

Zabel, Astrid; Engel, Stefanie

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Performance payments: A new strategy to conserve large carnivores in the tropics?

Astrid Zabel^{a*}, Stefanie Engel^a

^aInstitute for Environmental Decisions (IED)

Environmental Policy and Economics

Swiss Federal Institute of Technology, ETH,

8092 Zurich, Switzerland

Tel. +41-44-632 4605, Fax +41-44-632 11 10

*corresponding author's email: astrid.zabel@env.ethz.ch

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Abstract:

Biodiversity, including wildlife, is globally decreasing at alarming rates. This development has evoked calls for innovative conservation policies. In the present paper we explore the novel conservation performance payment approach which for wildlife-livestock conflicts, so far, has only been implemented in Sweden. The contribution of the paper is twofold. A structural framework of performance payments' design is developed and an empirical assessment of the approach to tiger-livestock conflicts at Bandhavgarh National Park in India, an example where conservation needs compete with humans' increasing demand for land and resources, is presented. The framework focuses on issues of scheme design such as identifying performance indicators, targeting, payment amount and timing, considerations on making payments to groups vs. individuals, scheme duration, and inadvertent side effects. The assessment of the applicability of the performance payment approach to tiger (*Panthera tigris*) conservation is based on a high-profile policy workshop, an interview with the park management, and 305 household-level interviews conducted in 20 villages in the buffer zone of the park.

1 Introduction

A recent survey conducted by the IUCN states that nearly a fourth of all mammals are extinct or globally threatened (Hilton-Taylor et al., 2009). Many large carnivores are endangered due to habitat loss, poaching for trophies, and deliberate persecution as consequence of depredation on livestock (Hazzah et al., 2009; Gusset et al., 2009; Karanth and Chellam, 2009). Wildlife-livestock conflicts are estimated to be especially severe in the tropics since the soaring demand for land and resources in these countries is in direct competition with wildlife's conservation needs (Madhusudan, 2003). Typically, rural populations living in marginal areas close to wildlife parks or reserves depend heavily on subsistence agriculture. To a poor rural household, losing livestock in a carnivore attack is not only a loss of a source of food, but can also affect the household's savings, its creditworthiness, its means of transportation, and capability to plough fields.

Throughout the past decades, different biodiversity conservation strategies have evolved and consecutively dominated the policy agendas, e.g. 'fences-and-fines' regulations and community-based management approaches. However, to staunch the rate of biodiversity loss innovative policies and more committed efforts are needed. Recently, interest in direct payment approaches for conservation has increased (Ferraro, 2001; Ferraro and Kiss, 2002; Engel et al. 2008).

Conservation performance payments provide incentives for conservation by issuing payments based on indicators of conservation outcomes. Performance payments are a type of payment for environmental services (PES). According to Wunder (2005) PES are defined as a voluntary transaction where one or more buyers purchase a defined environmental service from one or several sellers and the purchase is conditional on the

provision of the service by the supplier. Performance payments are contingent on conservation outcomes whereas other PES schemes base payments on indicators of inputs into the production of the service. A synonym for performance payments is ‘payments by results’. Performance payments provide flexibility in the production process of the good, and often show cost-effectiveness gains (Musters et al., 2001; Ferraro and Simpson, 2002; Wätzold and Drechsler, 2005). With respect to the carnivore-livestock debate, it has been demonstrated that this policy can provide strong incentives for livestock holders to refrain from hunting damage-causing carnivores (Zabel et al., 2009).

To date, there is some limited practical experience with general wildlife performance payment schemes in developing countries, e.g. for turtle conservation in Kenya (Ferraro and Gjertsen, 2009) or eradication of invasive snails in Samoa (Shine et al., 2000). However, the conservation goals targeted in these small-scale schemes do not interfere with local peoples’ livelihood needs. The literature still lacks a discussion on how to implement a performance payment approach as an incentive-based strategy to mitigate wildlife-livestock conflicts, which typically have major livelihood impacts, in a developing country. This paper attempts to start filling this gap by providing a structural framework on issues to consider when planning a scheme. Along the lines of the framework we present a brief overview of a pioneer performance payment scheme for carnivore conservation which is implemented in Sweden. The paper’s main contribution is to provide a first assessment of the transferability of the performance payment approach to a developing country setting. For concreteness we focus on the specific example of tiger conservation around Bandhavgarh National Park (BNP) in India. For this assessment we conducted 305 household-level interviews with villagers in the buffer

zone of BNP, an interview with the park management, and a high-profile policy workshop with wildlife scientists, policy makers, and park managers.

The paper is structured as follows: Section 2 presents the general framework and briefly sketches the key points of the Swedish scheme, section 3 discusses the case study on India, and section 4 concludes.

2 Framework

To facilitate the comparison of the performance payment approach to other PES initiatives (e.g. payments based on indicators of action for the production of environmental services) we construct our framework around the discussion of the design of PES presented in Engel et al. (2008) and the adjoining paper by Wunder et al. (2008). The first column of Table 1 summarizes the outline of the framework. We discuss the issues in the context of wildlife conservation and briefly describe how each issue is treated in the Swedish scheme. The information on the Swedish scheme is based on the government's carnivore policy (Swedish government bill, 2000).

Policy goal and context, service buyers and sellers

The starting point in the planning process for a performance payment scheme should be the definition of the policy goal. An important question is whether the policy is intended to purely focus on environmental issues or also on secondary goals such as poverty alleviation or provision of income support to farmers. A multitude of secondary goals is likely to dilute the effectiveness of a performance payment scheme because each secondary goal can create constraints, e.g. on eligibility for enrolment into the scheme,

that can impose limitations for the attainment of the primary goal. Pagiola et al. (2005) voice the concern that making poverty reduction goals predominate in a PES scheme could be self-defeating if it compromises the provision of the environmental service.

Buyers of an environmental service in general can be any government, NGO, industry, or private person (Engel et al., 2008). Concerning the environmental service sellers, a crucial issue is whether the production of the good is attributable to individuals or primarily to groups of people, e.g. goods such as wildlife or water that move across many individuals' properties. Furthermore, goods that are produced on common land or in places without clear property rights may also only be attributable to groups. Possibilities to deal with such goods are discussed below.

Finally, new schemes are typically not initiated in a vacuum (Corbera et al., 2009), but rather develop from a historically interwoven fabric of policies. Taking the policy context, i.e. other policies that may be implemented concurrently, into account is important to obtain a comprehensive overview of factors impacting actors' decision making processes.

In Sweden, the goal of the performance payment scheme is to compensate livestock losses but also to create strong incentives for the conservation of lynx (*Lynx lynx*) and wolverines (*Gulo gulo*). Funding of the program is provided by the government who thus is the service buyer. The environmental service sellers are the 51 Sami reindeer herder villages in Sweden. The villages are very large on a spatial scale providing enough room for several carnivore territories. With respect to the policy context, there is a general ban and penalty on illicit hunting of lynx and wolverines.

Baseline, indicators, and monitoring

A well-designed scheme requires a baseline against which progress can be measured. The baseline typically is defined as the status quo prior to scheme implementation. To additionally assess the effectiveness of the policy itself, it can be useful to identify a control region in which the policy is not implemented (Ferraro and Pattanayak, 2006).

Indicators are necessary to measure the degree of goal attainment in comparison to the baseline. For narrowly defined goals, using only one indicator may be sufficient whereas broadly defined and multifaceted goals will call for several indicators. General conditions for the indicators are that they should be easy to understand, reliably and accurately measurable at low cost (Pannell and Glenn, 2000), and difficult and costly to fake. The policy makers should also consider whether the good measured by an indicator is mobile or immobile, seasonal or permanent, as well as measurable directly after a participant's actions versus measurable after a time-lag. These criteria will determine large parts of the practical design of the scheme, e.g. an indicator measuring a mobile and seasonal good is likely to call for substantial monitoring efforts during certain times of the year whereas an immobile permanent good can be monitored all year round.

Ideally, the defined environmental goal will be quantifiable itself, but otherwise indicators that are undistorted, i.e. closely correlated to the goal, can be used as proxies. A further aspect is to what degree the indicators are a function of human actions in comparison to how much they are influenced by random external environmental effects. Indicators with low random environmental noise are preferable because they require lower risk premiums for the scheme participants. Zabel and Roe (2009) discuss the trade-off between risk and distortion among proxy indicators in performance payment schemes.

The monitoring activities themselves should ideally be led by impartial agents. Providing opportunities for scheme participants to assist in the monitoring may help create mutual trust. Involving the participants may even be cost efficient, if, for example, they have detailed local knowledge that reduces searching times.

In Sweden, the baseline counted at the start of the scheme in 1996 was 167 lynx offspring and 69 wolverine offspring. The indicators to measure conservation outcomes are the number of certified lynx respectively wolverine offspring on each Sami village's territory. The monitoring of offspring is restricted to certain defined weeks in winter when tracks can be observed in the snow. The tracking is done in cooperation between the reindeer herders and staff of the county administrations. This cooperation facilitates the exchange of skills and local knowledge on carnivore tracking and at the same time strengthens mutual trust between the reindeer herders and the administration.

Targeting

There is a debate on how to select participants if there are more applicants than the scheme's budget can fund. The scheme managers can simply use a first-come first-served rule or may choose a more elaborate approach. Following Babcock et al. (1997) three basic procedures are available to prioritize sites: (i) selection of sites with high environmental benefits, (ii) selection of applicants with low opportunity costs, i.e. maximization of the number of participants, hectares of fields, or kilometers of shoreline etc. enrolled, or (iii) selection according to a ratio of the generated environmental benefit to the cost of provision. For a case study on the third approach and many further references see Wünsch et al. (2008).

The Swedish performance payment scheme does not have any special targeting mechanism. It simply applies to all Sami villages.

Payment amount, timing and vehicle

To incentivize an agent to voluntarily participate in a performance payment scheme, the payment amount offered must exceed the agent's opportunity cost, i.e. the foregone benefit of his alternative resource use. Determining the correct payment amount is difficult in settings with subsistence agriculture where market values play a minor role in households' decision making. In practice, the scheme may need to be adjusted in an iterative process as scheme designers gain more insight into agents' responsiveness to the policy.

The timing of the payment disbursement can be customized so that it aids the participants in overcoming periods of the year that tend to be economically tight, e.g. prior to the main crop harvest. However, care needs to be taken to still maintain conditionality of payments on conservation outcomes.

Several payment vehicles are worth consideration. The most obvious is cash, but in-kind payments, or provision of project support is also possible. An advantage of cash payments is that the recipients can invest the payment according to their preferences and needs. Although there is a potential risk that cash can be squandered for goods such as alcohol that do not benefit the entire household, reviews of emergency relief programs for food crises that made use of cash transfers provide little evidence in support of this argument (Peppiatt et al., 2001).

In-kind payments avoid this problem, but the commodity provided through the program may not meet the demands or needs of all households. A household may sell the good for cash or trade it against other goods. Such trading activities give rise to transaction costs, e.g. costs of travelling to a market, which in turn decrease the de facto payment to the household.

Furthermore, support for development projects may be requested by scheme participants, but it can be considered unethical or unenforceable to close a health care centre because the production of an environmental good diminished (Milne and Niesten, 2009). Because payments have to satisfy the conditionality criterion that is central to the idea of performance payments, project support is not an advisable option.

The payment amount in the Swedish scheme is SEK200,000 (SEK1 \approx 0.13US\$) per lynx or wolverine offspring. It is calculated to offset the economic damage a carnivore is expected to cause throughout its lifetime. The payment is made contingent on the annual offspring inventory but split into two to three consecutive cash transfers. This facilitates making corrections if, e.g. the preliminary offspring count differs from the final data.

Payment modality

Apart from making continuous payments directly based on the indicators, relative performance evaluation and threshold payments are also interesting options. Relative performance evaluation is useful if there is considerable external noise in the production process of the environmental good. To back out this noise, the average of the scheme participants' performance levels is computed and used as benchmark to evaluate each individual's performance. Payments are then issued to those with above-average

performance and eventually penalties can be imposed on participants with below-average performance. Two preconditions are important for this type of scheme: (i) all participants must be exposed to the same environmental noise and (ii) none of the participant's should be able to significantly impact the benchmark.

Threshold payments may be convenient if small changes in the level of the performance indicator are particularly difficult to measure. Several thresholds can be defined at larger intervals and payments issued according to the highest threshold that is met. A disadvantage is that participants may not have enough incentives to continuously increase their performance but rather permanently stay only slightly above the first threshold.

Continuous payments based directly on the performance indicators were chosen as payment modality for the Swedish scheme. This indicates that there is little concern over external noise impacting the number of carnivore offspring and the techniques to measure the number of offspring are deemed quite accurate.

Payments to groups

When the environmental outcomes produced are not attributable to individuals, a group of people can collectively function as service seller. Because in this case the overall payments are based on group performance rather than individual performance, the group faces a common pool resource (CPR) dilemma.

There are two basic payment allocation procedures. Payments can either be issued to each member of the group according to some rule (e.g. equal share per person, per household, per livestock unit etc.), or given to the group as a whole without interfering in the subsequent distribution process. In the first case, a crude partitioning of the performance payments may not result in a fair compensation of the effort individuals invest in the

production process or the costs (e.g., livestock losses) incurred. A rational self-regarding group member will thus only contribute to the production of the good if his expected private payoff per unit of effort is higher than his opportunity cost. All group members for whom this condition does not hold will free ride, which will result in a suboptimal production of the good.

The second payment allocation procedure is to issue the performance payment as a lump sum to the group. Depending on the group's skill in solving CPR dilemmas, it will succeed in finding a way to distribute the money that is in accordance with the effort individuals contribute to the production process. The group itself may have internal information on effort contribution that is not observable for the policy makers.

However, the provision of incentives for conservation through rewards which have a common good nature has been stated as a major cause for the failure of schemes (Gibson and Marks, 1995). If the CPR dilemma cannot be resolved within the group, e.g. because corrupt elites seize the payment or community ability for collective action is low¹, there will be no incentive to engage in the production of the good and prospects for environmental service provision consequently are fairly dim. If corruption is a major concern, issuing payments directly to individuals rather than the group may be advisable.

In Sweden, payments are issued to the Sami villages which then have the authority to decide on the further use and distribution of the money. It is each village's responsibility to distribute the performance payment in a way that will increase the utility for as many village members as possible (Zabel and Holm-Müller, 2008).

¹ See Agrawal (2001) for a review of factors commonly hypothesized to affect a group's ability for successful collective action. These include, for example, group size, social and economic heterogeneity, as well as market integration.

Duration of policy scheme

Long-term funding is particularly favorable if the production of the environmental good requires large investments with path-dependencies (Adams and Hulme, 2001). Before taking a stake in such a venture, a scheme participant may want to have certain securities on funding in long-term contracts or guarantees for future funding opportunities after the expiration of short-term contracts. When the motivation for wildlife conservation is mostly based on financial considerations, withdrawal of funding can have detrimental effects for long-term conservation efforts (Maclennon et al., 2009).

There is no time limit defined in the Swedish scheme. The government's goal is to maintain viable carnivore populations in perpetuity.

Inadvertent side effects

Implementing a performance payment scheme may create side effects, e.g. leakage, that are not in the interest of the planners. Leakage refers to the danger that a scheme does not essentially inhibit actions that are harmful to the environment but only relocates them from the scheme area to some other area (Robertson and Wunder, 2005; Boyd et al., 2007).

Listing the possession of a resource, e.g. land, as an eligibility criterion for scheme participation may provoke local elites to confiscate the resource although it was previously managed by less influential rural poor. Limiting access to a resource can even violate the survival constraint of very resource-dependent poor. This is in particular a threat in countries with weak property rights systems and deficient legal support for the poor.

A scheme may also give rise to undesirable distributional effects. For example, conservation can necessitate restrictive uses of a resource which can impose livelihood constraints on resource-dependent poor, or reduce employment opportunities for the landless rural population (Kerr, 2002; Pagiola et al., 2005; Milne and Niesten, 2009).

A performance payment scheme may give rise to the so-called magnet effect. This implies that the prospect of gaining income by participating in the scheme may attract people from other regions to translocate to the designated scheme area (Nyhus et al., 2005). Increasing the population density in this way may be destructive to the environmental goal that the scheme was designed for.

Leakage, land seizure, and magnet effects have not been observed in the Swedish Sami villages. Dispute over performance payments for offspring in border regions between two villages is frequent but rules to handle such cases are explicitly given in the policy.

(Table 1 about here)

3 Transferability to Bandhavgarh National Park

The total tiger population in India is estimated to be at a precarious low of 1,400 individuals (Jhala et al., 2008). Bandhavgarh National Park (BNP) in Madhya Pradesh is one of the parks with the highest tiger densities in India, with 47 tigers residing on an area of 1,575km² (Jhala et al., 2008). There are 61 villages with a human population of 28,500 in the buffer zone of the park. The livestock tended by the villagers is imposing enormous biotic pressure on the tiger reserve (Project Tiger, 2006). Many villagers suffer livestock losses due to carnivore attacks.

3.1 Assessment method

To assess the transferability of the performance payment scheme to BNP we applied a three-step approach: (i) we hosted a policy workshop at the Indian Institute of Management Ahmedabad (IIMA) in 2008 with key policy makers, park directors, and researchers concerned with wildlife-livestock issues to investigate whether there is general interest in the policy, (ii) we conducted a structured interview with the management of BNP, and (iii) during March and April 2009 we conducted a stated choice experiment on aspects of scheme design in 305 households in 20 villages in the buffer zone of the park. The villages were selected according to recommendations by the park management. The sample size per village was stratified according to the population of the respective village. Within the villages random-walk methods were applied to select the households. The surveys and the choice experiment were pre-tested for two weeks in villages not included in the sample.

The aim of the stated-choice experiment was to elicit villagers' preferences on three attributes of scheme design: the payment vehicle, issues of making payments to groups, and scheme duration. For each attribute we provided two levels, i.e. two choice options. In total this resulted in eight ($2^3 = 8$) scenarios. Table 2 lists the attributes and their levels.

(Table 2 about here)

To facilitate keeping an overview, eight show cards with pictograms for each attribute level were laid out in front of the respondent. During the pre-testing phase we tried

asking for a full ranking of the options. Since a full ranking turned out to be difficult, we adjusted the survey to ask only for the most preferred choice.

3.2 Results

The policy workshop at IIMA revealed that the stakeholders, at large, were previously not aware of the performance payment approach. Since other policies have not succeeded in halting the decline in tiger populations, there was interest in exploring the approach and eventually implementing it on a pilot basis. After the policy workshop, the project thus focused on developing a proposal for a scheme that is adapted to the context at BNP. The proposal follows the framework developed above and is summarized in column 3 of Table 1.

Transferring the Swedish policy one-to-one to the Indian context is unlikely to work because ascribing the conservation of a tiger to a single village is extremely difficult. This implies that implementing the most direct form of a performance payment scheme, in which incentives are tied to the ultimate conservation goal, is not possible. Several recent studies suggest that tiger densities are strongly correlated with the density of their prey species (Chapron et al., 2008; Karanth et al., 2006; Karanth et al., 2004; Damania et al., 2003; Karanth and Stith, 1999). The studies conclude that one of the most important factors for tiger conservation is the sustainable management of sufficiently high prey densities, in particular wild ungulates. Currently, the buffer zone of BNP is heavily overgrazed by livestock with an average density of 80 cattle/km² (Project Tiger, 2006) and tree cover is sparse due to heavy lopping activities and collection of firewood (Müller, 2008).

The goal for a new policy could thus be to improve the forest and pasture quality in the buffer zone. This would increase the fodder basis for wild ungulates which in turn would benefit tiger conservation. Depending on the type of trees planted, a side goal could be to provide valuable non-timber forest products to the villagers. It is important to note that the proposed scheme remains a performance payment scheme albeit incentives are tied to an intermediate conservation goal.

Either an NGO or the park management could function as in situ environmental service buyer. Since the park management currently faces budget constraints, the scheme would need to be externally funded. “Project Tiger” is the largest national tiger conservation program in India. Between 1997 and 2002, its budget amounted to US\$17.75 million (Dinerstein et al., 2007). Founded in 1973, the initiative spent considerable effort on attempts to move villages out of the tiger reserves. However, fairly few villages were moved and the decline in tiger populations progressed. A debate on how funds could be invested in the future to achieve more effective tiger conservation is necessary.

The environmental service sellers in our proposed scheme would be the villages in the buffer zone of BNP. An improvement in pasture quality would necessitate a stringent livestock management policy within the villages. The majority of pastures around the park are not privately owned, which, due to the resulting open access situation, results in classical commons problems with excessive overgrazing. The lack of privately owned land necessitates the involvement of entire villages.

Concerning the policy context, Bandhavgarh was declared national park in 1968. The Indian Wildlife (Protection) Act of 1972 forbids the grazing of any livestock in a national park. However, villagers who lose livestock in tiger attacks outside BNP can apply for

compensation. The Indian Wildlife (Protection) Act illegalizes the hunting of tigers. Convicted poachers are penalized with prison sentences and fines.

The interview with the park management on scheme design resulted in ideas for five indicators that could advance tiger conservation. The first three focus on increasing the fodder availability in the buffer zone for tigers' wild prey species: (i) rejuvenation of trees without bite marks, (ii) abundance of palatable grasses, and as negative indicator the (iii) number of felled trees. To avoid a displacement of livestock grazing activities into the park (iv) lack of cow dung traces in the park area adjoining a village could be used as additional indicator. To reinforce the ban on poaching a fifth indicator (v) non-occurrence of poaching in the adjoining park area could be added. A baseline to measure overall scheme success could build on a study on pasture vegetation presented in Müller (2008).

All performance payment schemes require certain monitoring efforts. The monitoring of the pasture quality around BNP could be commissioned to trained park rangers and botanists who have the necessary skills and are impartial. We suggest monitoring fields three times per year to account for the large changes in vegetation between the rainy and dry seasons. The costs for this monitoring would need to be covered by the scheme.

Independent of the source of funds for a performance payment scheme around BNP, the budget would undoubtedly be limited, necessitating a selection of villages. Eligibility criteria for the scheme could include spatial aspects, e.g. distance to the park or tiger density in the area. Villages in the buffer zone that are disjointed from the park, e.g. through roads with heavy traffic, may be excluded from the scheme because a change in pasture quality there is less likely to impact tiger conservation. Alternatively, villages

between BNP and the next closest tiger reserve could be targeted to enhance the corridor between the reserves. Furthermore, sites at which the scheme most likely would create the largest additionality could be selected.

The amount of the payment should cover the opportunity cost of the environmental service provision, in this case the value of forgone fodder for livestock and fuel wood. Since the main economic activity in all villages is subsistence agriculture, the opportunity costs can be expected to be fairly homogenous across the villages. The performance payment could be issued in intervals equivalent to the monitoring frequency. To reinforce commitment to conservation one of the payments could be timed to coincide with the dry season when conditions become more difficult as fodder becomes scarce.

The park authorities suggested to benevolently reward increases in conservation outcomes but not to impose penalties in the form of fines or repayments if performance decreases. If a decline in performance is observed, there would simply be no payment. Referring to the payment modalities discussed in the framework, we thus suggest a continuous payment (rather than relative performance evaluation or threshold payments) based on several indicators.

The stated choice experiment described in the methods section served to elicit villagers' preferences on several aspects of scheme design. As background the interviewees were told to assume a conservation agency were to come to their village and it would offer rewards for letting community pasture land close to the park become more suitable for wildlife. The agency would come three times a year to make rewards based on several indicators, which were formulated based on the park management's suggestions

presented above. In detail these were: Number of saplings per acre, number of large trees that are not lopped in the top third of the crown, and abundance of palatable grasses. In case a villager was found guilty of poaching, the village would be expelled from the scheme. To avoid perplexing the interviewees with too many scheme details, the idea on incorporating cow traces in the park as negative indicator was not included.

Concerning the payment vehicle, 53% of the villagers opted for a scheme with cash payments whereas the remaining 47% preferred in-kind payments. Interestingly, 62% of the female respondents chose a scheme with cash payments while only 49% of the male respondents did so (a chi-squared test shows that this difference is significant at the 5% level). Some of the men commented their choice for in-kind payments as precaution to not directly spend cash payments for alcohol consumption. Some interviewees suggested in-kind payments such as improvements to health care programs or renovation of school buildings. Albeit the need for such project support was manifested, it would be intricate if not unethical to withdraw funding for such investments if conservation performance declined. Therefore, we do not consider such project support as suitable for a performance payment approach.

The choice experiment furthermore revealed that villagers have a strong preference for payments to households in equal shares. Out of all 294 respondents 82% chose an option that included payments to households. We hypothesized that the preference for village payments would be stronger in places with previous experience in successful community activities but the data does not substantiate this hypothesis.

Considering scheme duration the majority of respondents (73%) indicated that they preferred a scheme that had guaranteed funding for 10 years even though this entailed

lower per-unit payments. This result indicates that villagers have a strong preference for schemes with long-term commitment. This is in line with findings of a study on preferences for community-forestry contracts in Indonesia (Arifin et al., 2009).

The most frequently (32%) chosen combination of scheme attributes was cash payments to households with a 10 year guaranteed funding. The second most frequent combination (29%) was in-kind payments to households with 10 years of guaranteed funding. The four most frequently chosen attribute combinations all foresee payments to households.

After the respondents had indicated their preferred scheme setup, we asked the following question: “If your village had this kind of scheme, what would you do to make pasture land more suitable for wildlife?”

The most frequent responses were that the respondents would engage in the scheme by supplying labor to look after and guard the enrolled area and they would plant trees. Often participation was made conditional on the provision of water, fences, and saplings to facilitate pasture quality improvement. Only 9% stated that they would not participate. Reasons given were a prevailing lack of land and labor resources, lack of interest in conservation due to other problems, projection that the scheme wouldn't work due to scarcity of land, perception that wild animals will increase without intervention, and a desire to drive away wild animals. This fairly low rate of disinterested or doubtful respondents must be interpreted with care. Respondents may have been biased toward responding positively because they deemed this to be the anticipated or strategically advantageous answer.

3.3 Discussion of potential caveats

Although policy makers and villagers may be enthusiastic about such a scheme, considering potential inadvertent side effects is important. The implementation of this type of scheme in a poor rural area could jeopardize the livelihood of those who crucially and solely depend on livestock as source of living. Some villagers may have the resilience to cope with changes in pasture management whereas others, especially in the short term, may face serious economic shortcomings. Although the payment for an improvement of pasture quality should offset the foregone resource benefits, it is questionable whether all village members will truly be at least equally well-off as without the scheme. Land use changes induced by a PES scheme may decrease labor demand which could result in adverse effects for people whose livelihoods depend on labor income (Pagiola et al., 2005). For example a professional herder, i.e. someone who tends other villagers' livestock for salary, may run out of business if livestock numbers were to drastically decrease. On the other hand, additional employment opportunities may arise for planting, fencing and guarding saplings. Whether the village can flexibly rebound such alterations in its socio-economic structure will to a large extent depend on the internal allocation of the performance payments.

If leakage is deemed a serious concern, we suggest also monitoring adjacent areas in the base year. This will provide an objective basis to deal with potential future leakage allegations.

4 Conclusions

This paper outlined a general framework for performance payment schemes for environmental service provision. A brief overview of the unique Swedish experience was

presented. Although a longer time span may be required to ascertain the outcome of this pioneer scheme, the increasing number of wolverines which now has surpassed the set population goal is indicative of the policy's success. For the Indian context we suggested a modified approach which took into account ideas given by the park management as well as preferences expressed by villagers around BNP.

Our assessment of the transferability to India and previous experiences with small performance payment schemes, e.g. for turtle conservation in Kenya and Tanzania (Ferraro and Gjertsen, 2009), suggest that there is no general restriction on implementing this type of policy in a developing country context. Examples of PES schemes which make payments based on indicators of inputs into the production process rather than conservation outputs are also abundant in developing countries (Landell-Mills and Porras, 2002; Wunder et al., 2008). The policy makers, park directors, and wildlife biologists in India who participated in the policy workshop hosted for this study were generally in favor of testing the performance payment approach. The tenor was that it is worth trying this approach since it may help relax the tension between conservation efforts and the increasing number of rural poor living around wildlife parks. The villagers in our survey in the buffer zone of BNP responded positively toward a suggested performance payment scheme. Their enthusiasm must be interpreted with care due to the possibility of strategic or hypothetical bias.

Experiences with community-based natural resource management schemes especially for wildlife in Africa point toward problems that could also hamper the functioning of a performance payment scheme. In particular these are elite capture by chiefs and their kin, nepotism, corruption, uneven participation, and mismanagement (Balint and Mashinya,

2006; Blaikie, 2006; Shackleton, 2002). These problems are especially relevant in cases where the environmental service cannot be attributed to individuals and payments are based on group performance. If these issues are of serious concern, the payments should not be given to the group as a lump sum. Chances to motivate members to exert effort to generate the environmental service may be higher if there is congruence between the level of individuals' cost and benefit of scheme participation (Ostrom, 1990).

A further concern is that people may be reluctant to participate in a performance payment scheme if enforceability of contracts is not guaranteed due to a deficient legal system (Ferraro and Kiss, 2002).

Where there are no major concerns about corruption or the reliability of the legal system, performance payments are likely to provide strong pro-conservation incentives. The policy framework outlined in this paper indicated several different alternatives for special aspects of scheme design. By choosing among the different alternatives a performance payment scheme can be tailored to suit a specific context.

An interesting objective for further research would be to implement a performance payment scheme, such as the one outlined for BNP in this paper, following an experimental design that allows later comparisons to similar areas without such a scheme. Following up such a pilot project would provide valuable experience and insights into more practical issues of scheme implementation.

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	Sweden	Potential scheme for BNP
Policy goal	80 lynx offspring and 90 wolverine offspring annually in reindeer herding area	Increase forest and pasture quality in buffer zone
Secondary goals	No	Provision of non-timber forest products to villagers
Service buyer(s)	Government	NGO or park management (with external funding)
Service seller(s)	Sami reindeer herder villages	Villages in buffer zone of BNP
Policy context	Ban and penalty on illicit poaching of lynx and wolverines	<ul style="list-style-type: none"> • Livestock's intrusion into park illegal • Ban and penalty on hunting of tigers • Compensation for predation on livestock available
Baseline	167 lynx offspring in 1997 69 wolverine offspring in 1996	Could build on assessment of vegetation in Müller (2008)
Indicators	Number of certified carnivore offspring	<ul style="list-style-type: none"> • Rejuvenation of trees without bite marks • Abundance of palatable grasses • Number of felled trees • Cow dung traces in adjoining park area • Non-occurrence of poaching
Monitoring	Cooperation between reindeer herders and officials	Conducted by park rangers and botanists
Targeting	No special targeting	Villages in potential corridor to closest park
Payment amount	SEK200,000 (SEK1≈ US\$0.13) per certified lynx or wolverine offspring	Slightly larger amount than value of forgone fodder and fuel wood
Payment timing	Annual payment split into two or three transfers	According to monitoring frequency, one transfer during dry season
Payment vehicle	Cash	Cash
Payment modality	Continuous	Continuous
Payments to groups	Yes, group has authority to decide on use and distribution of payments	Overall payment based on village performance, but payment distributed to individual households
Duration	No time restriction on funding availability	Preferably funding availability of min. 10 years
Side effects	None reported	Supplementary monitoring to assess leakage advisable

Table 1: Outline of scheme in Sweden and proposed scheme for BNP, India

Attribute	Levels
Payment vehicle	<ul style="list-style-type: none"> • Monetary • In-kind (examples: seeds, solar cookers)
Payments to groups	<ul style="list-style-type: none"> • Lump-sum payment to village • Payment in equal shares to all households in village
Duration	<ul style="list-style-type: none"> • Guaranteed funding of scheme for 10 years and slightly lower per-unit payments • Guaranteed funding of scheme for 3 years and slightly higher per-unit payments

Table 2: Attributes and the levels used in empirical assessment