

Incentive-based Approaches in Marine Conservation: Applications for Sea Turtles

Heidi Gjertsen^{a,#} and Eduard Niesten^b

^aConservation International, San Diego, CA, USA

^bConservation International, Economics and Planning Program, Arlington, VA, USA

[#]Corresponding author. E-mail: hgjertsen@gmail.com

Abstract

Conservation practitioners are increasingly turning to incentive-based approaches to encourage local resource users to change behaviors that impact biodiversity and natural habitat. We assess the design and performance of marine conservation interventions with varying types of incentives through an analysis of case studies from around the world. Here we focus on seven examples that are particularly relevant to designing incentives for sea turtle conservation. Four of the cases are focused on sea turtle conservation, and the others contain elements that may be applied to turtle projects. Many more opportunities exist for interventions that combine the strengths of these approaches, such as performance-based agreements that provide funds for education or alternative livelihood development, and leasing fishing rights to reduce bycatch.

Keywords: conservation, contracts, economic benefits, incentives, marine, sea turtles

DOI: 10.4103/0972-4923.62674

INTRODUCTION

Conservation practitioners are increasingly turning toward incentive-based approaches to encourage local resource users to change behaviors that impact biodiversity and natural habitat. Although past approaches have employed the stick of fines and penalties (negative incentives), some current approaches use subsidies and payments of various forms (positive incentives) to encourage particular conservation practices (Ferraro 2001; Ferraro & Kiss 2002; Milne & Niesten 2009; Simpson & Sedjo 1996; Wunder 2007, 2008; Troeng & Drews 2004). These approaches recognise that conservation can impose a loss in terms of foregone income or access to resources (opportunity cost). Since people face pressing socio-economic needs in many priority areas for conservation, such potential losses can hamper the acceptance and sustainability of conservation interventions. Put simply, unless conservation programmes address economic needs, local resource users may be compelled to make choices that generate economic returns despite their destructive impacts.

The basic motivation for the use of incentives is as follows: the distribution and nature of conservation costs and benefits contribute to misaligned incentives for conservation. Many of

the benefits are non-market values, notably existence values and to a lesser extent indirect use values, and these benefits accrue to people far removed from resource owners and users. In contrast, the costs of conservation largely fall on local communities, and are immediate and tangible through lost incomes and foregone consumption of resources. Although global benefits from sustainable management may outweigh gains from destructive practices, at the level of decision-makers or resource-users the benefits from unsustainable use often exceed those from sustainable management (Balmford *et al.* 2002). In addition, reducing harvests in the present to maintain stocks in the future may require resource-users to give up income for a period; indeed sustainability may require harvest to be permanently reduced for some resources, implying that users would need to give up income for the long term. The challenge relates to creating structures and economic alternatives that make foregoing income from destructive resource-use a viable and preferred option for resource-users and decision-makers at different scales. In other words, decision-makers need to see tangible incentives to change resource-use patterns if sustainable management and conservation of marine biodiversity is to be achieved.

The role of incentives in conservation efforts is receiving

increased recognition, and there are numerous ways in which incentives can be incorporated. This research is motivated by the proposition that changes in destructive behavior will require interventions that enhance the economic appeal of alternative resource-use decisions, and examines what kinds of site-based interventions show the greatest promise for doing so. We assessed the design and performance of marine conservation interventions with varying types of incentives through an analysis of 27 case studies from 14 countries. These broad results are discussed in Niesten & Gjertsen (2010). The insights and results from this study are applicable to sea turtle conservation initiatives. The threats to sea turtles are similar to threats facing other marine resources in the case studies, and sea turtle conservation takes place across the wide range of conditions covered by our sites. Here we focus on seven specific cases that are particularly relevant for designing incentives for sea turtle conservation. A growing number of sea turtle conservation projects have been experimenting with payment programmes as reviewed in Ferraro & Gjertsen (2009). We discuss two of these payment schemes, as well as two other incentive-based sea turtle conservation programmes. In addition, we present three marine conservation cases that may not be familiar to sea turtle conservationists and which provide useful insights.

THE STUDY SAMPLE

We conducted a study of incentives in marine conservation projects around the world, as a component of Conservation International's (CI) Marine Management Area Science programme. We designed a purposive sample of sites representing a range of geographical and other conditions and used a template to collect comparable standardised data for each site. This includes a detailed characterisation of the project, such as location, stakeholders, conservation objective, principal threats, intervention model, etc. In approximately three-fourth of the cases, the research team visited the project site and met with the implementation team to collect the information. Project implementers and other key informants, including community representatives, were interviewed to complete and verify all information in the template. Each case study was written as a project review, on which project implementers were invited to comment. The individual case studies then informed analysis of the full sample to compare approaches in terms of opportunities, challenges, and best practices. The cases covered a range of approaches, including buy-outs, alternative livelihoods, and conservation agreements. Readers are referred to Niesten & Gjertsen (2010) for a complete presentation of the study.

In this paper, we discuss variations of the conservation agreement approach through which conservation investors provide direct economic benefits to resource users in exchange for changes in their resource use practices. Conservation agreements typically include a set of common components (TNC & CI 2009; Niesten *et al.* 2008). In general, conservation agreements specify:

- *Parties and their rights and responsibilities.* The agreement typically is between two principal parties—the resource-users who agree to forego destructive practices and collaborate in conservation efforts, and the conservation-investor who agrees to provide compensatory benefits. Other entities may be recognised in the agreement documentation, e.g., defining the role of government agencies or other third parties in monitoring activities.
- *Prohibited or required activities.* These will be the responsibility of the resource users, designed to advance the conservation objectives of the project. Examples include observing no-take zones, desisting from certain practices such as dynamite fishing, conducting patrols to deter poaching by outsiders, etc.
- *Benefits provided by the conservation investor to the resource users.* In return for commitments in the form of prohibited or required activities on the part of resource users, the conservation investor agrees to supply a defined benefit package. To the extent possible, the value of benefits should be commensurate with the value of foregone resource use (e.g., reduced fish yields from not using certain destructive gear types) and, when appropriate, the cost of conservation actions required (e.g., wages for patrolling activities). A portion of benefit packages may take the form of cash payments, but in many cases benefits are defined as specific investments in social goods such as scholarships or infrastructure development.
- *Sanctions for non-compliance.* Benefits are provided in return for adherence to the conservation commitments in the agreement. In the event that these commitments are not met, benefits must be adjusted; a thorough agreement will define how benefits are reduced in response to particular types of infractions. Typically, reductions in benefits will be temporary to allow resource-users an opportunity to improve compliance and thereby restore the full benefit package.
- *Performance monitoring protocol.* Given that benefits are contingent on performance, compliance with the conservation commitments must be monitored to justify continued benefit delivery or application of sanctions. This means that the conservation commitments must be defined in a way that is amenable to monitoring, and the parties to the agreement must agree to objective compliance standards and means of measuring performance with respect to those standards.

Although most conservation agreements will include the components listed above, the tool is extremely flexible and allows for adaptation to specific contexts that can vary widely. Consequently, agreements can take a variety of forms, as reflected in the case studies that follow. Note, however, that conditionality of the benefits on conservation performance (thus requiring well-defined performance metrics and monitoring) is a critical element of the approach. Some of the cases presented below do not contain a strong conditionality link, thus are not strictly conservation agreements, but they do attempt to use benefits as incentives. We include these cases

and discuss how they could be incorporated into more formal conservation agreements. Table 1 presents the case studies that are discussed in this paper and the locations are presented in the map in Figure 1.

CASE STUDIES

Rendova, Solomon Islands: Turtle incentive payments

Rendova is located in the Western Province of the Solomon Islands and is an island of approximately 40,000 ha. In March 2002, Australian biologists proposed the idea of establishing a conservation agreement for protecting leatherback turtles (Gjertsen & Stevenson 2009; Ferraro & Gjertsen 2009). The project takes place in four villages. The participating villages each selected their own turtle monitor who is responsible for recording data about turtle-nesting activities.

In 2004, the turtle incentive programme operated as follows:

a villager who sees a leatherback coming onto the beach to nest is to bring the turtle monitor to the turtle. If the monitor tags the turtle and records the information on the data sheet, the observer is paid approximately USD 2 and the monitor is paid USD 1.33. If the observer disturbs the turtle in any way he does not receive the payment. In addition to recording the data, the monitor photographs the turtle, recording the date and time for verification purposes.

In addition to the individual payments, USD 1.33 is placed in a community fund, managed by a board of community members. There are five signatories to the fund, all of whom must sign to withdraw money. When funds are withdrawn, the signatories are required to provide minutes of the community meeting clarifying how the money will be used.

A villager who finds a nest or tracks after the turtle has gone back to sea must bring the turtle monitor to the nest. If the turtle monitor marks the nest and records the other information on the data sheet, the person who found the nest or tracks, the monitor,

Table 1
Description of case studies

Site	Year	Purpose	Incentive
Rendova, Solomon Islands	2002	Reduce poaching of leatherbacks and their eggs	Individual finders and the community development fund receive cash payments for allowing hatchlings to hatch from eggs
Mafia Island, Tanzania	2002	Reduce poaching of leatherbacks and their eggs	Individual finders receive cash payments for allowing hatchlings to hatch from eggs
Jamursba Medi, Indonesia	2005	Protect a turtle nesting beach and fringing forest	Scholarships provide incentives to villagers to declare and respect the no-take zone
Ayau, Indonesia	2007	Reduce the consumption of sea turtles	Provide local villagers with an alternative protein source for feasts. Rather than attempting to provide an income generating activity (subsidising production), this project subsidises consumption of a local food. It thus does not require production, marketing, transportation, etc.
Laguna San Ignacio, Mexico	2005	Protect grey whale habitat by prohibiting coastal development	Under a conservation easement, community members receive funds for community projects each year that they meet all the conditions under the agreement
Misool Eco Resort, Indonesia	2005	Protect reef habitat and species through a no-take zone	Villagers receive employment and lease payments contingent on declaration and observance of the no-take zone
Northern Gulf of California, Mexico	2007	Reduce vaquita bycatch by reducing use of gillnets	Gillnet permits were purchased or leased from fishermen to compensate for relinquishing fishing rights

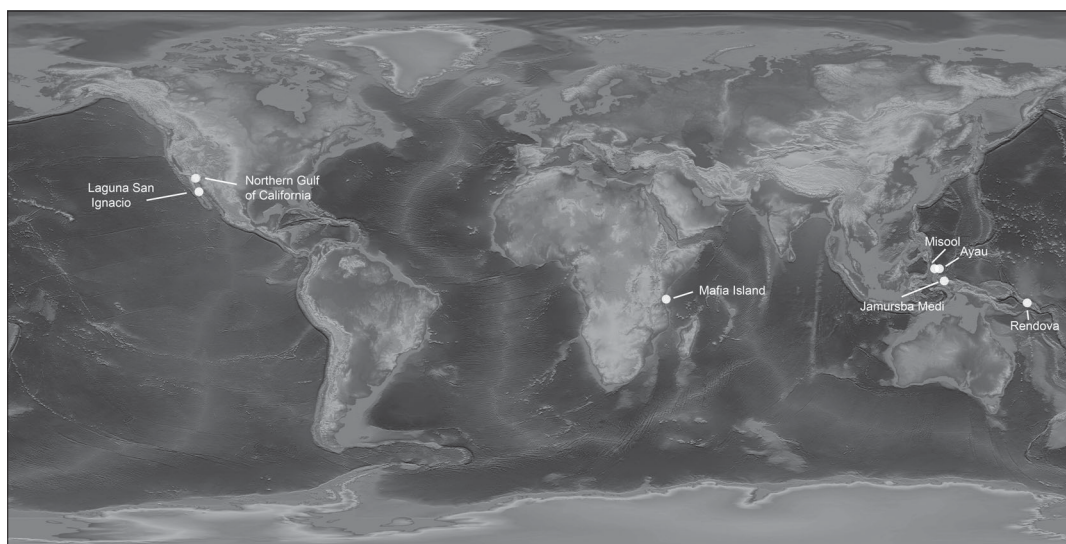


Figure 1
Map of case studies

and the community fund are each paid USD 1.33. If the nest successfully hatches (i.e., at least one hatchling emerges), the initial reporter is paid USD 4, the monitor USD 1.33, and an additional USD 4 is paid into the community fund.

A staff member from a local organisation (Tetepare Descendants Association) visits the villages and collects the photos and data sheets and distributes the payments. This project creates multiple incentives for turtle conservation. Every villager and turtle monitor has the potential to access payments for reporting and not disturbing or consuming turtles or their eggs. In addition, there is an incentive to prevent others from disturbing the turtle or the nest, since they receive an additional payment if the nest hatches. Finally, the community as a whole faces an incentive in the form of contributions to the community fund if turtles and their nests remain undisturbed. Thus, someone who did not find the nest receives some benefit (via the community fund) from not harvesting. The strength of this incentive of course depends on the degree to which everyone perceives the fund as something from which they will benefit.

Since the 2007 tsunami, tides have been quite high, inundating many of the nests. Therefore, all nests below the high water line are now relocated and the community rangers monitor the nests. The finders still get a payment, but there are no individual hatching payments. Instead, the hatching payments all accrue to the community fund.

The conservation agreement currently being implemented on Rendova has been successful in protecting nesting leatherback females and their eggs. Although there are occasional poaching incidents, prior to the project nearly all eggs and females were harvested. In addition, the project has provided modest income to villagers and funds for community development. Financially, the project has long depended on short-term funding that does not quite cover the full range of needed activities, posing an obstacle to long-term planning.

Mafia Island, Tanzania: Turtle incentive payments

Mafia Island is located 10 kilometers off the mainland and 120 kilometers south of Dar es Salaam in Tanzania. It is an important turtle nesting area, primarily for green turtles, but also for a small number of hawksbill turtles (fewer than five nests per year). Turtles lay an average of 190 nests per year on the island and surrounding small islands (densities in 2005 were approximately 50 nests per km of beach).

Prior to 2001, surveys of residents conducted by WWF-Tanzania indicate that all nests discovered by residents were poached. In 2001, the Mafia Island Turtle Conservation Program was initiated through a collaboration between Mafia Island Marine Park and Mafia District Council, with financial support from WWF (Ferraro & Gjertsen 2009). The programme worked with communities on Mafia Island to elect turtle Conservation Officers in 2001. A Tanzanian NGO (Sea Sense) was established to conduct the conservation activities. Sea Sense trained the elected monitors and paid them to patrol the main nesting beaches, relocate nests when necessary and assist with data collection and tagging.

Project staff perceived that the monitors were not sufficient to deter nest poaching, and in January, 2002 the project initiated a payment scheme for nest protection. Under this scheme, individuals who report a nest to a monitor receive an initial payment of approximately USD 3.50 once the nest is verified by the monitor. They then receive a payment of USD 0.07 for each successful hatching and USD 0.04 for each non-viable egg. If a nest completely fails to have a single egg hatched, or is poached or predated, no payment for hatching is made. When the programme was first implemented, Conservation Officers who were the first to find a nest were not paid a finder incentive in addition to their salaries. In 2004, this rule was changed and anyone who found a nest received the same payment.

Poaching rates were 100% prior to 2001, and approximately 50% with monitors in 2001. With the implementation of the performance payment scheme, the poaching rate decreased to 3% in 2002, 2% in 2003, less than 1% in 2004, 1.2% in 2005, 4% in 2006, 6.8% in 2007 and 1.6% in 2008. In 2004 the project was extended to the Temeke District, south of Dar es Salaam. Sea Sense employees believe the programme has been successful as only three nests were poached (4%) in 2004. In 2006 nest poaching remained 4% but decreased to less than 1% in 2007 and 2008.

Although confounding factors prohibit precise estimation of project impacts, the evidence suggests that a substantial drop in poaching has been achieved by the programme and that a substantial portion of this drop stems from the introduction of the nest incentive scheme. The project is quite similar to that described in Rendova, Solomon Islands, but it includes a variable hatching payment, which creates an additional incentive to maximise hatchling production. In the case of Rendova, it would be possible for someone to harvest a portion of the eggs and still receive the hatching payment, as long as a single hatchling emerged. Also similar to the Rendova programme, the Sea Sense payment initiative is quite inexpensive at a cost of about USD 10 per nest, or USD 0.08 per hatchling.

Jamursba Medi, Indonesia: Scholarships in exchange for protected area declaration

Jamursba Medi is a series of beaches covering a 20 km stretch on the north coast of Bird's Head peninsula in West Papua, Indonesia (formerly Irian Jaya). Jamursba Medi hosts the largest remaining leatherback nesting population in the Pacific. Together with a nearby beach (Warmon), this accounts for approximately 75% of nesting in the Western Pacific (Dutton *et al.* 2007). Two villages border Jamursba Medi beach, Saubeba at one end and Warmandi at the other.

Since 1993, WWF-Indonesia, in collaboration with the local government, has been working with the two communities to protect nesting leatherbacks. WWF employs villagers from both Saubeba and Warmandi to patrol the beach and collect data. In addition to direct project employment for villagers (patrolling and data collection), attempts in the past to create incentives for turtle conservation have included small-scale alternative livelihood projects. However, these initiatives, such

as palm-sugar production, all failed. Thus, benefits from the conservation project only accrued to the 24 patrollers receiving salaries. This caused tension in the village and conservation project staff recognised that the situation was threatening the future of the project.

Based on discussions and priorities identified by villagers, WWF began compensating villagers for opportunity costs by distributing benefits more broadly. In 2005, WWF donated a 40hp outboard engine and wooden longboat to the villages as compensation for their involvement in conservation work. In 2005 WWF also developed a collaboration with SEACOLOGY to provide 13 three-year scholarships for village students (worth USD 23,000) in exchange for establishing a 280 acre no-take leatherback turtle nesting beach and 160 acre fringing forest reserve. This no-take reserve is where no hunting, cutting, gathering, farming, or any other activity that changes the natural state of the beach and fringing forest is permitted for a period of five years.

In 2006, 13 students were awarded scholarships. The recipients' families provided statements pledging their commitment to protecting the turtle nesting beach and forest habitats; if a family is found poaching eggs, they no longer will be eligible for participation in the scholarship programme. Village elders, landowners and leaders have also signed a statement ensuring their commitment to protect the nesting beach and forest reserve. In August 2007 the villages agreed to protect an additional 2,031 acres.

The conservation programme at Jamursba Medi has been successful at curtailing human predation of leatherback eggs for fifteen years. There remain opportunities for strengthening incentives, such as by expanding the number of children receiving school fee support. A more formalised conservation agreement in which benefits are contingent on conservation performance could improve the effectiveness of the project, particularly if conservation commitments are explicitly targeted to address the principal threats. In addition, there is a need to build institutional capacity and secure long-term funding for the project.

Ayau, Indonesia: Pig breeding as a replacement for turtle meat

Raja Ampat is a large archipelago in eastern Indonesia's West Papua province, covering nearly 50,000 sq. km, with a population of 32,000. The Ayau group of islands are located in North Raja Ampat. The islands have very limited agricultural potential. Rapid ecological assessments by CI in 2001 and The Nature Conservancy in 2002 led these organizations to declare Raja Ampat as the 'Epicenter of Marine Biodiversity.' Raja Ampat is home to over 540 species of coral (70% of the world's total), over 1,300 species of coral reef fish, and more than 600 species of molluscs. It also provides habitat for a number of endangered species, including dugongs, whales and four species of sea turtle.

Turtles and turtle eggs have been a staple food in the Ayau Islands for many years. All sizes of green turtle are hunted

and eggs are also taken on a regular basis. Turtle meat is particularly sought after to provide a communal protein source at large community gatherings including religious holidays, weddings and funerals. It is estimated that at least 80 turtles have traditionally been taken for the annual Christmas feast in Ayau; at other feasts or church events 30–50 turtles may regularly be consumed. In 2005, CI visited the Ayau villages to conduct outreach about turtle conservation. In 2005, the headman of one village suggested that a substitute for turtle meat would help the communities to agree to stop the hunt; he emphasised however that culturally it would be important that the substitute also represent a large communal protein source (as opposed to, for instance, individual plate-sized fish). The village committed to become an example of zero turtle take beginning Christmas of 2007. They wrote a letter to CI to request assistance in developing alternative protein sources and alternative livelihoods. CI agreed to supply 6 large pigs for the Christmas feast to demonstrate that it is possible to have a feast without turtle meat. CI also supplied each family group with two piglets to raise for later feasts as an alternative to sea turtle meat. The other villages have not yet agreed to halt turtle consumption.

To prevent water contamination from pig waste, CI assisted the village in building and managing a closed-system piggery, whereby all waste is collected and processed into cooking biogas and semi-processed compost manure. The biogas is used for cooking with an adapted cooker, and the manure can be used to improve the soil for fruit and vegetable production. The village was rewarded with this pilot project because of their commitment to turtle conservation and their demonstrated success with pig rearing. CI also supplied each village with simple machines that extract coconut oil and produce residue for pig feed.

The pigs were initially provided to the village as a one-time benefit. However, for the time being, CI has decided to continue providing pigs each year to the village hosting the Christmas feast. If the pilot succeeds, the plan is to expand to four other villages as an incentive for setting aside no-take zones within their reef areas.

Although there currently is no monitoring of turtle harvest and consumption, based on reports from local monitors it appears that few turtles have been taken by the village. The project achieved a reduction in turtle harvest of 80–100 turtles that normally would be consumed for the Christmas feast. In addition, the villagers were exposed to the possibility of a feast without turtle meat. There currently are no formal rules regarding the conservation commitment or monitoring programme or sanctions if someone breaks the rules. Thus, the benefits are not contingent on performance. However, it appears that there is some interest in formalising the agreement and making the benefits more performance-based.

Northern Gulf, Mexico: Purchase and lease of fishing permits to avert vaquita extinction

The vaquita (*Phocoena sinus*) is a small porpoise endemic to

the Northern Gulf of California, Mexico. Its known distribution encompasses an area of only about 4,000 sq. km, far smaller than that of any other living marine cetacean species. The main threat to vaquita survival is bycatch in gill nets used for fish and shrimp. The vaquita is particularly vulnerable given its restricted distribution in an area where fishing has long been a primary economic activity, providing the sole source of income for many people.

Despite regulations to protect vaquita and other species, the threat from fishing (both legal and illegal) persists. Although fishermen do not wish to catch vaquita, practices within the fisheries have not changed enough to reduce the pressure. Numerous regulations, protected designations and management recommendations have sought to protect the vaquita since the IUCN declared it endangered in 1990. However, a recent paper by Jaramillo *et al.* (2007) estimates that there were only 150 vaquitas remaining in 2007. Continued failure to mitigate the threat as well as conflicts between government, NGOs, and fishermen necessitated a palatable solution that quickly could remove all nets from vaquita habitat. In 2005 the Mexican government, the US government, and a variety of NGOs began discussing the design of a programme to compensate fishermen for ceasing to use nets in vaquita habitat.

After much discussion about how to implement a buyout of all nets, the Mexican government decided to proceed with an initial buyout and reduce fishing effort as much as possible for approximately USD 1 million. The pilot scheme was implemented in August 2007. Fishermen were given the opportunity to respond to different offered prices either for giving up their net permits (for shrimp or finfish) in exchange for permits for gear that do not harm vaquita, or for funding to develop a tourism-related business. Sixty-six permits out of approximately 1,400 were purchased. A second buyout took place in June and July, 2008. Out of 893 applications submitted, 738 applications were accepted: 52 for switching gears; 138 for full permit buyouts; and 548 for compensation for not fishing inside the refuge for one year.

Fishermen were very responsive in particular to temporary compensation for not fishing inside the refuge (which does not require relinquishing a permit). There are efforts underway with the Mexican government, stakeholder groups, and US fishermen and academics to design and test new vaquita-safe gear. The potential for marketing vaquita-safe shrimp is being investigated, which could complement the introduction of alternative gear and lessen the impact of banning nets. In addition, there is interest in establishing micro-credit projects to assist the fishermen and their families in transitioning to other livelihoods. Long-term financing is being sought for monitoring, enforcement, and creation of additional incentives.

Laguna San Ignacio, Mexico: Conservation easement to protect grey whale habitat

Laguna San Ignacio is situated on the Pacific Coast of Baja California Sur, Mexico. More than half of the world's grey whale calves are born inside Laguna San Ignacio and the

neighbouring lagoon of Ojo de Liebre. Thousands of grey whales make an annual 10,000-mile voyage from feeding grounds in the Arctic circle to the warmer waters of Laguna San Ignacio to calve and rear their young before journeying back to Alaska in the spring.

In 1994, Mitsubishi proposed to establish a salt plant at Laguna San Ignacio. The proposal was eventually defeated in 2000 through the efforts of local and international NGOs, but coastal development pressure continued to threaten the area. To conserve the area over the long term, Mexican NGO Pronatura suggested the option of an easement, which is a voluntary, legally binding agreement between two parties in which the land use rights of one party are restricted, with the objective of preserving in perpetuity natural resources, scenic beauty, or historical and cultural values of the land. In 2005, the Laguna San Ignacio Conservation Alliance established a 120,000-acre conservation easement comprising all the communal lands within the *ejido*¹ Luis Echeverría Alvarez on the southern shore of Laguna San Ignacio.

There are four parties to the agreement, each with a specific role. *Ejido* Luis Echeverría agrees to limit coastal development. Pronatura monitors compliance. The International Community Foundation (ICF) is a US-based foundation responsible for disbursing funds to *ejido* Luis Echeverría. They maintain a trust fund and manage it as a third party to ensure transparency and accountability. Maijanu is an NGO that was created in *ejido* Luis Echeverría to receive and manage the funds disbursed through the easement.

Pronatura conducts bi-annual monitoring of the area to assess compliance with the terms of the easement. Pronatura then reports back to ICF with a determination of whether the *ejido* has met the terms of the agreement. If so, then ICF disburses to Maijanu the annual interest generated from the *ejido* Luis Echeverría Alvarez Seed Fund, which is capitalised in the amount of USD 650,000. These annual payments amount to approximately USD 25,000 per year. The payments can be used for any community development projects that are not harmful to the environment and that do not contradict the terms of the contract. Every year any member can present a project proposal that will be reviewed by the *ejido* leadership and all the members decide on the proposals by vote in a general assembly.

If the *ejido*'s obligations in the contract are not met, the payments to the *ejido* will not be disbursed. If the violation caused damage that can be restored, payments recommence when the damage is restored. If the damage cannot be restored, the payments permanently cease. Since the contract is signed in perpetuity, compliance is required each and every year. When compliance is lacking, not only can the payments be halted, but Pronatura also can take legal action to force compliance. ICF maintains a Legal Defence Fund of USD 225,000 to enforce and defend the terms and conditions of the conservation easement. ICF also maintains a Stewardship Fund of USD 250,000 that disburses USD 10,000 per year to Pronatura for monitoring.

Thus far, the terms of the easement have been met by *ejido*

Luis Echeverria, and funds have been released to the *ejido* for community projects. Some of the projects that have been funded are technical assistance and training for a goat rancher, technical assistance for raising chickens, and pilot projects for small-scale artisanal salt production and cactus production.

Intense development pressure in Baja California means that conservation requires incentives to compete with potentially lucrative alternative land uses. The *ejido* Luis Echeverria conservation easement recognised these opportunity costs of forgoing development and created incentives for the *ejido* to protect valuable whale habitat in perpetuity. Responsibilities of the various stakeholders and the associated procedures (monitoring, reporting, enforcement, payments, etc.) are clearly spelled out in a written contract. Long-term funding was secured upfront in trust funds (managed by a third party) so that all easement-related costs are covered in perpetuity. Because payments are only released when conservation objectives are met (based on monitoring compliance with the terms of the easement), incentives are performance-based and these costs are not incurred if conservation is not achieved. Furthermore, a legal team and funds are available in case infractions must be prosecuted.

Misool Eco Resort, Indonesia: Leasing of a marine protected area

In southeast Raja Ampat (Papua, Indonesia; see Ayau, Indonesia This issue: p. 9), a group of divers have built an ecotourism resort at Batbitim island. Though the island is uninhabited, the surrounding waters are used by local people for fishing. On 28 November 2005, the Misool Eco Resort (MER) entered into a 25-year lease agreement with a local community—the customary owners of the island—to establish a no-take zone (NTZ) surrounding Batbitim and many neighboring islands.

The signatories to the lease contract were the Misool Eco Resort company and the heads of the families in the village. Under the terms of the lease, MER secured exclusive rights to the island and rights were secured to designate approximately 425 sq. km of surrounding seas as a NTZ including animals, coral reefs, turtles, sharks, rays and fish. The agreement was made under both Papuan *adat* (customary) law and Indonesian law.

Under the lease, anyone other than MER is prohibited from taking any marine products from the NTZ or granting permission to any other party to do so. In return for rights to the islands and marine area, MER agrees to act as a steward of the area and pays a lease fee to the community every five years. In addition to making rental payments, the resort also employs villagers and provides them with health insurance for themselves and their families, job training, and English lessons. Under the agreement the resort regularly patrols the area for illegal fishing and shark finning and manages the area for conservation, including observance of the no-take area.

Despite extensive experience and understanding of the area on the part of the resort investors, establishing the agreement for the Misool Eco Resort lease faced many challenges. There

were many legal issues to surmount, including identification of the appropriate landowners, obtaining government permission, and preparing the appropriate documentation and fees. The Misool Eco Resort opened its doors to visitors in October 2008. MER intends to protect another site (Daram) that is being used by turtle harvesters and shark finners, in return for which the community receives a fishing fee of USD 425 per year. MER plans to work with the community to investigate the possibility of declaring a NTZ there in return for comparable benefits.

DISCUSSION

The experiences of these seven incentive-based marine conservation projects offer several lessons for sea turtle conservation. We discuss these below.

Benefit packages

Some of the most well-developed conservation agreements we reviewed are the sea turtle nesting payment programmes. The Rendova and Mafia Island nest protection payment initiatives have achieved substantial results for a very low annual cost. Gjertsen & Stevenson (2009) find that the Rendova egg payment project protects on the order of 90 leatherback nests per year at a cost of approximately USD 2,500, though this figure likely underestimates administrative costs. Sea turtle nesting represents a case that is quite amenable to the approach, since nesting can be monitored and individuals can establish ‘property rights’ over the nests.

The cases illustrate how benefit packages can be tailored to the needs of particular sites. In many contexts, individual cash payments are not appropriate, therefore the approach has evolved to include a wide range of options, including funds for community development projects. Importantly, benefit packages must respond to resource-user’s needs and priorities, typically identified through a participatory consultation process. For instance, if destructive resource-use is driven by the need for cash to pay school fees, a benefit package that includes scholarships may be appropriate. Table 2 presents the general types of benefit packages included in each project.

Monitoring and enforcement

The conservation agreement model hinges on the contingency of benefits on conservation performance. It thus follows that conservation performance must be measured. The Laguna San Ignacio easement is a model agreement whereby a third party monitors and reports on compliance on an annual basis and funds are released based on this reporting. Not all the projects exhibit such a structured monitoring programme, which may weaken the impact of incentives if the link between benefits and compliance is not sufficiently strong. For example, the Ayau project lacks a monitoring and enforcement protocol for the turtle commitments. The approach of providing scholarships to communities that forego turtle harvests is promising, but in Jamursba Medi, these are only loosely tied to

Table 2
Description of benefit packages

Site	Cash payment to individuals	Cash payment to group	In-kind payment to individuals	In-kind payment to group
Jamursba Medi, Indonesia			X	X
Rendova, Solomon Islands	X	X		
Mafia Island, Tanzania	X			
Ayau, Indonesia			X	X
Laguna San Ignacio, Mexico	X	X		
Misool Eco Resort, Indonesia	X		X	X
Northern Gulf of California, Mexico	X		X	

conservation performance. The scholarship programme could be strengthened by direct incorporation into an agreement. Examples such as Ayau and Jamursba Medi are not truly conservation agreements in their current forms, since they provide benefits without a strong conditionality link. They do offer examples of benefits that could be provided in a conservation agreement for turtle conservation.

The case studies illustrate how direct incentives can be structured to protect a species, such as sea turtles. Mafia Island and Rendova devised compensation formulas of varying complexity linked to numbers of nests, eggs, and hatchings. These projects demonstrate how the degree of complexity and the explicit link between conservation performance and benefits have significant implications for monitoring requirements. The more sophisticated the benefit arrangement, the more imperative it is that performance and conservation outcomes are closely monitored; such monitoring has the added benefit that the project can better demonstrate actual conservation impact.

Not only must it be possible to monitor conservation performance, but the ability to apply and enforce sanctions is also critical. This depends on the legal environment and it must be possible to take recourse in that context. In some contracts, sanctions may simply take the form of withholding funds completely or reducing benefits by some prescribed amount. Losing eligibility for scholarship funds if caught poaching, as in Jamursba Medi, would be a good example. In this case, government or third party enforcement is unlikely to be necessary. However, in cases such as Laguna San Ignacio, legal action may be required to halt construction or development that is contrary to the terms of the contract. In all of these cases, there was an absence of laws or existing laws were not enforced, therefore the contract in essence created a third party enforcement system. Some of these projects, for example Ayau and Jamursba Medi, provide the benefits up front, thus it appears that there are no direct consequences for infractions. However, poor conservation performance may affect whether or not the payment scheme continues in the future. Therefore, communities may be aware that failure to uphold commitments may reduce opportunities for future benefits.

Long-term funding is required to maintain ongoing incentives

A common challenge for conservation agreement projects is

long-term financial and institutional sustainability. A critical aspect of the conservation agreement approach is the guarantee of a long-term, sustained flow of benefits to the communities. This requires a secure funding mechanism for the long term, for example, a dedicated endowment, capitalised to a level sufficient to support ongoing community benefits and management of the site. The Laguna San Ignacio easement is supported by an endowed fund, and a permanent third-party monitoring role for an established institution. In the Misool Eco Resort case sustainability is supported by the presence of a private sector enterprise with a long-term stake in the success of the agreement.

Despite the importance of secure long-term funding to the conservation agreement approach, the other projects remain dependent on short-term grant cycles, affecting both the reliability of the benefit stream and the ability of project implementers to continue fulfilling project management and monitoring roles. While most conservation agreements seek to use short-term grants to sustain benefits for a window of time during which long-term financing is secured, actually capitalising trust funds for the long term is a non-trivial task. This becomes even more difficult in challenging economic times such as the recent global financial recession. This is seen by some as a major shortcoming of the conservation agreement approach. For example, the alternative livelihood approach reflects a model in which an initial set of investments is intended to result in self-sustaining enterprises or changes in resource management, thereby dispensing with the need for long-term financing. Although alternative livelihood projects aim to become self-financing, there are very few examples of projects that succeed in this aim and most continue to rely on series of short-term grants (Salafsky *et al.* 2001; Agrawal & Redford 2006). Thus, long-term financing remains a challenge for most conservation interventions.

Incorporating alternative livelihoods into conservation agreements

As noted above, conservation agreements can incorporate a range of benefits as incentives for conservation. One such option is to provide funds for alternative livelihood development. In this context, the alternative livelihood is not expected to be the driver of conservation *per se*, but instead the livelihood investment is provided as a direct reward for conservation.

Livelihood options may include products that are used locally to avoid the need for marketing and transportation. Rather than rely on alternative income sources, the Ayau project encourages reduced consumption of sea turtles by providing local villagers with an alternative protein source. Ayau is very remote, so by supporting consumption of a local alternative food this avoids some of the challenges relating to distance from markets and limited business capacity. It appears that formalising this approach in a conservation agreement and securing long-term funding for the provision of pigs for the Christmas feast will be a low-cost manner of achieving conservation. A monitoring system and a formalised agreement and benefits would reduce uncertainty on the part of the villagers and provide sanctions for actions that run contrary to the agreement. In the Northern Gulf of California, a buyout provided support for alternative livelihoods, rather than the cash payments typically associated with buyouts. This was in part because the government made use of an existing programme for alternative livelihoods. The funding supported projects for tourism development, fisheries processing, and alternative gears.

Incentives for bycatch reduction

Several initiatives are exploring the potential for expanding conservation agreements beyond nest protection to reduce direct take and bycatch of sea turtles. We are aware of two projects that use payments to reduce bycatch in Kenya and Congo (Ferraro & Gjertsen 2009). A project in Colombia is experimenting with incentives to adopt turtle-safe fishing gear. Lessons from the vaquita buyout may be applicable to turtle bycatch hotspots. After decades of failed programmes to reduce gillnet fishing in vaquita habitat, the incentives provided through the buyout succeeded in eliminating many of the nets. In particular, the option of receiving compensation for retiring nets for one year was well received by fishermen. Thus, explicit quid-pro-quo arrangements based on short-term commitments can generate the confidence needed for resource users to incrementally change behavior in ways that achieve longer-term objectives.

In many places, the large number of fishing vessels and lack of enforcement capacity can make conservation agreements for bycatch reduction a much more difficult and potentially costly approach than the use of payments to protect nests. Nevertheless, in some areas the cost may be outweighed by the substantial impact on a major cause of sea turtle mortality. For example, contexts where a small number of fishermen cause high levels of bycatch may offer cost-effective possibilities. Furthermore, some artisanal fisheries may present opportunities for 'leaseouts' that buy time until new gears can be found. Permits could then be leased back with the requirement that turtle-safe gears and practices are used.

Bycatch also can be reduced by focusing on rights to operate in a particular area rather than changes in gear. The Misool case demonstrates the possibility of contracting for management rights over a geographically defined area and implementing protection plans to reduce bycatch by forgoing harvests

altogether. Areas that are especially prone to high bycatch may offer strategic opportunities for conservation investments of this kind. Moreover, although one might expect formal property rights and strong legal frameworks to be necessary, Misool and other examples show that this approach is viable in a wide range of contexts (<http://www.mcatoolkit.org/>). In fact, the approach is particularly well-suited to Melanesia where resource users hold customary rights to marine areas (Nielsen *et al.* 2005).

CONCLUSIONS

Economic incentives drive behavior with respect to resource use, therefore project impacts on incentives are crucial to eliciting change in that behavior. Direct incentives that reward conservation and sustainable practices offer unambiguous choices to resource users if conservation performance is measured and used to calibrate benefit packages. Thus, these incentive-based approaches present resource-users with distinct decisions regarding how to extract value from their resources, and force implementers to consider important factors of monitoring, enforcement, and coordination mechanisms for resource-use decisions. The conservation agreement model is built on a stream of benefits over time, such that the incentive for resource users to support conservation is sustained. Of course, there are other social and cultural factors that determine behaviour—these also must be considered when assessing the potential of incentive-based approaches.

The cases we present in this paper offer examples of how incentive-based approaches might be applied and strengthened. However, qualitative presentation of seven selected case studies cannot yield generalised conclusions. Thus, while recognising the potential of these interventions, we do not mean to suggest that they are universally applicable. Projects require thorough feasibility assessment; TNC & CI (2009) provide an example of guidelines for doing so. We also recognise that many of these initiatives are in their infancy and while they may appear promising, it is too early to evaluate long-term success. Continued monitoring of these projects will provide valuable information on performance and yield future insights for project design.

Given that most conservation projects—regardless of approach—seek the termination or reduction of particular resource uses by local stakeholders, other economic opportunities are needed to drive socioeconomic development. Thus we see projects such as Laguna San Ignacio, Misool Eco Resort, and the Northern Gulf of California providing support for alternative livelihoods as a benefit under conservation agreements. These examples combine the strengths of different incentive-based approaches. Further piloting of combined approaches, such as performance-based agreements that provide funds for education or alternative livelihood development (as opposed to strictly individual cash payments), and leasing fishing rights to reduce bycatch, offer great potential. In addition, the development of a global network of sea turtle conservation agreements would strengthen the

application of the approach and result in greater learning opportunities through shared experiences.

ACKNOWLEDGEMENTS

The authors would like to thank Conservation International's Marine Management Area Science programme for funding and guidance, the National Fish and Wildlife Foundation for financial support, and the project Advisory Committee for input on the study design. The authors also acknowledge the tremendous conservation efforts of the projects featured in this research. We thank the following groups for providing information for the case studies and assistance with site visits: *Ejido* Luis Echeverria, WildCoast, Pronatura, International Community Foundation, Natural Resources Defense Council, Alto Golfo Sustentable, INE, UC-Santa Barbara, Southwest Fisheries Science Center, Sea Sense, Misool EcoResort, CI-Indonesia, WWF-Indonesia, Seacology, Tetepare Descendants Association, WWF, The Nature Conservancy, and the communities and governments of all sites.

Notes

1. *Ejidors* are a form of communal landholding created under Mexico's 1917 Constitution to distribute property among landless Mexicans. Until the early 1990s, all land was communally owned by ejidos or by the federal government. In 1992, an amendment to Article 27 of the Mexican Constitution made it possible to privatise communal land, giving *ejido* members the chance to acquire their own land and sell it. *Ejidors* are now comprised of both communal lands that are shared in equal percentages by all members, as is decision-making, and private land, some of which is entirely private and some of which requires *ejido* agreement for decisions.

REFERENCES

- Agrawal, A. and K. Redford. 2006. *Poverty, development, and biodiversity conservation: Shooting in the dark?* New York: Wildlife Conservation Society Working Paper No. 26.
- Balmford, A., A. Bruner, P. Cooper, R. Costanza, S. Farber, R. Green, M. Jenkins, P. Jefferiss, V. Jessamy, J. Madden, K. Munro, N. Myers, S. Naeem, J. Paavola, M. Rayment, S. Rosendo, J. Roughgarden, K. Trumper and R. Turnet. 2002. Economic reasons for conserving wild nature. *Science* 297(5583): 950–953.
- Dutton, P.H., C. Hitipeuw, M. Zein, S. Benson, G. Petro, J. Pita, V. Rei, L. Ambio and J. Bakarbessy. 2007. Status and genetic structure of nesting populations of leatherback turtles (*Derموchelys coriacea*) in the Western Pacific. *Chelonian Conservation Biology* 6(1): 47–53.
- Ferraro, P.J. 2001. Global habitat protection: Limitations of development interventions and a role for conservation performance payments. *Conservation Biology* 15(4): 990–1000.
- Ferraro, P.J. and H. Gjertsen. 2009. A global review of incentive payments for sea turtle conservation. *Chelonian Conservation and Biology* 8(1): 48–56.
- Ferraro, P.J. and A. Kiss. 2002. Direct payments to conserve biodiversity. *Science* 298: 1718–1719.
- Gjertsen, H. and T. Stevenson. 2009. Direct incentive approaches for leatherback turtle conservation. In: *Conservation of Pacific sea turtles*. (eds. Dutton, P.H., D. Squires and M. Ahmed). Honolulu: University of Hawaii Press.
- Jaramillo-Legorreta, A., L. Rojas-Bracho, R.L. Brownell Jr., A.J. Read, R. R. Reeves, K. Ralls and B. L. Taylor. 2007. Saving the Vaquita: Immediate action, not more data. *Conservation Biology* 21: 1653–1655.
- Milne, S. and E. Niesten. 2009. Direct payments for biodiversity conservation in developing countries: Practical insights for design and implementation. *Oryx* 43: 530–541.
- Niesten, E. and H. Gjertsen. 2010. *Economic incentives in marine conservation*. Washington, DC: Conservation International.
- Niesten, E., A. Bruner, R. Rice and P. Zurita. 2008. *Conservation incentive agreements: An introduction and lessons learned to date*. Washington, DC: Conservation International.
- Niesten, E., R. Rice and M. Erdmann, 2005. Conservation incentive agreements as a tool for developing and managing MPAs. *MPA News* 7(4): 4–5.
- Salafsky, N., H. Cauley, G. Balachander, B. Cordes, J. Parks, C. Margoluis, S. Bhatt, C. Encarnacion, D. Russell and R. Margoluis. 2001. A systematic test of an enterprise strategy for community-based biodiversity conservation. *Conservation Biology* 15(6): 1585–1595.
- Simpson, R.D. and R.A. Sedjo. 1996. Paying for the conservation of endangered ecosystems: A comparison of direct and indirect approaches. *Environment and Development Economics* 1: 241–257.
- The Nature Conservancy and Conservation International (TNC and CI). 2009. *Practitioner's field guide for marine conservation agreements*. Seattle: TNC and CI.
- Troëng, S. and C. Drews. 2004. *Money talks: Economic aspects of marine turtle use and conservation*. Gland: WWF-International.
- Wunder, S. 2007. The efficiency of payments for environmental services in tropical conservation. *Conservation Biology* 21(1): 48–58.
- Wunder, S. 2008. Payments for environmental services and the poor: Concepts and preliminary evidence. *Environment and Development Economics* 13: 279–297.