apparent when there is ownership. If there is open access to a resource, restraint simply allows another agent to exploit it. Establishing secure ownership amongst the exploiters of a resource or concentrating an existing system of ownership is one method of decreasing the effective discount rate. In developed monetary economies, discount rates are heavily influenced by the rates of interest generally available on savings and loans, but in rural developing-country communities with little access to credit, their relationship to individual preferences is far more direct. At times of need, discount rates will be higher, causing people to draw down their stocks of capital. This is especially problematic when the capital is a wildlife population, because a) it is subject to natural fluctuations and shocks, and b) the rate of recovery is dependent on the stock density. For any harvesting system to be sustainable, therefore, there needs to be a stock and/or financial buffer, to allow recovery after a dip in stock levels or an external economic shock and prevent the system flipping into an unsustainable state (Barrett and Arcese 1998; see Roughgarden and Smith 1996 on stock buffers). In specific instances, introducing either of these two discount rate orientated approaches may be enough to safeguard the future of a natural resource, but more generally, both should be seen as pre-requisite to any system of conservation that is based on resource use.

Increasing the return from existing resource products by moving into a new market for extracted products increases the marginal return, but on its own does not provide a conservation incentive, as the LHS of eqns 7-1 to 7-3 will consequently increase by at least the same factor as the RHS without any change in the stock level. Herein lies the fundamental antagonism between use and non-use approaches; the incentive to actively conserve rides hand-in-glove with the incentive to exploit. In combination with other measures, however, a more profitable market may make it financially viable to invest in the management structures necessary to regulate a renewable resource, i.e. to close the gap between potential and realised equilibria. If the demand structure of the new market differs from the old, then the form of the relationship between marginal return and stock size may change, as opposed to a uniform increase in returns across the board. In most cases this will not be helpful; new markets will mean accessing external markets with competing suppliers, so prices will be unlikely to respond to the level of supply from the local resource stock (i.e. will become more elastic), therefore removing an incentive to manage for higher stock levels where low extraction costs combine with high product prices. In addition, external markets are likely to be more volatile, as they can respond to shocks from a

wider area, which exacerbates the problems indicated above. Trophy hunting may be an exception relevant to the exploitation of large mammal populations, however. As the ability to guarantee suitable quarry is an important part of the attraction of an area to time-limited sport hunters, this is a case in which demand is related directly to stock size itself, rather than to the supply flowing from it. It is possible to envision other specific cases in which demand for products of particular size or quality, which can only be produced from large stocks, may attract premium prices.

The marginal future return of the standing stock can be increased by developing alternative, non-extractive uses of a resource, such as tourism or the harvesting of dependent products, which are themselves inexhaustible or of lower conservation concern. At the level of authorities, it is also possible to realize an income stream from existing uses by taxing the beneficiaries of positive externalities generated by a natural resource (e.g. Chomitz *et al.* 1998 on initiatives in Costa Rica). The strength of what is usually called conservation linkage depends on the marginal, however, not average return. In the short term it is usually very difficult to estimate this, and perceptions will probably be largely based on information provided by the implementing agency (Salafsky *et al.* 2001), but in the longer term natural experimentation will probably steer perceptions towards a value with a greater basis in reality. If, for instance, tourists are most eager to visit easily-accessible pockets of tropical forest, then ecotourism alone will not guarantee the persistence of large contiguous tracts.

Direct payments are another mechanism for raising the marginal future return. The advantage with these is that the marginal return, not just the average return, can be set by the body designing the system of payments, providing that it is supported by sufficient monitoring. Direct payments are considered by their advocates to be more cost effective than other types of positive conservation incentives, both because they engender less market distortion (Ferraro and Simpson 2002) and due to lower transaction costs (Gullison *et al.* 2000; Ferraro and Kiss 2002). They have attracted criticism from both sides of the spectrum, however; proponents of sustainable development claim that reliance on external funding is unsustainable, and biological purists consider that they undermine the moral imperative to conserve (see e.g. Ferraro and Kiss 2002). The economic rationale is the internalization of positive externalities, however, and when employed as a tactic for a specific level of agents, they may form a component of a strategy which is financially autonomous.

7.4.2 Strategies

In order for conservation intervention to be effective, the balance of incentives must favour the conservation outcome at all levels of agents. This does not mean that a conservation intervention has to work directly with all levels of agents, however; and in fact this will rarely, if ever, be feasible. One level of actors may be employed to change the incentives of levels of actors below it, but in this case the incentive for the participating level must be strong enough to cover the costs of changing the incentives of others, not just to refrain from depleting the stock themselves.

Intervention strategies will almost always combine more than one tactic, and a single approach to conservation will usually be represented by different strategies at different levels. For instance, if proceeds from an authorities-managed trophy hunting scheme were used to compensate villager communities for restricting their own hunting, this would represent an alternative extractive use to the authorities and a direct payment to the communities. Furthermore, if the village communities were expected to be primarily responsible for enforcing their own hunting regulations amongst their members, then the size of the community incentive must take into account the costs involved in that.

Conversely a single action may engender several tactics and span different levels of agents. For instance, an ecotourism project may represent an alternate use for a local community, and provide incomes that raise the opportunity costs of individuals who would otherwise be involved in resource extraction. Tactics should obviously be complementary and designed so that their secondary impacts are positive or at least not antithetical to the overall goal. A direct payment to a community need not be in the form of a cash payment which could be used to buy hunting equipment, but instead could focus on providing increased employment. In fact many development initiatives within ICAD projects probably act as informal community payments, rather than having a major effect on direct individual incentives. The fact that there are many potential complementarities is rightly seen as a strength of integrated conservation and development models, but it must be judged against the equally rich potential for creating perverse incentives, according to the individual circumstances.

Some tactics cannot be combined at a single level of agents; banning all use of a resource by locals and establishing local ownership are clearly antithetical, although banning local use and encouraging use options by authorities are not.

7.4.3 Considerations

7.4.3.1 Number of agents and ownership structure

Ownership is a precondition to any tactic based on economic use because there must be a basis for dividing the rents between agents. Ownership does not necessarily require specific legal titles, but it does require that there is a recognized system for deciding entitlement to benefits. Authorities can usually be treated as sole owners, because at least in the case of terrestrial conservation, governments do not usually compete with each other for access to a single resource. Outsiders do not have ownership by definition.

Game theory suggests that cooperative exploitation of a resource is only possible for only about half a dozen agents when those agents can only interact through their actions with respect to the resource (Polasky *et al.* 2003). This type of joint ownership might be applicable to a small number of villages around a conservation area sharing access to a mobile resource, such as a wildlife population, within it.

This is not to say that joint ownership cannot occur on a larger scale, but it is only expected to be stable within the context of a broader set of interactions between the relevant agents, which provide an opportunity for mutual reward and punishment beyond the scope of the resource; i.e. it requires the existence of some kind of community. In the case of group ownership, the group and its constituent member are treated as separate levels of agents in the framework. At larger group sizes, interactions between individuals become too diffuse to maintain community structure and effective group ownership can only be achieved through formal rules overseen by a specific agency, i.e. by creating an effective single owner with an explicit system of enforcement.

As the number of group members increases, individual rent shares decrease, whilst the incentive to defect from group rules remains the same, so group and individual level decision-making become increasingly distinct. Even if a resource is static, and many owners divide access rights spatially, transaction costs in any system of positive incentives are likely to rise in proportion to the number of owners even if the overall size of the incentive does not. The effectiveness of providing positive incentives through economic use therefore falls off with the number of agents involved.

Too many agents at a single level essentially precludes effective ownership. The potential for employing positive incentives in general will fall with the number of actors involved, as the cost of providing economic alternatives also increases with population size, both in terms of the size of the overall incentive that must be provided and the difficulty of targeting relevant actors. In contrast, enforcement costs increase only weakly with the number of actors, as the negative incentive created is the same for each, rather than based on a rent or expenditure which must be divided, suggesting that for large populations of agents enforcement becomes the only credible option. There are also considerable complementarities between enforcement at different levels of agents, in that where enforcement is used to prevent exploitation at one level, it will usually serve to achieve the same at lower levels, without any additional expenditure. Disenfranchised locals are separated from outsiders only because their population may be limited to a size whereby some non-use positive incentives are workable.

Hence in general, diffuseness of ownership is correlated with the number of agents, and the effectiveness of positive incentives decreases as we move along this axis.

In and of itself, ownership cannot be a solution because it is still necessary to exclude those agents who do not have ownership rights. Where systems for doing so already exist, however, solidifying ownership amongst existing agents, e.g. by getting authorities to recognize community access rights, may be the only intervention that is required. Alternatively, where existing ownership is non-existent or too diffuse, concentrating effective ownership, e.g. by creating a new management agency, can be used as an enabling tactic, allowing other tactics based on economic use to be employed.

7.4.3.2 Demand

Any activity is only profitable if there is demand for the products or services that it provides. Demand determines the price that products attract at any given level of supply.

Analytically, the simplest situation occurs when the agents in question generate negligible demand themselves, and the area in question supplies a negligible share of the total supply of the good. In this case, demand can be treated as an exogenous variable; it may not be constant, but it is independent of management interventions.

If these assumptions are not justified, then the situation is more complex. Demand is influenced by the economics of local exploitation, and hence any intervention in this economy will have a secondary impact on demand. Economic processes can impact demand through consumption effects, whereby overall purchasing power changes, and substitution effects, whereby demand switches between alternative goods as their relative prices change. The impacts of economic changes are gauged through various elasticities of demand.

Own price elasticity of demand. Price elasticity is the percentage change in the quantity demanded divided by the percentage change in its price; i.e. it is closely related to the inverse of the gradient of the demand curve on a conventional supply and demand diagram. The price elasticity of demand determines the market response to a change in the supply of a good. As all but one of the tactics listed above are supply-side tactics, the price elasticity of demand is crucial in determining the market response to them. As the price of a good rises, spending shifts to substitute goods, and the quantity demanded falls. If spending on that good represents a significant proportion of income, there may also be a fall in overall consumption. Basic human requirements, e.g. staples such as rice, have a lower intrinsic elasticity of demand than luxury goods. Other than this, demand is more elastic the greater the availability of close substitutes. The closest substitute for a good is the same good supplied from a different source. Only the elasticity of demand for products produced from the target area is relevant, which is why the availability of supplies from other areas is of such importance. In some cases demand can increase following price rises through Verblen (Verblen 1970) effects where higher price goods are consumed primarily for their status value. Although far from universal, such effects may be important to the consumption of high value products from rare species.

Income elasticity of demand. This is the percentage change in the amount of a good demanded, divided by the percentage change in income. The income effects on demand are represented by vertical shifts in the demand curve on a conventional supply and demand diagram. Income increases fuel higher consumption, but substitution effects are also important. The marginal utility obtained from most goods decreases with the quantity consumed, so as consumption increases, spending shifts to other goods, even if these are not very close substitutes, and the breadth of the consumption basket widens. Hence the income elasticity of a normal good is <1. If the good is inferior, however, then more expensive

substitutes will be actively preferred, and as these become more affordable with increased income, spending will shift to them, so the income elasticity of demand will be <0. Finally, if it is a superior good, preferred to cheaper substitutes, then spending will shift towards it at higher incomes, so the income elasticity will be >1. In designing management interventions, we are interested in endogenous income effects, i.e. those that occur within a groups of agents as a result of a tactic, which is why it is important to consider the contribution that agents make to overall demand for the good.

Cross price elasticity of demand. This is the percentage change in the quantity of a good demanded over the percentage change in the price of a given substitute. It mainly measures a substitution effect, therefore, but if spending on the substitute represents a significant proportion of income, then a consumption effect will also be involved. An increase in the price of a substitute will produce an upwards shift in the demand curve for a good, and probably also cause the curve to steepen, i.e. decrease the price elasticity of demand due to the lower availability of the substitute.

Although the simplest econometric models often assume constant elasticity, elascticities themselves commonly vary with prices and incomes. A single good can be inferior, normal or superior depending on the level of income – if incomes are very low, it may be a rare luxury, but as incomes increase, it could be replaced by even more expensive substitutes. As with most economic processes, short- and long-term effects may be markedly different. Short-term effects will be dictated by existing preferences, but in the longer term, shifts in preferences and structural changes may occur in response to new economic circumstances. In particular, increases in income tend to encourage immigration to an area (Barrett and Arcese 1995; Noss 1997; Oates 1999; Salafsky *et al.* 2001; Scholte 2003; see InterBilim 2001 for Kyrgyz example for in-migration in response to a development project), which will engender a positive long-term demand response.

Although price and income elasticities have different theoretical bases, there will typically be a correlation between them to the extent that superior goods are less likely to be readily substitutable, and will hence have lower price elasticities. Hence income and price elasticities will often increase and decrease respectively along a common axis representing the perceived quality of a good. Low price elasticity retards the effectiveness of tactics aimed at raising production costs because prices rise with costs. In the extreme, if a good is an absolute necessity, such that price elasticity = 0, then cost increases will be perfectly tracked by price, with no change in the extraction incentive. High income elasticity will similarly undermine the effectiveness of tactics which increase incomes amongst agents. The only group of tactics that are immune from considerations of secondary demand effects are those based on increasing the sustainability of harvesting within the existing market, as extraction incentives are balanced by stock incentives in this case.

Cross-price elasticities are specific to individual pairs of products. The tactic of supplying substitute products can only function on the basis of a strong positive cross-price elasticity with the product supplied, i.e. where subsidizing the substitute will reduce demand for the product of interest. Supplying

substitute products is the only tactic with a primary demand-side effect. If a superior substitute exists, then increasing its availability may be sufficient to remove the exploitation incentive on its own. Otherwise the introduction of a novel substitute may be used to increase the price and income elasticities of the product, enabling the success of other tactics conditioned on these.

There are therefore two broad factors which influence the general applicability of different classes of tactics to a given level of agents; the number of agents / ownership structure, and the relative quality of the product involved. Figure 7-1 provides some rough guidance on which tactics are appropriate to which areas of state-space. In addition to these general considerations, each potential tactic requires specific preconditions for successful application. These are summarized in table 7-1, and, in areas, expanded upon below.

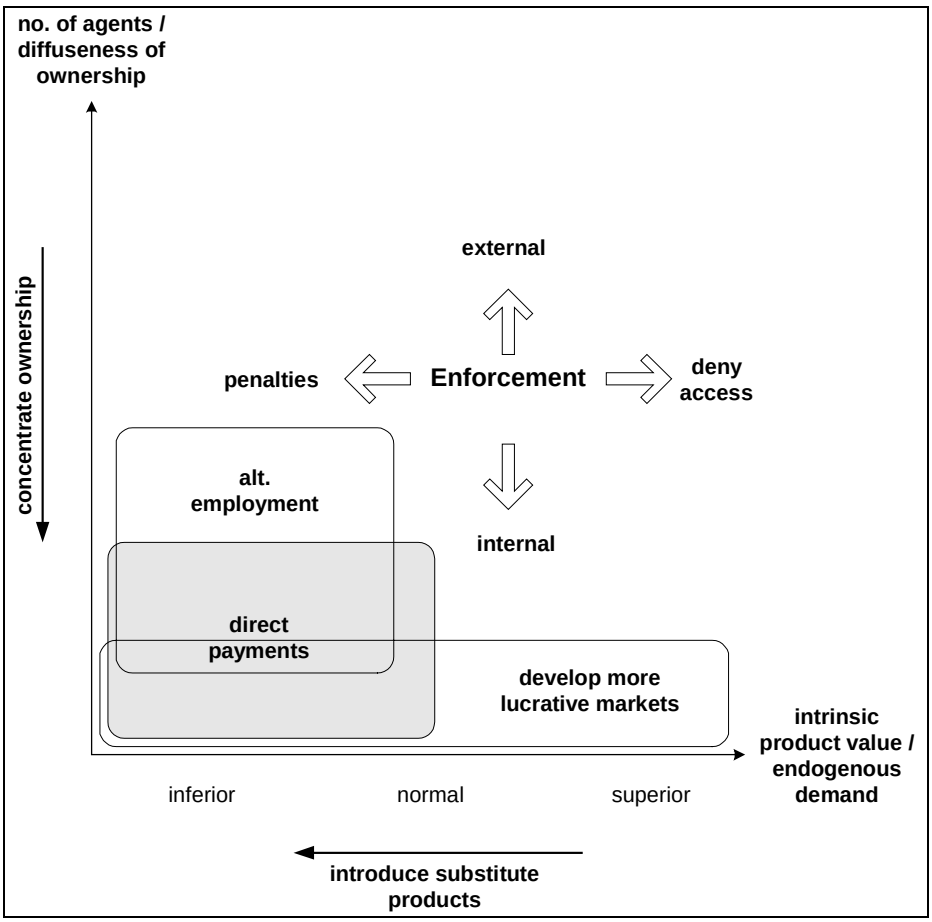

Fig 7-1. Indicative schematic showing tactics likely to be effective in relation to axes correlated with the number of agents and/or the diffuseness of resource ownership, and the strength of preference for the product derived from the resource and/or the demand for it amongst the group of agents in question. The direct payments box is shaded purely as a visual aid. Enforcement is indicated for all cases, but the balance of enforcement strategies varies with conditions as indicated by the arrows. The two tactics of concentrating ownership and introducing substitutes for the product in question are primarily used to alter conditions in order to favour the success of other tactics.

Tactic	Aim	Secondary effects	Costs	Conditions / notes
Enforcement	↑*c(x)*	Decrease in income, related to the existing importance of the activity as a source of income. Decrease in demand related to price elasticity. At the extreme, if elasticity = 0, then p(x) will track the increase in c(x), and there will be no reduction in the activity. A decrease in income could reduce demand, but this will probably be a minor effect in the majority of cases. Possible increase in demand if inferior product.	Start-up costs are relatively low, as systems are easily understood and staff capacity does not need to be very high. If enforcement concentrates on stopping activities in the field, then costs may be high; often best to target bottlenecks in supply chain. Cost of enforcement is independent of, or only weakly increasing with the number of agents incentivised.	• Means of detecting offences. • Ability to impose penalty. • Expected cost from penalties must exceed incentive. Risk preference and information flow may be important in determining expectations of costs. Higher penalties appear to be the cheapest way to increase expected cost, but are constrained by social acceptability and risk perceptions, and also encourage greater avoidance behaviour. • Virtually all management systems require some kind of enforcement of regulations, but external enforcement may not be necessary if communities are suitably incentivised and cohesive.
Fines				• Bans and fines aim to prevent an activity entirely, or at least reduce it to a minimal level. • Banning an activity removes existing ownership rights associated with it. Imposing bans without effective enforcement can therefore lead to depletion of a resource by creating open-access conditions without a credible deterrent.
Taxation				• Although the economic theory is similar (see Becker 1968) the philosophical basis and social implications of taxation are different from bans and fines. Taxation recognizes utility generated by the activity, and therefore aims to regulate the level of it, rather than abolish it. In addition to the penalty, bans can involve costs associated with guilt and bad publicity (Doremus 2003). • Taxation can also be used to raise revenues for management, providing the legal mechanisms exist. If raising revenue rather than decreasing offtake is the goal, then a low price elasticity is beneficial. • As the penalty in a system of taxation is relatively small, the probability of detection must be very high.

Economic alternatives			Cost will increase in proportion to the number of agents incentivised. Initial costs are likely to be high as capacity-building and promotion of the activity will probably be required. There may also be substantial structural changes required, such as access to new markets, etc. Running costs depend on the economic viability of the activity.	• Activity must reach the majority of the target group, yet exclude outsiders. • Schemes often ignore the real-world limitations of development projects. Projects tend to be small pilot initiatives, which target limited groups of motivated individuals. If these are successful, benefits can then be expected to filter through to the rest of the population as the methods are copied, and to a certain extent as trickle-down benefits occur. This takes time and often does not reach the majority of the population. I.e. these initiatives will often be ineffective in the short term, and only patchily effective in the long term.
Alternative employment of labour	↑*c(x)*	Involves a direct increase in income. As labour is only one factor of production, the increase in income may outpace the increase in opportunity cost. If income elasticity of demand exceeds price elasticity, then this tactic will lead to increased production incentives.		• Supply of labour is limiting. • Alternative activity is more attractive. • The program must target those people who are actually depleting the resource or potentially incentivised to do so. • Need means of preventing outside labour migrating to the project area; i.e. will have no effect in the presence of a perfect labour market.
Making substitute products available	↓*p(x)*	May be a slight income increase, if the product accounts for a significant proportion of expenditure. This is the only direct demand-side tactic. The effectiveness depends entirely on the cross price elasticity of demand between the two products, which incorporates the income effect.		• Agents targeted are driving demand. • Alternate product is a good substitute; should not be carried out unless have a fairly good idea of the cross-price elasticity of demand. • Outsiders can be excluded from the market. • Can be used alone to decrease price through cross-price elasticity, or in conjunction with strategy to increase cost, to increase the price elasticity. Or to change cross-price elasticity. • Unlikely to provide a total solution on its own, unless product is an inferior good.

Increasing marginal return of stock				• System of ownership required.
Decreasing effective discount rate	$\downarrow\delta$	Precise income effects will depend on method used to reduce discounting, but there will almost certainly be some increase. Demand effects are essentially irrelevant, however, as they incentivise stock protection as much as over-exploitation.	Methods will be essentially institutional, such as establishing ownership systems, micro-credit schemes, etc. Hence costs are primarily in the start-up phase. The stock recovery phase may need to be subsidized until the more profitable higher equilibrium is reached. Schemes should essentially be self-supporting as long as transaction costs have been accurately assessed during project design. Continuing subsidy may be warranted if it still represents a substantial saving over other forms of protection.	• Discount rate is initially high and tractable. A more profitable potential equilibrium must exist at an achievable discount rate. It should not be assumed that natural systems are more profitable; if this were the case then conservation would only be a problem where institutional or market failures are present. These often are present in developing countries, but Western experience shows that their absence does not guarantee a conservation outcome. • System for monitoring, regulating harvest and enforcement must all be feasible. If transaction costs are not accurately assessed, then there will be a high chance of failure. • Have to accept some level of stock depletion, probably substantial. Also will not protect other elements of biodiversity which are not considered necessary to the stock of economic interest
Moving into a higher value extractive or alternate use market	$\uparrow d\pi/dx$ [$\uparrow p(x)$]	Increase income. Decrease in demand due to opportunity cost depends on the price elasticity. This may be countered to some extent by an income effect dependent on the income elasticity. If the higher value market is for extractive use, then p(x) will increase in tandem with stock value.	Costs will depend on the precise nature of the enterprise, but substantial initial costs, especially involving capacity building should be expected in most cases.	• Clearly identified and sustainable high-value market for product. • Difficulty of estimating chances of success and necessary subsidies as essentially an enterprise-based solution. May want to consider failure rate of similar businesses in the area. • The marginal return needs to be high at high stock density, for the tactic to be effective. May be preferable to keep control of the activity within a single authority, and use profits to incentivise individual agents through direct payments, in order to maintain closer control.

Direct payments	$\uparrow d\pi/dx$	As above.	Start-up and transaction costs depend on complexity of target group and monitoring system. Direct costs increase with number of actors.	• Need system of performance monitoring. • Direct payment gives more control of marginal return and overall income effect.

Table 7-1. Specific characteristics and considerations for different tactics.

7.4.3.3 Additional secondary impacts

Changes in demand are not the only undesirable secondary economic effects that interventions may produce, and for each tactic considered, the potential for it to produce perverse incentives must be carefully evaluated in light of local circumstances. Migration into the conservation area in response to the establishment of positive incentives has been mentioned already with respect to its effect on demand. It may also undermine or outright reverse conservation gains through reducing labour costs, diluting ownership, dissolving community structure and driving up the costs of providing positive incentives, and has been cited as the main reason for the failure of conservation and development approaches (Oates 1999). Any conservation strategy based on net positive incentives needs to take the possibility of in-migration into account. In some cases in-migration will not be likely, e.g. when working with remote, closed communities, and in others its effects may be mitigated, but unless there are grounds for thinking this to be the case then it may be difficult to justify relying on positive incentives.

In general, where development is a fundamental part of the approach, there is potential for a variety of perverse incentives. As discussed, most development initiatives function by giving people the capacity to exploit existing opportunities, rather than providing entirely new ones. Some of these opportunities will involve the degradation of natural resources. Hence access to capital can be used to acquire more efficient hunting technology and agricultural inputs may make it viable to convert more natural habitat. At heart, the process of development is one of economic integration, allowing economies of scale and specialisation to be exploited. This may engender problems for conservation strategies not only in terms of access to new markets, but also in the corollary social and cultural changes such as erosion of communal cooperation (DasGupta and Serageldin in prep.; also see Anderson 2001 for an example specifically relating to the commercialisation of hunting within ICAD) and increased importance of cash-generating activities and conspicuous consumption.

Even negative incentives can be perverse. If rules are applied without the capacity to enforce them, then the consequence can be that existing systems of ownership are eroded due to the removal of legal recognition or simply induced insecurity, without any reduction in the incentive to exploit. Hence the change in discount rates leads to more rapid resource degradation (Jefferies 1985). ‘Enforcement’ is discussed within the framework, rather than ‘regulation’ to emphasize the point that without enforcement, regulation is at best inconsequential.

7.4.3.4 Legal and institutional framework

Any management strategy is of course constrained by the legal and institutional conditions under which it must function. In many countries, all extractive use is legally proscribed within national parks, and many non-extractive uses may similarly be so. Some political systems prohibit any kind of extra-

governmental organisation, such as resource management cooperatives, and some cultures and community structures are inherently ill-suited to particular management structures. If a strategy is predicated on the existence of a coherent, self-regulating community, then it is necessary to investigate whether this is the case, and consider the prospect that it may be eroded in the future by increased opportunity and mobility.

One of the greatest constraints for any strategy is the capacity of the staff who will carry it out. Although training can increase capacity, it is a costly, long-term option which will ultimately achieve little if it does not have the genuine commitment of relevant authorities. A weakness of integrated conservation and development models is their complexity. It is far easier for staff with limited training to understand a system of fines and patrolling, than to understand which economic levers will produce favourable incentives and which perverse in a complex exercise in social manipulation. It is all too easy for those implementing conservation and development projects to confuse the means with the end and concentrate on development activities without regard for conservation outcomes.

7.5 Evaluating strategies

In and of itself the incentive-based evaluation framework does not produce precision. Its function is ensure that strategies are evaluated in a coherent and objective fashion, assumptions made explicit at all stages and consequences fully considered. Evaluations should be as quantitative as possible, without shying away from making uncertainties explicit.

Steps in the process are as follows, and a schematic is provided in figure 7-2:

1. Establish the management goal and the background to the situation. Determine the existing hierarchy of agents; the levels of agents, the need to differentiate between groups within a single level due to taste, socio-economic status, etc., and the number of agents, their existing uses of the stock and the value of the products derived for each group.
2. According to the management goal, establish the range of acceptable uses for the stock and any conditions on these uses. This will involve estimating the potential equilibrium stock level for each use and, where the use is already in operation, the realised level.
3. Outline potential strategies according to the acceptable uses. These will include the uses envisaged for each groups of agents and the general approach incentivising each groups of agents. Note that some strategies might involve the creation of new agents.
4. Detail the precise tactics to be used for each groups of agents.
5. Survey the conditions necessary for each tactic to be successful and consider whether they are or can be met. This step will inevitably involve making assumptions about many processes and it is important to consider as much evidence as possible. For example, if success is pre-conditioned on the effectiveness of a development program, then examine the performance of analogous programs in similar areas, if on the capacity for cooperative management within a

community, then examine the success of other areas of cooperation within that community. Also consider carefully the likely time-frame over which results can realistically be achieved and possible need for bridging measures; remember that incentives must be favourable at all levels at all times. Re-evaluate the strategy in light of these considerations, and amend, augment, or abandon it as necessary.

6. Determine the incentives that each group of agents will experience at the target equilibrium, and therefore the change in incentives needed to ensure it is obtained. Wherever possible, assess incentives on the basis of the perceptions of the agents rather than simple economic theory; for example an apparent opportunity cost might not exist if there is no access to capital required to exploit that opportunity. Start at the lowest level of agents and work up, as the size of the incentive needed at lower levels will affect the effort required from higher levels if they are to act as the incentivisers. In some cases it may be possible to estimate an existing positive non-use incentive, such as that evidenced by existing spending on protection by authorities, but in the absence of strong evidence to the contrary all agents should be treated as rational economic optimisers.
7. Evaluate the secondary effects of tactics used to produce the necessary incentives with regard to income, demand, and other less tangible properties such as community coherence, support for conservation, cooperation with external enforcement, etc. Determine the impact that these will have on incentives and revise incentive estimates accordingly.
8. Determine the cost of achieving the necessary incentives for each of the tactics at the point of input. Costs include start-up costs (consultancy, capital, capacity-building and short-term bridging measures), running costs (direct payments, subsidies, salaries, maintenance), and contingency costs. For many activities costs will be difficult to estimate precisely, and similar projects should again be examined closely. Assess each source of uncertainty associated with the estimate; i.e. the size of the necessary incentive, the cost of achieving it, the influence of secondary effects and the probability that conditions of success will be met.
9. Compare assessments of various strategies and consider whether elements of separate strategies could be combined or swapped to achieve a more efficient outcome.
10. Select the best strategy according to explicit criteria. Cost and uncertainty will certainly be major criteria, but may not be exclusive, depending on management objectives.

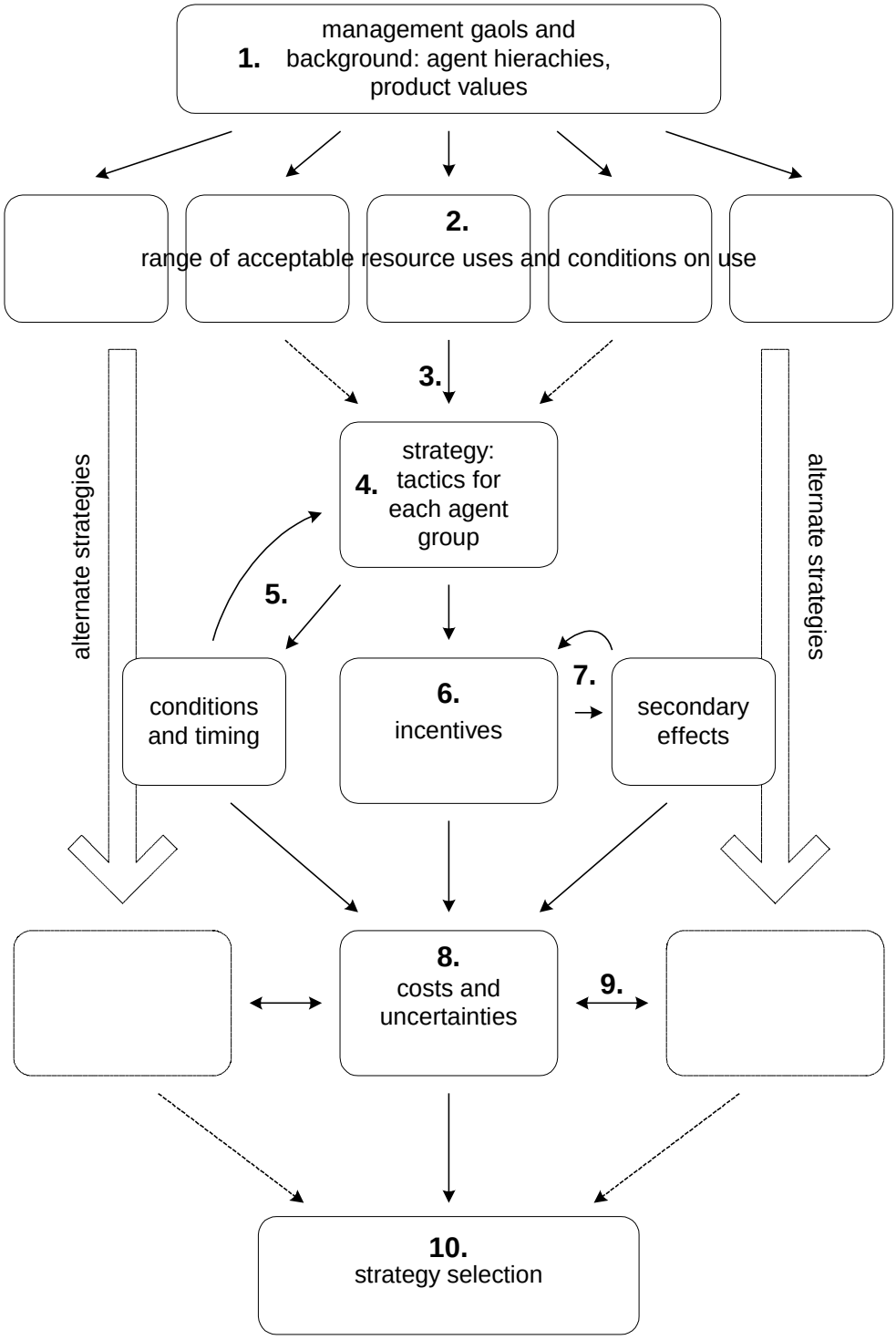

Fig 7-2. Schematic of the process of strategy evaluation and selection. Numbers refer to the steps outlines in section 7.5.

7.6 NTS example

This section develops a simple, illustrative example of the application of the framework to the hunting of ibex in the North Tien Shan. As this is an entirely hypothetical exercise and little precise information is available, the calculations will be approximate and incorporate many uncertainties, but the importance of the incentives framework is not that it generates precision in itself, but that it makes assumptions explicit and reveals the extent of uncertainties.

The estimate of incentives for casual hunting will be based on the deterministic *a priori* individual-based S&D model from chapter 6, as the deterministic and stochastic versions of this show good agreement, and predictions are not too far removed from those of the simulation. The potential for the development of commercial meat hunting will also be considered. Although there were no reports of organised meat hunting in the study area and all hunters formally interviewed stated that they hunted ibex only for personal consumption, there were indications that people would not be slow to exploit commercial opportunities. The author was offered higher-value wildlife products on a couple of occasions in the region, including by hunters who were approached for interview. A couple of local informants made unsolicited, casual comments to the effect that they would consider shooting ibex to trade the meat if economic prospects did not improve locally, and at least one shepherd claimed to sell ibex meat at local markets from opportunistic kills, although not to undertake hunting specifically for this purpose. Commercial hunting for meat certainly does occur to the south of Issyk-Kul, where it is sold at market at a marked down price of around 50 som kg^{-1} in order to attract a quick sale (T. Harder, pers. comm.). Commercial hunting incentives are estimated through a tentative re-parameterisation of the casual hunting model.

7.6.1 Commercial hunting model

The biological component of the model is retained from the casual hunting version. Hunters who talked about the prospects of hunting to sell meat indicated that this was only really viable if the hunter possessed a proper hunting rifle. Essentially, therefore, the economic parameters of the casual *a priori* S&D model were amended to reflect a trade-off between greater hunting efficiency with better equipment and the higher capital costs involved.

Commercial hunting is a major economic activity for those involved in it. Hunters are assumed to spend 100 days per year in the field, and their opportunity cost is measured on an annual time-frame at 10000 som, which represents a typical household income or salary according to survey data from chapter 4. Hunters work in pairs, as previously, and each pair must cover the capital cost of a rifle (15000 som), binoculars (5000 som) and horses (2x15000 som). Purchase costs are estimated from information in chapter 4 and additional comments from local informants. The annual opportunity cost

of capital is the product of the total capital cost (50000 som) and the interest rate. Replacement costs are ignored as rifles and binoculars last a long time, and horses can be bred. The only year for which both gross interest and inflation rates were available suggested a real interest rate of 19% (ref year and source). The interest rate in the model is therefore assumed to be 20%. It is highly unlikely that there are efficient credit markets within the study area, so even if this figure represents an accurate underlying rate, the actual cost of borrowing is probably far higher, whilst the actual opportunity cost of capital may be much lower if alternate investment opportunities are not available. Fortunately, the effect on incentives of changing the assumed interest rate is very simple to calculate. Rifle ammunition costs 25 som per round, according to information from local informants.

H is assumed to be a quarter of that for casual hunters due to the greater distance from which a rifle allows commercial hunters to kill animals. Shooting from a greater distance both reduces approach time and increases the possibility of killing more than one member of a single herd.

Unencumbered by other employment, commercial hunters are able to base themselves in the mountains for extended periods and do not return after each kill. Maximum bag size is 6 animals, which implies that a single horse can carry three dressed carcasses. Anywhere below this, bag size is limited by the number of additional animals that can be killed within the time period before the meat from the first animal killed is at risk of spoiling. This time period is set at 3 days, which implies that animals must be taken to market within about 5 days of slaughter. Hence, bag size:

$B = min\{6, 1 + 3/t^k\}$ **Eqn 7-4.**

where t^k is the expected capture time.

Demand is assumed to be perfectly elastic. The price that commercial hunters get for meat is conservatively estimated at 40 som kg^{-1}, according to the existing black market price, minus a modest amount to account for the cost of bringing meat to market.

The full form of the model and parameters are represented in table 7-2. Figure 7-3 shows that the essential difference between this and the casual model is that commercial hunters are more efficient at higher prey densities which allow them to exploit their greater offtake capacity. This comparative advantage is steadily eroded as prey density falls, however, and would eventually be reversed at very low prey density. The higher capacity and time investment of commercial hunters also implies that each individual hunter pair has a far greater impact on the stock and far fewer active hunters can be supported by the system. Table 7-3 summarises the incentives for the two types of hunting at different stock levels derived from the models.

Deterministic cost	Deterministic growth
Cost per kill, C, is is the same within each of 40 sectors, and determined in a similar fashion to the casual hunting model, except with change to the bag size function, opportunity and fixed costs, and H: $C = (c^o.vt + c^f) / (W/n)$ Where: variable time per kill, $t^v = t^k + t^t/B$ bag size, $B = min\{6, 1 + 3/t^k\}$ hunting time per kill, $t^k = H/N$ N is the population density within each sector N^T is the total population size $H = 0.75$ t^t is return travel time to each sector, determined according to rules for travel movement in 5.5.2.1 opportunity cost, $c^o = (c^s + c^K.I/n) / d = 200$ som day^{-1}. seasonal time opportunity cost, $c^s = 10000$ som capital cost, $c^K = 50000$ som interest rate, $I = 0.2$ hunting days per year, $d = 100$ days number of hunters per group, $n = 2$ (see table 4-8) fixed cost per kill, $c^f = 95$ som, due to the higher opportunity and ammunition costs involved meat weight per kill, $W = 40$ kg (see 6.3.1.4)	Growth is identical to the casual hunting model, i.e.: $g(N^T) = \Sigma\, r.N.(1 - N/K)$ over all sectors Where: K is the carry capacity density within each sector $r = 0.25$ (see 6.3.1.3)

Table 7-2. Equations and parameters used in the commercial hunting model.

Casual hunting					
N	**C**	**Q**	**E**	**yearly profit**	**daily profit**
3000	9.4	57	20	3454	345.4
2500	13	109	54	2301	230.1
2000	16.3	147	92	1716	171.6
1500	20.8	167	134	1226	122.6
1000	29	154	175	722	72.2
500	55.5	96	208	134	13.4
Commercial hunting					
N	**C**	**Q**	**E**	**yearly profit**	**daily profit**
3000	9.6	59	0.45	79716	797.16
2500	10.8	123	1.2	59860	598.6
2000	11.8	175	1.9	51947	519.47
1500	13.3	196	2.5	41866	418.66
1000	17.3	169	3	25575	255.75
500	28.1	104	3.4	7280	72.8

Table 7-3 Yearly and daily profit incentives to hunt casually and commercially at different ibex population levels. The commercial hunting figures are valid for a 20% annual interest rate, but can be converted for alternative interest rates by subtracting 250 som yearly and 2.5 som daily for each 1% rate increase.

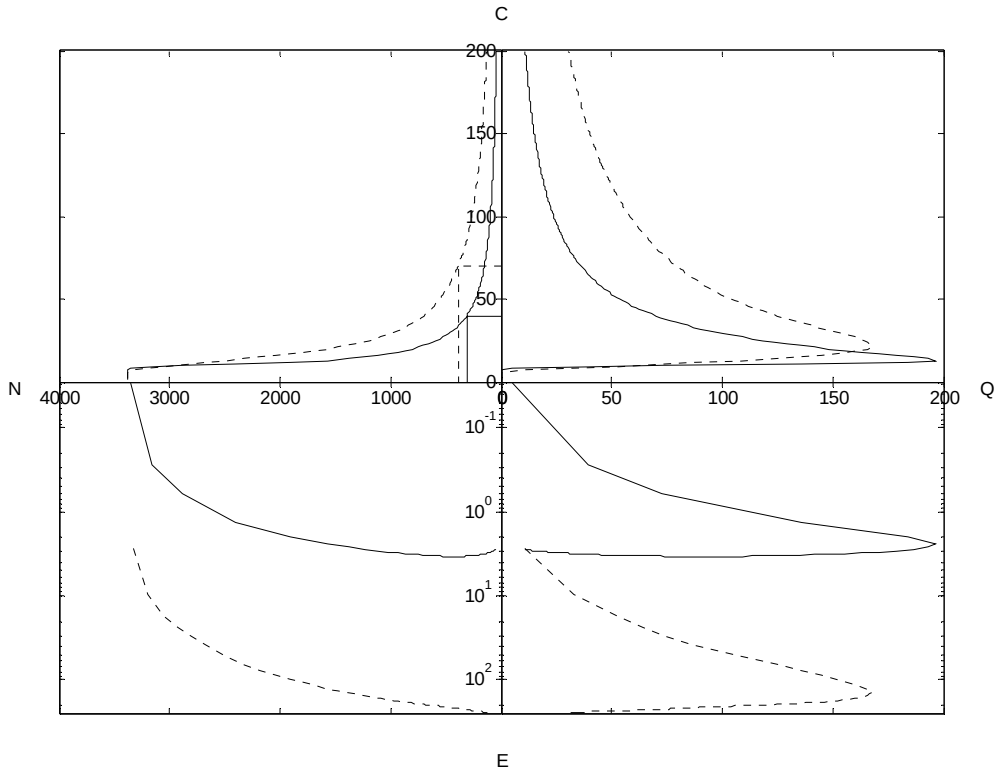

Fig 7-3. N, C, Q and E from the deterministic commercial hunting model with rate of interest set at 20% (solid lines) plotted next to the results of the (a priori) casual hunting model (broken lines) for comparison. Note that the E axis is plotted on a log scale in order to make the much lower number of hunter groups in the commercial model visible. Commercial harvesting is more cost-efficient, but beyond the MSY that added efficiency actually results in lower productivity for the system as a whole. At C = 40 som kg^{-1}, the demand price available to commercial hunters, the equilibrium population size is slightly lower than that for casual hunters at C = 70 som kg^{-1} (guidelines shown in C vs N plot, top left). Hence, if commercial hunting were to start, it would be expected to out-compete casual hunting in a deterministic system, driving stocks below the level where casual hunting is viable.

7.6.2 Management setting

The hypothetical management target is to maintain the stock of ibex at a healthy level, which is assumed to be at around 2000 animals or higher within the study region.

The only levels of agents considered explicitly are locals and outsiders. Authorities are assumed not to be antithetical to conservation, but the issues of whether they would pay the costs or support measures contrary to local welfare are not considered at this stage. Given the large number of villages in the area, their size and the lack of exclusive rights to mountain areas, no existing community-level agents are included. Drawing from census data presented in chapter 4, the local population is roughly 60000, 20000 of whom are assumed to be men of working age. 500 of these are potential causal hunters who already possess sufficient equipment and experience for casual hunting. The 40-50% of the population in the poor (but not very poor, see section 4.4.1) section of the population are assumed to be potential commercial hunters, as they have average opportunity costs, limited existing economic interests and the

wherewithal to make modest investments. Outsiders have the potential to be commercial hunters only, and their number is effectively infinite.

The management options assessed involve external enforcement of existing legislation that bans hunting of ibex other than through licensed hunts within hunting reserves, income generation to raise opportunity costs, incentive payments through community contracts, and establishing some form of local management body.

7.6.3 Management options

7.6.3.1 External enforcement

Due to the limited access routes into the interior NTS valleys, it is assumed that the establishment of permanently staffed ranger posts at key points would be sufficient to prevent access to all poachers. Three posts would be needed to control access to each of the three major valleys. Rough estimates of the costs involved (table 7-4) sum to $7000 capital cost, plus $7000 annual running cost.

Requirements	No. units	Unit capital cost ($)	Unit recurring cost ($ p.a.)
Guard posts	3	2000	
Rangers with horses	6		1000
Vehicle	1	1000	1000

Table 7-4. Approximate costs involved in enforcement through permanent guard posts, estimated from known costs of vehicles and salaries, and similar estimates given by Kyrgyz anti-poaching officers (Pala 2003).

	Casual hunters			Commercial hunters		
	Expected seizure	Value (som)	Per capita cost (som)	Expected seizure	Value (som)	Per capita cost (som)
Ibex	1	2800	1400	2	3200	1600
Weapons	1 shotgun	2000	2000	1 rifle	15000	7500
Penalty w/o fine			3400			9100
Penalty w/ fine			31400			37100

Table 7-5. Expected costs of enforcement penalties on commercial and casual hunters. Note that, unlike casual hunters, commercial hunters share the cost of replacing confiscated capital goods between the pair of hunters.

An alternative model of enforcement relies on occasional patrols penalising poachers found in the field. Given that poachers can be tracked, it is assumed that any hunters present in a valley during a patrol will be caught. Penalties involve fines and confiscation of weapons and meat. The official fine for poaching of ibex, 28000 som (V. Radchenko pers. comm.), represents a large sum of money in comparison to local incomes in the order of 10000 - 40000 som per household p.a., and it may

potentially be difficult for courts to award or collect this penalty, especially from local casual hunters. Expected penalties for casual and professional hunters are given in table 7-5. It is assumed that patrols will be carried out by three-man teams, each supported by one vehicle. Each team therefore has a $1000 capital cost, and a $4000 annual recurring cost, and is able to spend half its time in the field. Each patrol in one of the three major valleys lasts a week.

Comparing the penalties to the annual incentives to hunt at N=2000 (table 7-3), and assuming that hunters are risk neutral, casual hunters would need to be caught once every 2 years to overcome the incentive to hunt if the fine was not applied. This suggests 1 in 4 hunts would need to be detected, so patrols would need to cover each valley a quarter of the time, which implies 1.5 patrol teams would be needed to provided sufficient coverage overall (fractions of a team are possible because they could be shared with other areas) at a cost of $1500 capital, and $6000 recurring. If fines were reliably applied to casual hunters, then the necessary capture rate would drop to less than once every 10 years (implying < 0.3 patrol teams at $300 capital and $1200 recurring cost). In the absence of fines, commercial hunters would need to be caught at least 6 times a year (implying 18 patrols in each valley per year, or roughly 2 patrol teams at $2000 capital and $8000 recurring cost), whilst in their presence, two captures a year would be sufficient (0.7 patrol teams at $700 capital and $2100 recurring cost).

Hence temporary patrols are significantly cheaper than the establishment of permanent posts even if fines can only be reliably imposed on commercial hunters. Patrols do not prevent exploitation entirely. It might even be considered politically expedient to allow casual hunting to continue at a low level. Patrols also imply much less direct contact between rangers and local communities compared to permanent posts, reducing the potential for interaction and for enforcement spending to represent an injection into the local economy.

7.6.3.2 Income generation

Even if the 10000 males of working age from the ‘poor’ social grouping, who are considered those most likely to hunt, could be targeted in isolation, average daily income would have to be increased by over 170 som within 80% of this group to offset the incentive for casual hunting in enough cases to achieve the management target, as 80% of the assumed 500 potential hunters need to be removed (see table 7-3). This represents an aggregate additional annual income of around 275 million som (roughly $5.5 million), assuming there are 200 working days in the year. If the 500 potential hunters can be targeted specifically, then the aggregate additional income falls to a more modest, though still considerable $275 000 per annum. The aggregate additional income needed to disincentivise local commercial hunting purely through raising opportunity costs is even more excessive at around $10 million per annum.

Of course, the income needed to be generated does not directly equate to the cost of doing so. Income-focussed rural development projects in Kyrgyzstan concentrate on providing general agricultural advice and helping to develop specific business opportunities identified by external consultants and locals. An increasingly common approach relies upon the establishment of local micro-credit cooperatives. UNDP has three separate programmes, Poverty Alleviation, Local Governance and Conflict Prevention, all of which rely under various guises on establishing community groups, typically of less than a dozen members, who lend amongst each other and eventually can compete for external sources of micro-credit. Similar initiatives form part of the strategy of ACTED in southern Kyrgyzstan and other parts of Central Asia.

These initiatives are considered successful and to have raised incomes of thousands of households, but they are not entirely unproblematic. It is generally acknowledged that self-help programmes do not reach the most disadvantaged social groups (UNDP Participatory Poverty Alleviation Programme 2000; UNDP Social Governance Programme 2001) although within the present context that is not a central concern. In terms of their potential use as a conservation tool, the major problem is the time and initial expense they involve. It is difficult for development agencies to establish precise measures of cost-benefit, but UNDP estimate that $75 was spent per micro-credit beneficiary in the first year of its work. This figure has fallen with time, but after about half a dozen years of project implementation, the yearly ratio of project spending to credit generated (rather than income generated!) has decreased only from 4:1 to about 2:1 (UNDP Social Governance Programme 2001). After a similar period of time, the best cost-benefit ratio under an eco-tourism focussed Business Promotion Project, operated by Swiss aid agency Helvetas, was achieved in 2001 when the ratio of project spending to turnover (again a less exacting measure than net income) was 6:1, and an internal review admitted that 'High transaction costs are a well-known feature of international cooperation' (Helvetas 2001). Projects typically start by targeting a small number of households, but the most broad-based can grow to involve several thousand participants over a 4-6 year project cycle. DFID's Sustainable Livelihoods for Livestock Producing Communities project aims to reach 35% of a population slightly under 30000 (i.e. roughly half of that in the NTS study area) over 4 years with a budget of $2 million (A. Jones pers. comm.).

The spending to income generation ratios are extreme, but of course these are harsh standards by which to judge development projects. The intention is that these initiatives will not only become self-sustaining over time, but that they will serve as models to be copied by other local administrations and even individuals. Initial costs are often so high because a huge investment is made in capacity building, and increased stocks of human and social capital are just as important, though even less measurable than the direct income produced. Most project spending in any event represents an injection into the wider Kyrgyz economy.

But if development initiatives are to be used as a conservation tool, then the narrow, balance-sheet criteria are precisely those which should be evaluated. These would suggest that rural development initiatives are unlikely to generate the magnitudes of individual income increases needed to nullify the

hunting incentive, and even if they could, project spending would need to be several times the aggregate additional income required over at least 5-10 years, by the end of which coverage would still be patchy within the target group. There is an additional problem with projects which aim to develop local capacity to exploit existing incentives, in that the incentive to hunt, or otherwise degrade natural resources, is one of those that may be exploited. By lowering the cost of borrowing, micro-credit schemes in particular could potentially increase the incentive for commercial hunting by several thousand som per year.

Of course income-related measures would not change the incentives of outsiders. It might be supposed that if local communities are recipients of massive external funding, then this would induce them to report or otherwise prevent outsiders from hunting in order not to jeopardise these inputs. Locals may not necessarily make the connection between development assistance and conservation assets, however, unless it is made explicit, and if this is the case, then the tactic falls under the heading of an incentive payment.

7.6.3.3 Conservation contracts

The relatively small number of hunters and low potential offtake in the NTS suggest that at a community level the benefit from hunting is low. The incentive needed to dissuade the community from hunting should therefore be modest, but for this to be used as the basis for a conservation strategy requires a strong and coherent community that has the ability both to regulate the actions of its own members through social opprobrium and to exclude outsiders. In the NTS, the number and size of villages, ethnic divisions, social upheaval and large-scale emigration within the last 15 years and lack of traditional land-use rights suggest this is unlikely to be the case.

It may be possible to work with a specific sector of the community, however. Shepherds are present in the major valleys or their approaches for much of the year, and all of it in the case of Chilik. Active shepherds probably account for a substantial proportion of current hunting and should be aware of the presence of external hunters. Perhaps 200 families are currently involved across the area, based on conversations with shepherds currently working Chon Ak Suu.

The Snow Leopard Trust (SLT) currently has a project in Mongolia whereby communities receive direct incentives not to hunt mountain ungulates, and they are in the process of extending the scheme to parts of Kyrgyzstan. The Mongolian project has grown to encompass around 200 families after 5 years, each of whom benefit by about $50 per year (roughly an additional 25% of income) for their participation (Mishra *et al.* 2003). The total value of positive incentives produced is roughly double this, including no-violation bonuses (which provide a direct incentive to monitor the activities of neighbours), payments to a community fund, and to local authorities to cover monitoring costs. A similar level of payments might be expected to be appropriate in the NTS where base incomes are at a

similar level, and $50 represents somewhat more than the incentive for casual hunting and roughly the value of a single ibex kill. Total incentive payments might therefore be anticipated at $20000 per annum.

In the case of the SLT, the form of the incentive is in premium prices paid for village-produced wool artefacts which are then sold in western markets, with the intention that the scheme should become self-financing over the next 5 years (T. McCarthy pers. comm.). Whether or not there exists such a market opportunity in the NTS, the experience of business-based development projects suggests that direct payments in cash or kind may be more cost-effective. Sustainability certainly is an important issue, but the problem with linking incentive payments to commercial profits is that once a successful business model has been established, there may be little to prevent less conservation-minded entrepreneurs undercutting it. In respect of woollen crafts in particular, several development agencies are already promoting them in various parts of Kyrgyzstan as a way of adding value to pastoralist production, and the market may be limited.

SLT have not published the transaction costs of their project, although again judging by the experience of similar development initiatives, they might be expected to be considerable. An added complication in the NTS context is the diffuse nature of the shepherd 'community'. The lack of a pre-established community based in a single settlement will inevitably increase transaction costs can may obviate the necessary element of internal monitoring.

7.6.3.4 Local management cooperative

A similar scheme to that above, which would not rely on external incentive payments would be to establish a local management cooperative amongst those exploiting the ibex population which would be granted exclusive use rights in return for responsible management. The group would be granted or even set an annual offtake quota to be divided amongst members, potentially with the additional possibility of selling some or all of the quota rights to trophy-hunting operators. Again this would depend on members of the cooperative being able to monitor each other's actions and exclude or at least report upon outsiders. Hence it could only realistically operate within the ranks of shepherds, who would adopt a role of trustees for the mountain environment.

The incentive for individuals to conform would be the threat of loss of group hunting share, and possibly exclusion from all mountain use rights. The group incentive would depend on recognition that regulation of the harvest would increase long-term productivity and, especially if that harvest were kept below the MSY, a credible threat that the group use rights could be ignored. If a system of auctioning trophy-hunting licences could be developed which depended on a system of certification by a higher conservation authority, then that would give that authority more leverage in the setting of offtake quotas, and potentially provide revenue to cover monitoring costs. The authority might also be able to

confer exclusive rights to other benefit streams, such as revenues from tourism, which would strengthen both cooperative benefits and leverage.

Such a proposal is of course predicated on many institutional and even legal suppositions. It would also have to be carefully considered how this system would stand a greater chance of combating poaching than the present management of hunting reserves around the NTS, within which locals may hunt legally for a fee of 170 som, plus 160 som annual membership. Institution and capacity building would doubtless incur high initial costs, but with the potential for subsequent self-sufficiency and providing a model that could be repeated elsewhere.

7.6.4 Outcome

The setting and potential strategies are summarised below.

Goal. Maintenance of a stable ibex population at around 2000 or more individuals.

Agents. ~10000 local males of working in age in the socio-economic group most likely to hunt, of whom ~500 are potential casual hunters. Limitless number of potential commercial hunters amongst outsiders.

Acceptable uses. No extractive use, i.e. productive uses limited to nature tourism or research. Potential equilibrium stock is at carrying capacity.
Hunting for consumption. Potential equilibrium stock of over 1500 if well-managed. Currently realised equilibrium is unknown as it is not clear if the system is already at equilibrium; models suggest it may be below 500. Stock would probably have to be maintained slightly higher than the optimal productive level in order to meet the management goal.
Trophy hunting. High potential equilibrium stock, 2500+, if directed towards high-end market where hunters demand reliable trophy opportunities within a short space of time.

Strategies 1 and 2: external enforcement via permanent guard posts or occasional patrols.

Tactics
Permanent posts deny access to both local and outsider hunters.
Patrols raise expected costs for both locals and outsiders through imposition of penalties.

Conditions / considerations

- If denying access, need ability to distinguish between hunters and non-hunting shepherds. This is difficult as most hunters may be drawn from the ranks of shepherds, and shepherds

carry guns to protect stock from wolves. Suggests access denial needs to be complemented by at least some patrolling to ensure active shepherds are in compliance.

- Ability to impose fines.
- There is the possibility of antagonising the local community, but whether this would have an operational impact is unclear, and its importance per se depends on management philosophy. Negative opinion should be limited because only a small percentage of locals are affected directly and their economic inputs into the community from enforcement spending may potentially outweigh overall returns from hunting. Nevertheless, tact is needed, and possibly the adoption of a less severe line with local casual hunters.

Costs

Permanent posts: ~$7000 initial + ~$7000 annual.

Patrols: ~$1500 initial + ~$6000 annual, even if full legal penalties can only be applied to commercial hunters. Greater uncertainty in terms of how expected penalties actually relate to hunter perceptions and whether hunter incentives have been correctly estimated.

Secondary effects

- Negative income effects should be moderate, restricted to a small group, and at community level may be outweighed by new income from enforcement spending.
- Demand effects probably small or negligible due to high elasticity.

Strategy 3: increase local opportunity costs by generating additional incomes.

Tactics

Raise opportunity cost of labour for locals to the point at which it is not profitable to hunt. No mechanism to deal with outsiders.

Conditions / considerations

- Suitable opportunity for raising incomes is identified which specifically raises the marginal cost of labour, as opposed to returns from other factors.
- Need to cover ~80% of potential casual hunters and effectively all potential commercial hunters.
- Coverage must be achieved within a short time frame; years rather than decades.
- Means to prevent adjustment in labour market; i.e. prevent in-migration of labour.

Costs

Very uncertain and depends on precise strategy identified. At least several million US$ over the first 5-10 years, although potentially self-sustaining after that.

Secondary effects

- Demand effects probably limited due to high elasticity.
- Effects will depend on precise nature of the intervention. Credit-based schemes will increase the incentive for commercial hunting and other capital-intensive activities, some of which, such as rearing livestock, are potentially antithetical to wild ungulate conservation.

Strategy 4: conservation contracts with shepherds.

Tactics

Direct individual payments to active local shepherds for not hunting and preventing others hunting in the areas they work. Some monitoring by authorities will be necessary, and probably also input in backing up exclusion of outsiders.

Conditions / considerations

- Shepherds are aware of use by others and have capacity to prevent it.

Costs

At least $20000 per annum, and probably several times that over the first 5-10 years. Considerable uncertainty over the degree of input required from authorities and transaction costs.

Secondary effects

- Income effect is positive amongst active shepherds, negative amongst other hunters.
- Demand effects probably small or negligible due to high elasticity.
- The scheme will produce an added incentive for people to start working as shepherds, leading to a gradual increase in costs, unless newcomers can be excluded without compromising effectiveness. The ability to set the level of direct payments gives some control over the magnitude of this effect.

Strategy 5: shepherd management cooperative with exclusive use rights.

Tactics

Establish management cooperative amongst active local shepherds, benefiting from exclusive use rights in return for staying within acceptable offtake quotas. Cooperative is responsible for internal monitoring and exclusion of members defecting from agreement, and exclusion of non-members. There is also the potential to raise revenue through the sale of trophy hunting licences.

Conditions / considerations

- Discount rates amongst shepherds must be suitably low for sustainable harvesting to be attractive.
- Should be marketed to shepherds in a way that isn't resonant of soviet cooperatives.
- Institutional arrangements and use-rights must be legally feasible.
- Cooperative must not be dominated or subverted by more powerful members.
- Active shepherd community is sufficiently coherent to allow cooperation, and will remain so.
- Shepherds have ability to exclude defectors and outsiders.
- If trophy hunting is to be used to raise revenue for the scheme, as opposed to the cooperative alone, then it must involve a necessary input from authorities. This might be achievable via a certification scheme.

Costs

Should be self-sustaining, but initial organisational costs should be expected to amount to several tens of thousand US$ at least, and then ongoing monitoring costs of perhaps a couple of thousand US$ per annum will have to be met in the absence of surplus revenue from trophy hunting.

Secondary effects

- Demand effects probably small or negligible due to high elasticity.
- May produce an incentive for more people to become shepherds, potentially diluting benefits. This should not be a major problem if new shepherds do not automatically qualify for membership, however.

Obviously the analysis is not complete; authorities' incentives have not been treated explicitly, elements of many of the strategies are left undefined, and there are many sources of uncertainty. But even a cursory analysis has helped to narrow the range of credible options and define crucial issues, uncertainties and data needs. The process should be carried out in an iterative fashion; coarse early rounds of selection eliminating unpromising possibilities and focussing attention on pertinent questions.

Unless potential hunters can be clearly identified and targeted, due to the small number of hunters able to be sustained, positive incentives are best focussed at the community level, where potential benefits from hunting are limited, rather than on individuals whose incentives can be high. It is however difficult to achieve this in the absence of any coherent community structure, and any attempt to do so will inevitably involve a degree of social engineering. Basing conservation on the provision of alternate economic opportunities is only appropriate for very restricted groups whose existing opportunities are highly constrained and directly affect their resource use choices, and even then probably only in conjunction with other measures.

When dealing with large numbers of people the economies of scale of external enforcement come to the fore. If handled sensitively, there should be the potential for enforcement that is not antagonistic to the local population as few are greatly affected by the issue. Indeed if the expenditure from enforcement were to flow mainly into the local economy, then this would outweigh the potential social gain from hunting in any case. Schemes based on community management or incentive payments may well be worth exploring further, but it should be obvious that these will involve time, high initial cost and probably a significant chance of failure. External enforcement is the only option which provides for immediate protection at low cost, and will probably be necessary in some degree whatever the final management system. Suitably sensitive, non-antagonistic enforcement should therefore be established in the first instance, and if group-based management approaches subsequently prove feasible, this could adopt more of a monitoring function.

7.7 Other measures – targeting attitudes

Preferences underlie economic decisions, but in general economics has little to say about why preferences are as they are. Changing preferences is not therefore an economic activity, but it can be used to shape economic outcomes. In the context of conservation, it is often hoped to influence preferences so that practices or products that were once desirable become distasteful or socially unacceptable.

As well as preferences for specific products, it may be possible to influence wider societal values, specifically in regards to the intrinsic value of conservation. At a local level, virtually all conservation projects involve some component of conservation education. One of the central contributions of the recent changes in conservation practice has been the recognition of the importance of local attitudes. Even if not specifically geared to the welfare of local communities, it is important that conservation projects are not unnecessarily antagonistic towards them, and local interests are taken into account wherever there are cheap opportunities to do so. It has been suggested that the value of ICAD might be as a short-term palliative (Barrett and Arcese 1995; Bodmer and Lozano 2001), rather than in achieving profoundly beneficial changes to local economies.

Despite the importance of measures aimed at public opinion, such activities are not specifically included within the management framework. They provide the context in which incentives take shape over the long-term, rather than manipulating incentives based on current economic realities, and therefore, despite their long-term indispensability, they cannot be relied upon to safeguard a resource presently at risk. Similarly whilst active promotion of a scheme might improve the perception of its costs and benefits, it would be unwise to rely on advertising incentives with little basis in fact. Field research suggests that the attitudes of communities around a protected area are influenced primarily by the concrete services provided from it (Holmes 2003). It is also difficult to assess the investment required in such measures within an incentive-based framework; other authors have reported that a

change in expressed attitudes has not translated into changed activities (Infield and Namara 2001). Conservation and awareness, or as the Central Asians would say "propaganda", should therefore be seen as additional to, rather than a component of the set of tactics discussed here.

When selecting tactics in the short term, however, it is important to consider whether they might run counter to long-term goals. Specifically, one of the objections to conservation options based on extractive use is that consumption demand in general will continue to grow with increasing population size (Barrett & Arcese 1998). In the longer term reliance on wild populations to provide important products cannot be sustainable for more than a small fraction of the world's population. Given that, is it wise to recognise and institutionalise an extractive use that might otherwise become marginal and will perforce have to be abandoned by the majority?

7.8 Conclusion

Much of what is presented above relies on little more than common sense, and none of the individual elements are novel. Many of the factors and considerations have come up in the ICAD debate (e.g. in Barrett and Arcese 1995; Salafsky *et al.* 2001; Adams & Hulme 2001; Scholte 2003; Noss 1997; Oates 1999). But at present the elements do not appear to be being put together in practice; there are no examples in the conservation literature of a study that has taken them all systematically into account, and no ICAD project has actually quantified the incentive change needed to produce the desired result. Analytical (as opposed to simply descriptive) frameworks are beginning to be used to evaluate the suitability of different management options, but to date they have covered a limited range of strategies and conditions, and have been not been particularly accessible to non-specialists. Hence Muller and Albers (2004) cover a subset of the tactics and considerations surveyed in this chapter, but do so within the context of formal economic analysis and terminology. E.g. they do not explore the likely differences in the cost of different policies in relation to their population coverage, nor the role of community structure, and the question of in-migration would, in their terms, concern the longer-term completeness of the labour market.

At present, the approach taken by conservation projects tends to be defined in broad terms at the proposal stage before detailed examination of local conditions have even begun, and is typically determined by the current philosophy of the donors and implementing agencies. Conservation organisations have increasingly defined themselves by their approach, rather than the goal. The aim of an explicit framework is to encourage rational exploration of all available management options, a transparent exploration of influential assumptions and a sanguine assessment of what is required for each to work in any particular case. Although this chapter began was a critique of the philosophy behind ICAD, the intention was emphatically not to dismiss a specific practice, but to reject the uncritical application of any management strategy. Marrying interventions to conditions efficiently

requires the ability to look beyond a single approach and to define conservation according to the ends rather than the means.

Precise analyses require precise information, which will always be hard to come by for many systems of conservation interest, which is illustrated by the tentativeness with which conclusions can be drawn for the NTS system (see 6.6). But we should not be overly concerned by this unless it is an issue in management decision-making. Ballpark estimates and back-of-an-envelope calculations may show that more precise analyses are not needed. Despite the cursory nature of the information used in the NTS worked example in this chapter, some clear recommendations already emerge, and further attention can be focussed on those areas where more accurate assessments are required. One general point that does emerge with respect to data needs is the difficulty of evaluating the costs of many types of intervention because transaction costs are not typically published by implementing agencies. Although those agencies understandably fear a simplistic, balance-sheet assessment of project success, nevertheless it should be considered incumbent upon both development and conservation practitioners to make these factors transparent.

A common basis for comparison between predictions and outcomes of individual processes, and the performance of projects overall, should over time allow critical decision factors and hence information needs to emerge. The discussion in section 7.4.3 provides some tentative guidance in this area, but real progress in narrowing the range of relevant option for different scenarios and hence streamlining the process will come from repeat practical applications of the framework.