

# **Behaviour Change**

## **Conservation Evidence Special Issue**

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# Influencing human behaviour: an underutilised tool for biodiversity management

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## SUMMARY

Human behaviour is the key driver of all major threats to biodiversity. Habitat loss, climate change, invasive species and overharvesting are, in general, consequences of the lifestyle of billions of humans. In order to move from documenting losses and identifying causes for decline to tackling the underlying drivers and implementing solutions, we need to recognize that conservation is not only about animals and plants but equally about people and their behaviour.

Despite the growing emphasis that has been placed in areas such as environmental education or community-based conservation in recent decades, there is as yet little literature on the subject of influencing human behaviour and biodiversity conservation. One factor that has undoubtedly contributed to this trend is the lack of incentives given to conservation practitioners working on education or community-based conservation to publish their research. This has left a large proportion of conservation work either unreported or buried in inaccessible, grey literature, a concern that is common to many research fields. Another specific issue, which is perhaps more critical, is that despite biodiversity conservation being overwhelmingly about humans and their behaviour, the training of conservation professionals is still largely focused on biological sciences. Consequently, conservation professionals are often ill equipped to understand and influence human behaviour and, therefore, less willing to address it as a research subject. This lack of preparation explains, for example, the common use of changes in awareness, knowledge or attitudes as indicators of behaviour change. Such reasoning assumes that because changes in all of these indicators commonly precede behaviour change, there is a direct link between them and behaviour. Unfortunately, this assumption is generally wrong (McKenzie-Mohr *et al.* 2011) as there are often social, economic or psychological barriers, amongst others, to behaviour change that do not allow changes in behaviour to occur. The evaluation of conservation interventions should therefore focus on behaviour as it is the only indicator that translates into real world impact.

These oversights are especially worrying at a time when conservation needs to move beyond anecdote, personal experience and conventional wisdom, and towards a systematic appraisal of evidence collected by all those tackling a given issue (Sutherland *et al.* 2004, Kareiva & Marvier 2012, Sutherland *et al.* 2012). This special issue of Conservation Evidence on behaviour change and biodiversity conservation hopes to contribute towards addressing these issues by showcasing work conducted by practitioners worldwide, across different subject areas and in different landscapes and human contexts.

## The way forward

An emerging field that promises to deliver insight into how to change behaviour is social marketing. This is the application of marketing concepts and techniques to create, communicate

and deliver values to influence behaviour and benefit the target audience and society (Kotler & Lee 2011). Social marketing has been widely implemented in countries like the UK, especially in the health sector, with promising results in addressing issues such as obesity and smoking (French *et al.* 2009). More recently it is being used to tackle environmental issues (Jenks *et al.* 2010; Verissimo *et al.* 2011a, b). In terms of addressing the needs of conservation professionals, social marketing has several important features. One of them is its largely quantitative nature, which means that conservation professionals, the majority of whom have a background in biological sciences, are more willing to engage with it to address behaviour change. Another important trait is the strong emphasis social marketing places on metrics and evaluation, an inheritance of its past links with the commercial business sector (Smith *et al.* 2010). It is, thus, not surprising that social marketers have been at the forefront of applying frameworks such as social return-on-investment, a metric that compares the net benefits of a social intervention to the investment needed to generate them (Rotheroe & Richards 2007), and which could and should have wide applications in conservation. This focus on impact will become more critical as funding becomes ever more competitive, with conservation having to compete not only with other fields of science for government funds but also with other charitable organizations for members and donations. However, conservation interventions targeting behaviour change often lack any form of meaningful evaluation. A common example is the reporting of 'inputs' such as numbers of leaflets distributed or the number of schools visited as a measure of project 'outputs'. Although the former are important, because they document the processes used by conservation interventions (Ferraro & Pattanayak 2006), they are simply a methodological description and so cannot be used as evidence of a project's impact. This would equate to using the number of transects conducted to evaluate the results of an ecological study. We therefore need to focus on 'outputs' such as behaviour change and how they translate into biodiversity 'outcomes' (e.g. reduction of a threat to a habitat or increase in population of a species) if we want to understand the true impact of conservation interventions that deal with human behaviour (Ferraro & Pattanayak 2006). Only then, can conservation move towards evidence-based practice by learning from past errors and building on previous success.

One area where behaviour change strategies can have an important impact is that of payments for ecosystem services (PES), an increasingly popular type of economic incentive to conserve biodiversity. In this context, behaviour change campaigns can increase social recognition and visibility of those involved, therefore increasing participation and adoption.

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This is showcased by Green *et al.* (2013) who mitigated the clearing of the Mexican tropical forest, by mobilizing landowners to join a network of private conservation areas, in exchange for ecosystem services payments. Similarly, Martinez *et al.* (2013) used a behaviour change campaign and PES to connect downstream water users to upstream farmers in the Peruvian Andes, and thus drive the latter to set aside riparian forest areas for conservation.

Behaviour change can also be crucial to improve the management of natural resources by local communities. This is evidenced by DeWan *et al.* (2013) who promoted the use of fuel efficient stoves to reduce wood consumption and therefore mitigate the pressure on the habitat of the Sichuan Golden Snub-nosed Monkey (*Rhinopithecus roxellana*), a threatened Chinese primate. Similarly, Vaughan *et al.* (2013) address issues around the contamination of local drinking water supplies in Ecuador by increasing local buy-in for improved solid waste management practices, such as recycling old batteries.

Lastly, behaviour change can offer vital support to improving law enforcement, through increasing both detection probability and the social disincentives of rule breaking. The former is demonstrated by Saypanya *et al.* (2013) who focused on illegal hunting/harvesting of tigers (*Panthera tigris*) and their prey, in Lao PDR, through a campaign that included the establishment of a telephone hotline for reporting illegal wildlife-related activities. Focusing on the latter, Andriamalala *et al.* (2013) encouraged the improvement of fisheries management in southwest Madagascar, by increasing compliance with local law and consequently diminishing the use of destructive fishing methods, such as poison fishing.

These six case studies, across six countries in three continents, demonstrate that focusing on and achieving behaviour change is not only possible but relevant to a range of conservation issues. Therefore, the challenge is, therefore, to mainstream these principles and techniques amongst conservation professionals, which would undoubtedly help make research around the human dimensions of biodiversity management a more evidence-based endeavour.

### Where next?

Influencing and understanding the drivers of human behaviour remains a major challenge but also an objective shared with other fields of research, such as the recently emerged disciplines of environmental economics and conservation psychology (Balmford & Cowling 2006; Saunders *et al.* 2006). However, to progress from the natural-sciences based 'conservation biology' to a multidisciplinary 'conservation science' we will need to integrate more effectively the social sciences and the humanities in our training of conservation professionals (Kareiva & Marvier 2012).

Influencing human behaviour is one of the hardest challenges faced by conservationists today. Tackling it will require not only the willingness to learn from other research fields but also a push towards evidence-based practice and the emergence of a culture of strong commitment to evaluation and therefore, the embracing of failure. This is no small task. However, realising that without the ability to influence human behaviour, the conservationists' role will be limited to that of describing biodiversity loss should hopefully drive them to embrace human behaviour as a fundamental pillar of biodiversity conservation.

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### REFERENCES

- Andriamalala G., Peabody S., Gardner C. J., & Westerman K. (2013) Using social marketing to foster sustainable behaviour in traditional fishing communities of southwest Madagascar. *Conservation Evidence*, **10**, 37-41.
- Balmford A. & Cowling R.M. (2006) Fusion or Failure? The Future of Conservation Biology. *Conservation Biology* **20**, 692-695.
- DeWan A.A., K. M. Green, Xiaohong, & D. Hayden (2013) Using social marketing tools to increase fuel-efficient stove adoption for conservation results *Conservation Evidence*, **10**, 32-36.
- Ferraro P.J. & Pattanayak S.K. (2006) Money for nothing? A call for empirical evaluation of biodiversity conservation investments. *PLoS Biology*, **4**, e105.
- French J., Blair-Stevens C., McVey D. & Merritt R. (2009) *Social marketing and public health: Theory and practice*. Oxford University Press, USA.
- Green K.M., DeWan A., Arias A.B., & Hayden D. (2013) Driving adoption of payments for ecosystem services through social marketing: Evidence from Veracruz, Mexico. *Conservation Evidence*, **10**, 48-52.
- Jenks B., Vaughan P.W. & Butler P.J. (2010) The evolution of Rare Pride: Using evaluation to drive adaptive management in a biodiversity conservation organization. *Evaluation and Program Planning*, **33**, 186-190.
- Kareiva P. & Marvier M. (2012) What Is Conservation Science? *BioScience*, **62**, 962-969.
- Kotler P. & Lee N.R. (2011) *Social marketing: Influencing behaviors for good*. Sage Publications, Incorporated.
- Martinez R., Green K. & DeWan A. (2013) Reciprocal Agreements for Water and Biodiversity Conservation: Evidence from a social marketing campaign in Quanda Watershed, Peru. *Conservation Evidence*, **10**, 42-47.
- McKenzie-Mohr D., Schultz P.W., Kotler P. & Lee N.R. (2011) *Social marketing to protect the environment: What works*. Sage Publications, Incorporated.
- Rotheroe N. & Richards A. (2007) Social return on investment and social enterprise: transparent accountability for sustainable development. *Social Enterprise Journal*, **3**, 31-48.
- Saunders C.D., Brook A.T. & O.E. Myers (2006) Using psychology to save biodiversity and human well-being. *Conservation Biology*, **20**, 702-705.
- Saypanya S., Hansel T.E., Johnson A., Bianchessi A. & Sadowsky B. (2013) Combining social marketing with improved law enforcement to conserve tigers and their prey in Nam Et Phou Louey National Protected Area, Lao PDR. *Conservation Evidence*, **10**, 57-66.

- Smith R.J., Verissimo D. & MacMillan D.C. (2010) Marketing and Conservation: How to Lose Friends and Influence People in N. Leader-Williams, W. Adams, and R.J. Smith, editors. *Trade-offs in conservation: deciding what to save*. Blackwells, Oxford, UK.
- Sutherland W.J., Mitchell R. & Prior S.V. (2012) The role of 'Conservation Evidence' in improving conservation management. *Conservation Evidence*, **9**,1-2.
- Sutherland W.J., Pullin A.S., Dolman P.M. & Knight T.M. (2004) The need for evidence-based conservation. *Trends in Ecology & Evolution*, **19**, 305-308.
- Vaughan P.W., Encalada H.R.R., Torres S.C. & Campos B. (2013) Impact of the "My Community" Communications Intervention in Loja Province Ecuador on Changing Human Behaviors related to Surface Water Contamination. *Conservation Evidence*, **10**, 53-56.
- Verissimo D., MacMillan D.C. & Smith R.J. (2011a) Marketing diversity: a response to Joseph and colleagues. *Conservation Letters*, **4**, 326-327.
- Verissimo D., MacMillan D.C. & Smith R.J. (2011b) Toward a systematic approach for identifying conservation flagships. *Conservation Letters*, **4**, 1-8.

## Using social marketing tools to increase fuel-efficient stove adoption for conservation of the golden snub-nosed monkey, Gansu Province, China

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### SUMMARY

Fuel wood is a key source of energy for many families in developing areas of China. Fuel efficient stoves are often identified as a win-win solution for forest protections and public health/development in China and across the globe. However, the communication and connection between stoves and biodiversity conservation has been less clear, by both those who are promoting their use as well as those adopting the technology. Social marketing is the application of marketing principles used to sell products applied to “sell” ideas, attitudes, and behaviours to benefit the public good. The Campaign to Protect the Sichuan Golden Snub-nosed Monkey in the Yuhe Nature Reserve, Gansu Province, China, was initiated in 2008 in an effort to inspire communities to protect forest habitat in the reserve, and quickly adopt fuel-efficient stoves. Results of this study show significant increases in knowledge, attitudes, and interpersonal communication pre and post campaign (16 – 49 percentage points). Post-campaign (within 1 year) results concluded 28.0% and 43.1% of those surveyed within 1 year of and 2.5 years adopted the technology. For those households that adopted fuel-efficient stoves, consumption and gathering time were reduced by 40.1% and 38.2% respectively. Finally, preliminary research suggests that adoption of fuel-efficient stoves also lead to a reduction in forest destruction, with a 23.7 % reduction in the number of newly felled trees in areas where the stoves had been adopted by greater than half of the surrounding community. The results of this study suggest that social marketing can be an effective tool for improving community knowledge and attitudes, decreasing destructive behaviour, and reducing threats to biological important forests in China.

### BACKGROUND

Fuel wood is a key source of energy for many families in developing areas of China (Demurger and Fournier 2007). According to a recent review by Demurger and Fournier (2007), firewood and straw still account for two-thirds of rural household energy use, for both heating and cooking, in China (Jiang and O'Neill 2004). As such, wildlife species that rely on unfragmented forest areas may be negatively impacted by human activities and habitat loss. For example, Bearer *et al.* (2008) found that timber harvesting and fuelwood collection have significant impacts on forest habitat use by giant panda (*Ailuropoda melanoleuca*) that last decades after harvest activity.

International development organizations, like the Global Alliance for Clean Cookstoves, consider fuel-efficient stoves a win-win solution for forest protection and public health challenges. While, adoption rates of fuel efficient stoves have been associated with household income (wealth), stove efficiency, and fuelwood price (Amacher 1992) the connection between stoves and biodiversity conservation has been less clear. Given that economic and livelihood incentives are affected by numerous exogenous factors, it is not surprising that the connection between fuel efficient stoves and forest protection is tenuous at best.

The tools and theory for developing social marketing campaigns for wildlife conservation were developed and tested in the late 1970s with the Saint Lucia Parrot (Butler, 1988, Jenks *et al.* 2010). Butler (1988) used tactics from corporate

marketing to create a brand and local pride for the species. These techniques relied on the development of social marketing materials and communication tools such as billboards, posters, songs, and sermons, as well as the parrot as the flagship species or campaign mascot. Through training and partnerships, these approaches have been implemented to address biodiversity threats across the globe, and have been tested and refined based on quantitative impact assessments and the latest research from the social marketing literature (Jenks *et al.* 2010). Critical for testing and refining these tools is the creation of a campaign theory of change (see Conservation Measures Partnership 2009), which provides a template or hypothesis about how the action leads to changes in knowledge, attitudes, interpersonal communication, behavior change, threat reduction, and conservation results (Jenks *et al.* 2010, Figure 1).

Social marketing, or the application of marketing principles used to sell products applied to “sell” ideas, attitudes, and behaviours to benefit the public good (Weinreich 2010), has been identified as a potential tool for engaging communities on the adoption of fuel efficient stoves. Although social marketing tools may be effective for increasing the adoption rate of fuel-efficient stoves, these tools are often used to develop adoption strategies geared toward messages unrelated to conservation. Thus, social marketing with conservation objectives may offer a viable alternative for both increasing the speed of stove adoption as well as connecting communities more explicitly with long-term biodiversity outcomes. Rural Chinese communities exist at a critical intersection of carbon emissions, human health, and biodiversity conservation where social marketing may be effective for achieving multiple objectives.

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**Figure 1.** The fundamental theory of change for a social marketing, or Pride campaign, based on the stages of behaviour change models (Prochaska, DiClemente, & Norcross, 1992; Vaughan and Rogers 2000; Jenks *et al.* 2001), where K (Knowledge): the Pride campaign increases cognitive knowledge/awareness of the issues; A (Attitude): the Pride campaign improves environmental attitudes; IC (Interpersonal communication): the Pride campaign promotes interpersonal communication with peers and trusted opinion leaders, or to seek additional information to validate their new knowledge and attitudes; BR (Barrier removal): Pride campaigns identify what barriers exist to behaviour change and form partnerships with organizations that have particular expertise in that area; BC (Behaviour change) Pride promotes alternative behaviours for segmented target audience(s) in order to reduce threats; TR (Threat reduction): reduction of the main threat(s) to the conservation target; CR (Conservation result): conservation result that the campaign plans to achieve. Each theory of change is tailored to a specific campaign, and the changes needed in a specific target audience to achieve conservation results.

## ACTION

In 2004, the Yuhe Reserve in Gansu province in northwest China was established as a biodiversity corridor between the Qinling and Minshan mountain ranges (Li, 2010). This biologically rich region hosts a number of critically endangered wildlife. Although parts of the region are protected by the creation of the reserve, communities rely heavily on fuelwood consumption from the forest as their primary source of energy (Li 2011). Although assessing and quantifying the impacts of rural wood fuel use on deforestation are debated (see Arnold *et al.* 2003) these activities can have significant direct and indirect impacts on forest integrity and biodiversity, from cutting of young trees and burning as well as increased access and degradation from grazing livestock or increasing access by poachers.

The golden snub-nosed monkey (*Rhinopithecus roxellana roxellana*) is a primate endemic to the temperate, forested portions of western Sichuan, southern Gansu, and southern Shaanxi provinces (Yongcheng and Richardson 2008, Kirkpatrick *et al.* 2010). According to Li (2004), this species strongly prefers primary (undisturbed) forest, suggesting that disturbance or other human induced modifications may negatively impact habitat preferences or selection. In addition, Kirkpatrick (1995) suggests that suitable snub-nosed monkey habitat under protection accounts for less than 5% of the total distribution range.

**Social marketing:** The Campaign to Protect the Sichuan Golden Snub-nosed Monkey in the Yuhe Nature Reserve, Gansu Province, China, was initiated in 2008 in an effort to inspire communities to protect forest habitat in the reserve, and quickly adopt fuel-efficient stoves (Li, 2010). The golden

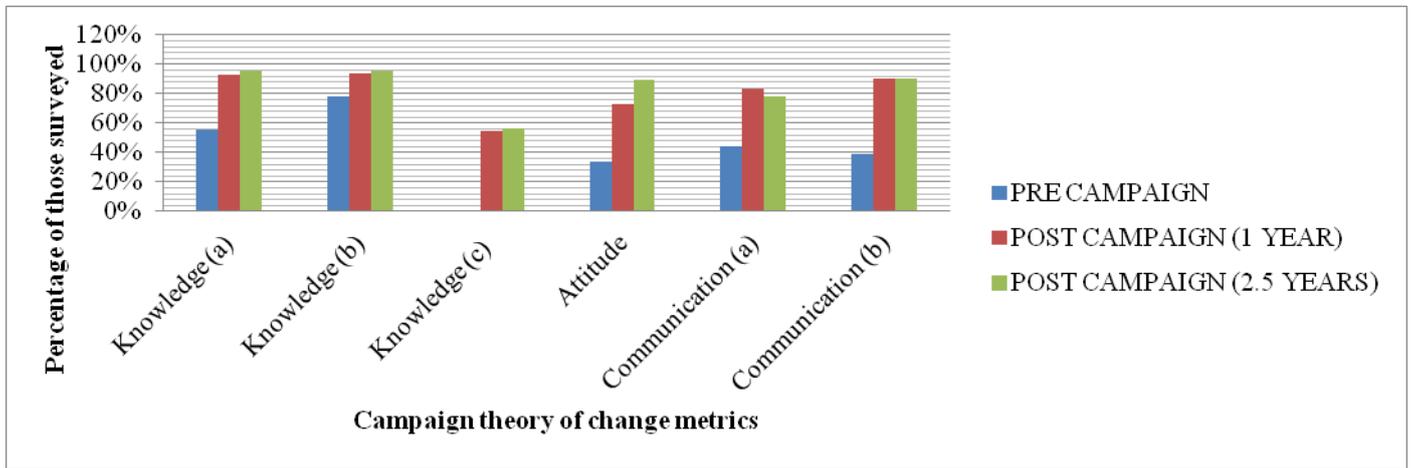
**Figure 2.** Image of a 2011 calendar using social marketing tools that promote the benefits of fuel-efficient stoves.

monkey was identified as a flagship species and mascot for the campaign to instill pride as a driving force for quickly changing behaviors. Messages were created using a variety of formats, including posters, calendars, and a telefilm that promoted the benefits of fuel efficient stoves (see calendar, Figure 2). Consistent with best practices for testing and evaluating impact, the campaign's theory of change identified the key shifts needed for the community to adopt stoves and commit to forest protection (Table 1).



**Impact Assessment:** Standard sociological surveys were conducted pre (2008) and post campaign (2010) to evaluate whether significant shifts in community knowledge, attitudes, and discussions were affected by campaign activities. An additional survey was conducted in 2011 to identify and longer term shifts as the campaign continued. Door to door surveys were conducted using a stratified random sampling design with sample sizes estimated using 95% confidence level, 5% confidence intervals (n=400). Survey questions were designed to test key attributes in the campaign theory of change. Additional surveys were conducted at a comparison site, to evaluate whether any shifts could be causally attributed to Pride (n=300). SurveyPro (Apian 2003) software was used to evaluate whether shifts in key factors were significant (Chi-square). Survey data were tested to ensure data were comparable on key demographic factors (e.g. age, education).

Fuelwood consumption and time spent gathering fuelwood was estimated based on stove adoption and associated decreases in fuel needs, as well as monitoring a random selection of farmer households (n = 22). The fuel-wood saving effect of the fuel-efficient stove was tested in three target areas; Shijiaba, Zhaoqianba and Yangba. Sixteen fuel-efficient stoves and Tiger Stoves were selected randomly to test the fuel-wood consumption when boiling 5kg cold water under the same conditions (cold stoves and oak fuel wood). Fuel wood and water were weighed, then the water was boiled, and the



**Figure 3.** Results from sociological surveys conducted in communities across the campaign area where campaign theory of change metrics represent the following: Knowledge (a); villagers who know the advantages of fuel efficient stoves; Knowledge (b); villagers who know that overconsumption of fuel wood is leading to the destruction of the forest; Knowledge (c) villagers who know that over-consumption of fuel wood is leading to the national park’s decline; Attitude; villagers who would like to pay for the building of fuel efficient stoves; Communication (a); villagers who talked about forest conservation; Communication (b); villagers who have talked about the benefits of efficient stoves. All differences pre and post campaign (1 year) were significant (Chi-square significant at the 95% confidence level or higher).

remaining fuel wood was weighed to estimate fuel-wood consumption.

Forest destruction and fuelwood collection were monitored in forested areas near three types of villages: where greater than 50% use of fuel efficient stoves (n=6), less than 50% use of fuel efficient stoves (n=6), and no efficient fuel stoves (n=6) are used. Fixed sampling lines were set around the villages with a 10m×10m fixed quadrat set on the sampling lines every 50m rising in altitude. The varieties, quantities, volume and canopy density of trees, storage of fuel wood on sampling lines, signs of human activities and wood cutting outside quadrats were recorded. Final measuring indexes are quantity preservation rate, biodiversity index and forest growing stock.

**CONSEQUENCES**

**Shifts in community knowledge and attitudes:** Baseline values pre-campaign suggested that key areas of knowledge were high, including the potential benefits of a fuel efficient stove as well as the fuelwood collection impacts on forest

destruction (range 56-78%). None the less there were significant increases in knowledge, attitudes towards adopting fuel efficient stoves, and interpersonal communication pre and post campaign (1 year) (range 16-49 percentage points) (Figure 3). knowledge and attitudes stayed at the same level or slightly greater after 2.5 years of the campaign, while communication about the benefits of stoves slipped slightly. Comparison sites surveys suggested that the shifts in community knowledge, attitudes, and communication observed at the campaign site could be attributed to the campaign (Table 2).

**Behaviour change and stove adoption:** Pre campaign baseline surveys suggest that only 12% of the target communities were using fuel-efficient stoves. Post-campaign (within 1 year) results concluded 28.0% of those surveyed had adopted the technology. Post-campaign results within 2.5 years demonstrated even more impact, with 43.1% of households reporting using fuel-efficient stoves (Chi square significant at 99% confidence level).

**Table 1.** The detailed Theory of Change for the Yuhe Nature Reserve Pride campaign, outlining the campaign objectives along all components: Knowledge, Attitude, Interpersonal Communication, Barrier Removal, Behavior Change, Threat Reduction and ultimately, Conservation Result.

Knowledge	Pride Campaign increases community residents’ awareness of the environment issue of fuel-wood felling, the health issue of using traditional stoves and the benefits of fuel-efficient stoves.
Attitudes	Pride Campaign increases communities’ willingness in using fuel-efficient stoves. Campaign improves communities’ identification in adopting measures to reduce fuel-wood felling.
Interpersonal communications	Pride campaign stimulates discussions among target audiences about fuel-efficient stoves and environment protection.
Barrier removal	Cooperative partners technically support community in building fuel-efficient stoves. Pride Campaign provides subsidies for fuel-efficient stoves.
Behaviour change	Community residents utilize fuel-efficient stoves in their daily lives.
Threat reduction	The community fuel-wood consumption starts to decline.
Conservation results	By October 2015, the biodiversity and forest quality of Yuhe Reserve will improve significantly (compared to pre-project, the biodiversity index will rise and the forest growing stock is increasing).

**Fuelwood consumption and forest impacts:** Average fuel-wood consumption for each fuel-efficient stove was 0.76kg, while the average for conventional (Tiger) Stove was 1.71kg. Therefore fuel-efficient stoves used 66% less wood, saving 0.95kg fuel wood. Monitoring of household fuelwood use confirmed this efficiency, with average household fuelwood consumption 40.1% less for fuel-efficient compared to conventional stoves. Gathering time for fuel wood was reduced by 38.2%. Forest monitoring revealed a 23.7% reduction in fuel wood felling in forests surrounding villages where fuel-efficient stoves were used in place of conventional stoves (29 stumps as opposed to 38).

## DISCUSSION

The results from this study suggest that social marketing techniques can be an effective and powerful tool for fostering acceptance and adoption of fuel-efficient stoves, and lead to a reduction in destructive fuel-wood collection in nearby forests. The impact of this campaign on key enabling conditions for behaviour change suggest that it was particularly successful in increasing knowledge, attitudes, and interpersonal communication within just 1 year of campaign implementation. Additional forest and fuelwood use monitoring also suggests that the campaign was able to decrease destructive forest practices as well as reduce the direct consumption of fuelwood. Although these results only reflect 1-2 years of data collection,

it is encouraging to note that knowledge, and attitudes remained stable over this time period. Interpersonal communication, or discussion among peers and opinion leaders to validate new knowledge and attitudes, has been identified as a critical component in fostering and maintaining changes in behavior (Vaughan and Rogers 2000). Future campaign activities will likely need to continue to maintain knowledge, and attitudes, but explicitly focus on enhancing discussion among peers about the benefits of using stoves as well as the importance of conserving healthy forests. This action is focused more explicitly on a product with multiple benefits (fuel-efficient stoves). It would be interesting to test whether this type of social marketing campaign is more effective than those with less tangible benefits (e.g. private land certification; see Green *et al.* this issue).

Finally, one of the critical elements of the structure of this

**Table 2.** Shifts in knowledge, attitudes, and interpersonal communication (See Figure 3) as measured at a comparison site. Percentage point differences were negligible, and suggest that observed increases at the campaign site can be attributed to the campaign.

	Comparison Pre-campaign (n=300)	Comparison Post-campaign (n=300)
Knowledge (a)	56.0%	57.1%
Knowledge (b)	67.3%	64.3%
Knowledge (c)	2.0%	2.1%
Attitude	56.0%	57.1%
Interpersonal communication (a)	67.3%	64.3%
Interpersonal communication (b)	56.0%	57.1%

campaign is the ability to test a hypothesis about how changes in audience knowledge, attitudes, and communication influence behaviour change and the reduction of threats to biodiversity. Few education or outreach campaigns explicitly document or test an explicit theory of change. The approaches detailed here, including a specific theory of change, quantitative surveys, and the use of comparison sites, provide a valuable framework for understanding the impacts of social marketing or other types of outreach activities on target communities.

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## REFERENCES

- Amacher, G.S., Hyde, W.F. & Joshee, B.R. (1992) The Adoption of consumption technologies under uncertainty: a case of improved stoves in Nepal. *Journal of Economic Development*, **17**, 93-105.
- Apian. (2003) *SurveyPro 3.0*, release 2001, Windows 95/98/NT/2000/ME.
- Arnold, M., Köhlin, G., Persson, R., & Shepherd, G. (2003) Fuelwood revisited: what has changed in the last decade? *CIFOR Occasional Paper*, **39**, 1-35.
- Bearer, S., Linderman, M., Huang, J., An, L., He, G., & Liu, J. (2008) Effects of fuelwood collection and timber harvesting on Giant panda habitat use. *Biological Conservation*, **141**, 385-393.
- Butler, P.J. (1988) *Saint Vincent parrot (Amazona guildingii) - the road to recovery*. RARE Center for Tropical Bird Conservation.
- The Conservation Measures Partnership. *Open Standards for the Practice of Conservation*. (2007) [http://www.conservationmeasures.org/wp-content/uploads/2010/04/CMP\\_Open\\_Standards\\_Version\\_2.0.pdf](http://www.conservationmeasures.org/wp-content/uploads/2010/04/CMP_Open_Standards_Version_2.0.pdf). (accessed 9 June 2012)
- Demurger, S. and Fournier, F. (2007) *Rural poverty and fuelwood consumption: Evidence from Labagoumen Township (China)*. Report prepared for French National Centre for Scientific Research (CNRS), 1-31.
- Green, K., DeWan, A., Balcázar Arias, A., and Hayden, D. (2012) Driving adoption of payments for ecosystem services through social marketing: Evidence from Veracruz, Mexico. Special Issue: Behaviour Change, *Conservation Evidence*, **9**, 20-24.
- Jenks, B., Vaughan, P.W. & Butler, P.J. (2010) The evolution of Rare Pride: using evaluation to drive adaptive management in a biodiversity conservation organization. *Evaluation and Program Planning*, **33**, 186-190.

- Jiang, L. & O'Neill, B.C. (2004) The energy transition in rural China. *International Journal of Global Energy Issues*, **21**, 2-26.
- Kirkpatrick, R.C. (1995) The natural history and conservation of the snub-nosed monkeys (genus *Rhinopithecus*). *Biological Conservation*, **72**, 363-369.
- Kirkpatrick, R.C. (2010) Snub-nosed monkeys: multilevel societies across varied environments. *Evolutionary Anthropology*, **19**, 98-113.
- Li, X. (2011) *Rare Alumni Follow-up Report: Reducing Threats to Forest in Gansu Yuhe Nature Reserve* (Unpublished manuscript).  
<http://www.rareplanet.org/en/node/20489>. (accessed 9 June 2012)
- Li, X. (2010) *Rare Pride Campaign Final Report: Campaign for Sustainable Forest Use Yuhe Nature Reserve, Gansu Province* (Unpublished manuscript).  
<http://www.rareplanet.org/en/node/20484?type=campaign>. (accessed 9 June 2012)
- Li, Y (2004) The effect of forest clear-cutting on habitat use in Sichuan snub-nosed monkey in Shennongjia Nature Reserve, China. *Primates*, **45**, 69-72.
- Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992) In search of how people change: applications to addictive behaviors. *American Psychologist*, **47**, 1102-1114.
- Vaughan, P. W. & Rogers, E. M. (2000) A staged model of communication effects: Evidence from an entertainment-education radio drama in Tanzania. *The Journal of Health Communication*, **5**, 203-227.
- Weinreich, N.K. (2010) *Hands on social marketing: a step-by-step guide to designing change for good*. Thousand Oaks, CA: SAGE Publications.
- Timmins, R.J., Richardson, M., Chhangani, A. & Yongcheng, L. (2008) *Macaca mulatta*. In: IUCN 2012. IUCN Red List of Threatened Species, 2012.2.  
<http://www.iucnredlist.org/>. (accessed 2 April 2012).

# Using social marketing to foster sustainable behaviour in traditional fishing communities of southwest Madagascar

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## SUMMARY

From April 2009 to November 2010, a social marketing campaign was designed and implemented in southwest Madagascar to encourage fishers to give up destructive fishing methods and to improve the awareness and enforcement of local laws (*dina*). The campaign, which targeted local leaders and fishers, was designed using results from formal and informal social surveys and focused on removing locally perceived barriers to behaviour change. In this paper, we describe the campaign from design to implementation, and evaluate its effects through surveys of 500 fishers and local leaders, and preliminary observational data on *dina* enforcement and use of destructive fishing techniques. Results after one year showed improved knowledge and positive attitudes about *dina* among leaders and fishers, moderate increases in the enforcement of *dina*, and moderate decreases in the use of destructive fishing methods. Our findings demonstrate the power and suitability of social marketing as a tool for fostering sustainable behaviour in traditional fishing communities, when combined with good governance and enforcement strategies.

## BACKGROUND

Marine biodiversity and food security are widely threatened by overexploitation of coastal resources and climate change. Most top-down or government-led fisheries management initiatives have failed to control these crises (Alcala & Russ 2006). In response to this, community-based approaches to marine conservation have proliferated and some have begun to demonstrate successes (Ferse *et al.* 2010, Gutierrez *et al.* 2011, Cinner *et al.* 2012). A key element of these community-based initiatives is education about ecological and biological processes and the impact of anthropogenic pressures on those systems (e.g. Casia 2000, Varney *et al.* 2010). However, psychological studies have consistently shown that increasing knowledge through education does not necessarily lead to a change in actions or behaviour (Thompson 2008, Schultz 2011). Furthermore, many environmental education outreach activities and programmes fail to incorporate adequate research and monitoring elements (Carleton-Hug & Hug 2010) and therefore cannot verify the usefulness of these interventions.

Social marketing - the application of commercial marketing techniques to effect positive social change (Butler *et al.* 2007) - emerged in the early 1970s (Fox & Kotler 1980), and has since grown as a tool to promote positive social change. These techniques have proven to be an effective method for achieving sustained behaviour change across a range of subjects and audiences (McKenzie-Mohr 2000, Schultz 2011). Of primary importance to the theory of social marketing is the identification of barriers to behaviour change, as it is these that must be removed in order for the more positive behaviour to be accepted (McKenzie-Mohr 2000). The public health sector in particular has used social marketing techniques since the early 1970s. Conservation organisations have begun using social marketing techniques with increasing frequency over the last decade (Lynn 2001) but until recently, social marketing has

rarely been used in local fisheries conservation and management (Thompson 2008).

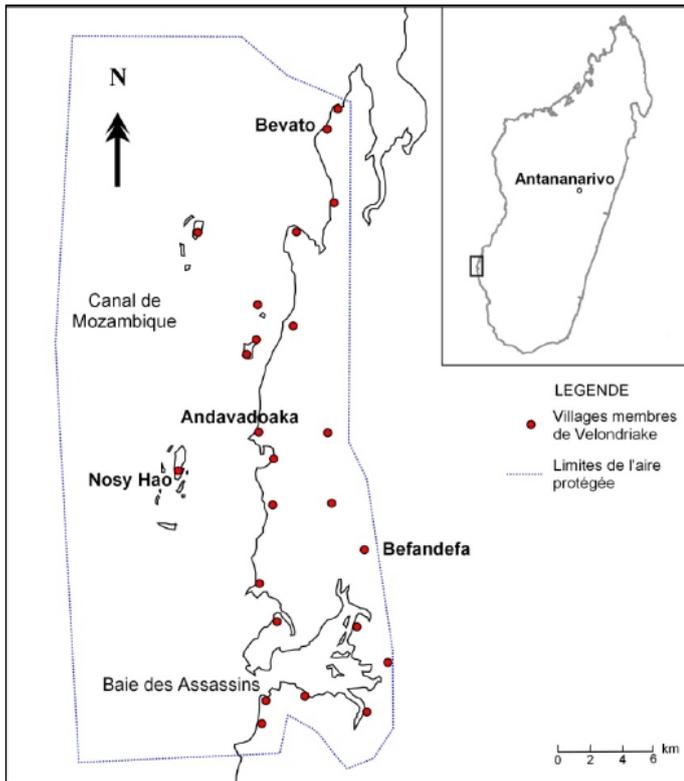
Here, we present a case study of a social marketing campaign implemented in southwest Madagascar from 2009-2010 that aimed to change local attitudes and behaviour towards destructive fishing practices. The 'product' marketed was pride in being responsible fishers. The campaign was jointly designed and implemented by two non-governmental organizations - Blue Ventures and Rare.

## ACTION

**Study area:** The Velondriake locally managed marine area, southwest Madagascar (Fig. 1), is home to approximately 7000 semi-nomadic, sea-faring Vezo people (Harris 2007) who rely heavily on the local marine and coastal resources for subsistence, income, housing materials and cultural identity (Astuti 1995). Destructive fishing techniques employed by both local and migrant fishers, local and commercial overexploitation, and coral bleaching have degraded the local marine and coastal ecosystems along the coast (Harris 2011).

Since 2004, management activities within the locally managed marine area have focused primarily on short-term closures of octopus fishing areas (Harris 2007). Early success with these allowed for the implementation of other resource management initiatives including coral reef permanent reserves (Westerman & Gardner 2013), temporary mangrove closures, and aquaculture development (algae and sea cucumber). At the same time, the process to create a legitimate governance system was begun with a local set of laws called *dina*, which were ratified by the regional Malagasy court system in December 2006. The *dina* bans the use of destructive fishing practices - poison fishing, beach seining, and overturning living coral - within the entire protected area, governs permanent reef reserves, and regulates the octopus closures (Andriamalala & Gardner 2010). With help from local community members, the *dina* is enforced by the Velondriake Committee, an elected body of representatives

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**Figure 1.** Map of Velondriake locally managed marine area and member villages.

from each of the 25 participating villages, who receive technical and financial support from Blue Ventures. The Committee is also responsible for overall management and guidance of activities. The Velondriake locally managed marine area is legally recognized as a protected area (IUCN category V) within Madagascar’s protected area system (known by its French acronym SAPM) and was granted temporary protected status by inter-ministerial decree in December 2010; definitive protected status is expected in 2014.

**Problem definition:** Despite local will to reduce destructive fishing practices, adherence to, and enforcement of, the *dina* has been weak (Blue Ventures unpublished data). A partnership between Blue Ventures and Rare was therefore launched in 2008 to increase ownership, compliance and enforcement of the *dina*. A participatory ‘problem mapping’ exercise was conducted with local leaders and members of the Velondriake Committee, during which the use of destructive fishing practices was identified as a critical problem. Moreover, the overt and highly-visible nature of destructive fishing practices created the impression that the *dina* was powerless and irrelevant. The decision was therefore taken to focus the campaign on enforcement of the *dina* to reduce the use of destructive fishing practices.

The two principal destructive fishing techniques were beach seine net fishing and poison fishing. Seine netting, where small mesh nets are dragged through areas of coral reef and seagrass beds, damages the structure of these habitats and reduces ecosystem quality through the indiscriminate removal of species, especially juvenile fish (Tietze *et al.* 2011). Employing 4-10 men, usually migrants, this method is very labour and time intensive (Gough *et al.* 2009). In order to gain a better understanding of this issue we held one focus group meeting with the migrant fishers and a number of one-on-one discussions with local beach seiners. Poison fishing is not as common as beach seining, and its use decreased over the last decade in most of the Velondriake area. Poison fishing, using a form of cyanide from *Euphorbia cf tirucalli* is particularly destructive as it indiscriminately kills juvenile fish and invertebrates (Kamat *et al.* 1997). The method is primarily used by migrant communities from inland villages outside the Velondriake locally managed marine area, many of whom lack fishing skills.

**Target audiences:** The problem mapping exercise generated information on the use of destructive practices and the sectors of the community that utilise them; these results were then supplemented and validated through key informant interviews with scientific experts, local leaders and community

**Table 1.** Characteristics of campaign audiences, desired behaviour change and barriers to behaviour change.

Audience	Characteristics	Desired behaviour change	Barriers to behaviour change
Leaders	Include Velondriake Committee representatives, village presidents and elders, and respected individuals within community. Are mostly fishers.	Increased role in <i>dina</i> enforcement (giving warnings, reporting cases to Velondriake Committee, investigating cases, contributing to fining process). Also increased involvement in educational outreach and meetings about the <i>dina</i> .	Lack of leadership skills, fear of the offender, and not wanting to denounce other community members.
General fisher population	General fisher population of Velondriake.	Increased role in warning offenders, reporting offenders to leaders, and supporting leaders in their actions. Also increased leadership within their family and peers to abide by and enforce <i>dina</i> .	Sense of lack of responsibility in enforcing <i>dina</i> (perceived as leaders’ responsibility only), fear of offenders, not wanting to denounce community members.
Users of destructive fishing practices	Primarily migrant fishers spending only a few days in locally managed marine area, but some are resident. Migrants claim not to know other, less destructive forms of fishing, and many are not aware of, or don’t understand, the <i>dina</i> .	Stop using destructive fishing practices, or modify techniques to avoid dragging nets over coral and seagrass beds. Also increased compliance with zoning and other <i>dina</i> rules.	Resistance to invest in less destructive nets, lack of knowledge of less destructive gears, belief that beach seining is part of their culture, and disrespect for locally managed marine area rules.

members. Three key target audiences were identified; local leaders, the general fishing population, and fishers using destructive practices (Table 1). All audiences are characterised by low education and literacy levels, but are knowledgeable about the marine environment and threats to it.

**Pre-campaign survey:** A pre-campaign survey was conducted in 2009 to assess the target community's baseline knowledge, attitudes, and perceptions about the local marine environment and the *dina*. Using a stratified random sampling protocol to ensure the representation of target audiences, we surveyed 455 people (approximately 13% of the Velondriake locally managed marine area's adult population) including 71 pirogue (fishing canoe) owners and 70 village leaders. The survey did not specifically target users of destructive fishing practices, as they are generally not receptive to formal discussions and can be aggressive. The survey also helped to identify trusted sources of information and the best ways to communicate campaign messages by assessing community perceptions of the different ways already used to communicate environmental information in the area.

**Campaign design and implementation:** The campaign was designed using the campaign theory of change formula (Jenks *et al* 2010):  $K+A+IC+BR=BC=TR=CR$ , where K = knowledge, A = attitudes, IC = interpersonal communication, BR = barrier removal, BC = behaviour change, TR = threat reduction and CR = conservation result. The theory and assumptions guiding the development of the Velondriake campaign are presented in Table 2.

Using our information about the target audiences, we designed a campaign slogan and logo, suitable behaviour change messages, and marketing materials used to spread those messages and encourage change. These were tested for effectiveness with the target audiences through focus groups. Recognizing pride that target audiences feel in being 'Vezo' (i.e. being skilled fishers who can live off the sea), the slogan

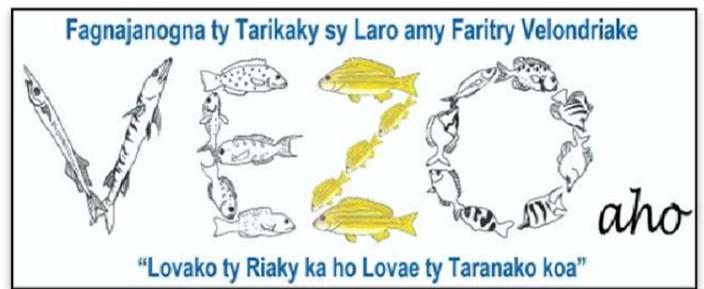


Figure 2. Campaign logo and slogan.

chosen for the campaign was "Vezo Aho" (I am Vezo), with a campaign title "stop beach seining and poison fishing in the Velondriake area", and a by-line "the sea is my heritage and that of my descendants" (Figure 2).

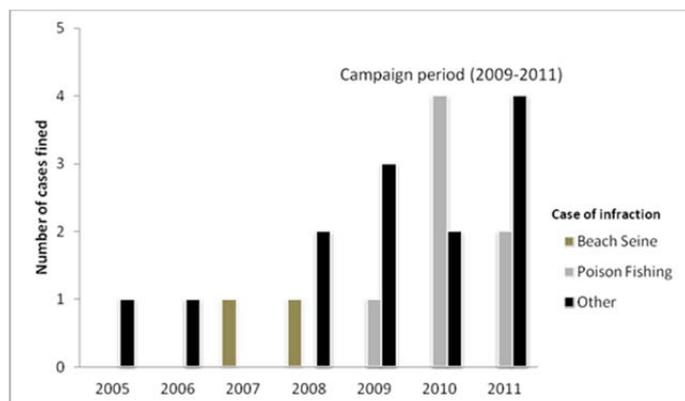
A number of marketing materials carrying these messages were created, including T-shirts, posters, radio broadcasts and songs. Each was designed specifically for the different target audiences to address their individual barriers to change. For example, the message on T-shirts for leaders said "I enforce the *dina* against beach seiners and poison fishers", while T-shirts for fishers said "I report poison fishing and anyone breaking the Velondriake *dina* to the Velondriake Committee and village president". Posters displayed similar messages, and those distributed to destructive fishers outside of Velondriake said "come fish with us, but leave your beach seine net and poison behind". In addition, pirogue owners had the opportunity to have the slogan and messages ("I don't poison fish or beach seine, I dive or use a line or net when fishing") painted on their sails to demonstrate their pride in being Vezo and support for marine resource management. A total of 900 T-shirts and 600 posters were printed and distributed, and 170 pirogue sails were painted with the campaign slogan. Three large festivals were held to celebrate the end of the campaign, whose messages were also reinforced through poetry contests, radio broadcasts, 23 theatre performances and two songs composed by community members.

Seventy local leaders also received training at the start of campaign implementation to enhance the Velondriake Committee's leadership skills and their ability to effectively enforce the *dina*. Training focused on sharing information about the qualities of a good leader and conflict resolution.

**Post-campaign evaluation:** In late-2010, a post-campaign survey was conducted within Velondriake, using the same survey instrument as the pre-campaign survey, to measure changes in knowledge, attitudes and behaviours and record exposure to campaign messages. Five hundred people (approximately 15% of adults within Velondriake) were surveyed using a stratified random sampling protocol, including 111 pirogue owners and 71 leaders. A second follow-up survey was conducted in early 2012 with 170 interviews of 119 pirogue owners and 51 leaders, to evaluate the durability of changes to knowledge, attitude and behaviours. Supplementary observational data were collected during and after the campaign to further monitor and evaluate campaign effectiveness, i.e. actual changes in behaviour (see Figures 3 & 4). A log book was maintained in each village to record *dina* infractions and known incidences of beach seining and poison fishing. Information in the log book was checked for accuracy by Velondriake Committee members and supplemented with additional information.

Table 2. Campaign goals following the theory of change

Component of theory of change	Application to Vezo Aho campaign
Knowledge	Local leaders and the fishing community will gain knowledge about the Velondriake <i>dina</i> and its importance for sustaining local fishing resources
Attitudes	Several workshops and village events will make the Velondriake leaders and fishing community feel more responsible for enforcing the <i>dina</i>
Interpersonal communication	Local leaders and the fishing community will talk amongst themselves about beach seining and poison fishing, and how to halt its use in Velondriake
Barrier removal	Blue Ventures will run leadership training for leaders and assist Velondriake during <i>dina</i> enforcement.
Behaviour change	Leaders will complete <i>dina</i> enforcement procedures on all cases; the fishing community will report <i>dina</i> infractions
Threat reduction	All forms of illegal, destructive fishing techniques - particularly beach seining and poison fishing - will be reduced.
Conservation result	There will be an increase in the near shore juvenile fish and reef fish in terms of biomass, abundance and diversity by 5% by 2015, compared to a control site.



**Figure 3.** Number of times the *dina* was successfully enforced following infractions during 2005-2011.

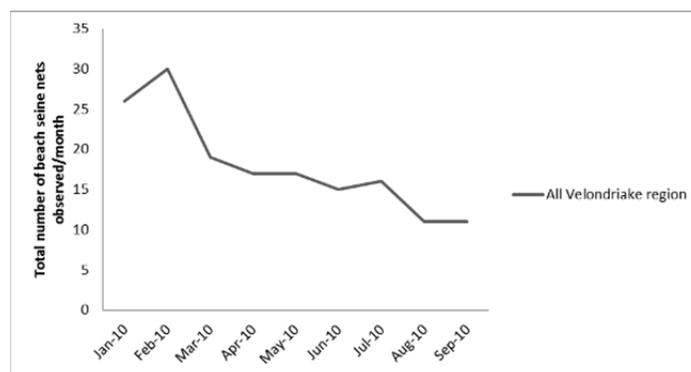
## CONSEQUENCES

Survey results from 2009, 2010 and 2012 show increases in awareness of, and responsibility for, the *dina* amongst local leaders, the fishing community in general, and pirogue owners (Table 3). These self-reported changes in awareness and attitudes appear to be reflected in behaviour change with regards to *dina* enforcement in that the number of cases increased from the start of the campaign period (Figure 3).

Behaviour change, in terms of a reduction in use of destructive fishing techniques, was assessed through key informant interviews and directly through records in village log books. In 2010, during the campaign implementation period, the number of beach seine nets recorded in use along the Velondriake coastline decreased by 63%, from a high of 30 in February to 11 in September (Figure 4).

## DISCUSSION

Our results indicate that the social marketing campaign was successful in improving knowledge of, and attitudes towards, the *dina*, increasing *dina* enforcement, and so reducing the practice of destructive fishing. This is likely to be due in part to the integration of the social marketing strategy into the existing Velondriake governance system, with its established rules and enforcement mechanisms. We do not know, however, whether



**Figure 4.** Change in observed beach seine net frequency in Velondriake from January to September 2010.

observed decreases in destructive fishing are due to the fishers themselves giving up the practice because they now understand the ecological threats as a result of the campaign, improved enforcement as a result of the campaign, or other factors. We believe that the time spent identifying target audiences and analysing their current knowledge, attitudes and barriers to behaviour change was critical in the development of the campaign, enabling targeted messages to be developed for each audience.

We have also identified several shortcomings of our campaign. First, we failed to adequately address the barriers to behaviour change faced by migrant fishers – for logistical and financial reasons, we could not offer either suitable alternative fishing methods or livelihood options. Secondly, other than painting their sails, we did not specifically target pirogue owners in the campaign with any materials or individualised messages, but rather included them as part of the general fisher community. This is a missed opportunity as we could have leveraged their high decision-making power with regards to fishing techniques, as well as their cultural leadership role as trend-setters. In general, having a number of target audiences made the campaign difficult to manage, in terms of collecting information, monitoring and evaluation. Finally, while we targeted community leaders, we failed to adequately incorporate government officials such as the mayor and Ministry of Fisheries into the campaign, leading to a missed opportunity to reinforce messages and acquire more robust institutional support for *dina* enforcement and application.

The spatial context of Velondriake, and having three target audiences, contributed to high campaign costs; materials such

**Table 3.** Survey results demonstrating changes in knowledge, attitude, interpersonal communication and behaviour amongst two target audiences.

Indicator (%)	2009	2010	2012
Leaders aware of the <i>dina</i>	76	96	94
Pirogue owners aware of the <i>dina</i>	71	89	96
General fishers aware of the <i>dina</i>	54	82	-
Leaders who say they are responsible for <i>dina</i> enforcement	88	97	94
Pirogue owners who say they are responsible for <i>dina</i> enforcement	54	64	74
General fishers who say they are responsible for <i>dina</i> enforcement	51	63	-
Leaders who have talked to someone about no longer using beach seine fishing (poison fishing)	33 (33)	83 (85)	61 (63)
Pirogue owners who have talked to one another about no longer using beach seine fishing (poison fishing)	13 (13)	43 (43)	61 (61)
General fishers who have talked to one another about no longer using beach seine fishing (poison fishing)	12 (13)	48 (48)	-
Pirogue owners who have warned <i>dina</i> breakers	11	28	40
General fishers who have warned <i>dina</i> breakers	13	23	-
Leaders that have helped with <i>dina</i> enforcement	11	48	59
Pirogue owners who have helped with <i>dina</i> enforcement	7	22	32
General fishers who have helped with <i>dina</i> enforcement	7	16	-

as T-shirts and posters could not be printed locally, while the dispersed nature of the 25 target villages incurred high transportation costs. In addition to direct campaign running costs (approximately 40,000 US\$), design, implementation and evaluation of the campaign required the dedicated time of Blue Ventures staff, Velondriake Committee members and community leaders. Lessons learned during the campaign continue to guide outreach activities related to the LMMA, introducing the concept and methodology of social marketing and jump-starting similar campaigns within broader conservation programs.

## ACKNOWLEDGEMENTS

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## REFERENCES

- Alcala, A.C. & Russ, G.R. (2006) No-take marine reserves and reef fisheries management in the Philippines: a new people power revolution. *Ambio*, **35**, 245-254.
- Andriamalala, G. & Gardner, C.J. (2010) L'utilisation du *dina* comme outil de gouvernance des ressources naturelles: leçons tirées de Velondriake, sud-ouest de Madagascar. *Tropical Conservation Science*, **3**, 447-272.
- Astuti, R. (1995) *People of the sea: identity and descent among the Vezo of Madagascar*. Cambridge University Press, Cambridge.
- Butler, B., Tyrell, M., Feinberg, G., VanManen, S., Wiseman, L., & Wallinger, S. (2007) Understanding and reaching family forest owners: lessons from social marketing research. *Journal of Forestry*, **106**, 348-357.
- Carleton-Hug, A. & Hug, J. (2010) Challenges and opportunities for evaluating environmental education programs. *Evaluation and Program Planning*, **33**, 159-164.
- Casia, M. (2000) Introduction to the establishment of a community-based marine sanctuary. [http://www.oneocean.org/download/db\\_files/community\\_base\\_d\\_mpa.pdf](http://www.oneocean.org/download/db_files/community_base_d_mpa.pdf) (accessed 5 May 2012).
- Cinner, J.E., McClanahan, T.R., MacNeil, M.A., Graham, N.A., Daw, T., Mukminin, A., Feary, D.A., Rabearisoa, A.L., Wamukota, A., Jiddawi, N., Campbell, S.J., Baird, A.H., Januchowski-Hartley, F.A., Hamed, S., Lahari, R., Morove, T. & Kuange, J. (2012) Comanagement of coral reef social-ecological systems. *Proceedings of the National Academy of Sciences, USA*, **109**, 5219-5222.
- Ferse, S. C. A., Costa, M. M., Manez, K. S., Adhuri, D. S. & Glaser, M. (2010) Allies, not aliens: increasing the role of local communities in marine protected area implementation. *Environmental Conservation*, **37**, 23-34.
- Fox, K. & Kotler, P. (1980) The marketing of social causes: the first 10 years. *The Journal of Marketing*, **44**, 24-33.
- Gough, C., Thomas, T., Humber, F., Harris, A., Cripps, G. & Peabody, S. (2009) *Vezo fishing: an introduction to the methods used by fishers in Andavadoaka, southwest Madagascar*. Blue Ventures, London.
- Gutierrez, N. L., Hilborn, R. & Defeo, O. (2011) Leadership, social capital and incentives promote successful fisheries. *Nature*, **470**, 386-389.
- Harris, A. (2007) "To live with the sea" - development of the Velondriake community-managed protected area network, southwest Madagascar. *Madagascar Conservation & Development*, **2**, 43-49.
- Harris, A. (2011) Out of sight, but no longer out of mind: a climate of change for marine conservation in Madagascar. *Madagascar Conservation & Development*, **6**, 7-14.
- Kamat, D.V., Thomas, M., Bhagwat, A.M. & Muthe, P.T. (1997) Inhibition of carbonic anhydrase by extracts of *Euphorbia tirucalli* and *E. antiquorum* in fish and prawn. *Journal of Animal Morphology and Physiology*, **44**, 153-155.
- Lynn, W.S. (2001) The ethics of social marketing for conservation: a learning module, in *RARE Training Manual*, RARE, London
- McKenzie-Mohr, D. (2000) Promoting sustainable behavior: an introduction to community-based social marketing. *Journal of Social Issues*, **56**, 543-554
- Schultz, P. (2011) Conservation means behaviour. *Conservation Biology*, **25**, 1080-1083.
- Thompson, M. (2008) Fostering sustainable behaviours in community-based co-managed fisheries. *Marine Policy*, **32**, 413-420.
- Tietze, U., Lee, R., Siar, S., Moth-Poulsen, T. & Bage, H.E., (eds). (2011) *Fishing with beach seines*. FAO Fisheries and Aquaculture Technical Paper. No. 562. FAO, Rome.
- Varney, A., Christie, P., Eisma-Osorio, R.L., Labrado, G., Pinsky, M. & White, A. (2010) *Designing and planning a network of community-based marine protected areas*. University of Washington School of Marine Affairs and the Coastal Conservation and Education Foundation, Cebu City, Philippines.
- Westerman, K. & Gardner, C.J. (2013) Adoption of socio-cultural norms to increase compliance in permanent marine reserves in southwest Madagascar. *Conservation Evidence*, **10**, 4-9.

## Establishing reciprocal agreements for water and biodiversity conservation through a social marketing campaign in Quanda Watershed, Peru

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### SUMMARY

In the high Andean landscapes of northern Peru's Cajamarca San Ignacio province, Rare and Cáritas-Peru together launched a social marketing 'Pride' campaign, targeted at upstream farmers and downstream water users, to re-align upstream and downstream incentives and create a locally-governed water institution with directives to protect upstream forests. These institutions, locally called Reciprocal Water Agreements, are based heavily on local norms of reciprocity, whereby downstream users compensate upstream farmers for setting aside riparian forests for conservation and thereby protecting local species and environmental quality. Upstream farmers are compensated in the form of in-kind payments—a combination of economic alternatives such as provision of beekeeping equipment or fencing to keep cattle from encroaching riverbanks. The purpose of the Pride campaign, based on Rare's methods, was to generate local buy-in and accelerate the process of institution-building and adoption of Reciprocal Water Agreements. Cáritas-Peru and Rare staff collaborated to construct a theory of change and a series of methods have been employed to measure progress and impact. This campaign has led to the signing of 25 Reciprocal Water Agreement contracts, securing the protection of more than 360 hectares of forest.

### BACKGROUND

In the high Andean landscapes of northern Peru's Cajamarca San Ignacio province, the expansion of coffee production, cattle ranching, and timber trade increasingly threatens forest ecosystems and the environmental services, such as water quality and biodiversity conservation. Low agricultural productivity and economic development in the area exacerbate these problems and provide limited opportunities for more sustainable practices. In 2010, the international conservation organization Rare and the local non-profit Cáritas began partnering on a pilot project in the San Jose de Lourdes municipality in the Quanda micro-watershed to change local behaviours and protect these forest ecosystem services. The Quanda watershed in the Peruvian municipality of San Jose de Lourdes extends 7,017 hectares in total. It lies between the Alliance for Zero Extinction site Cordillera del Condor and Peru's Tabaconas-Namballe National Sanctuary. Its forests serve as a connecting corridor between these two sites. The predominant ecosystem type of the upper-watershed is tropical montane and pre-montane cloud forest (Holdridge 1996). Here 26 animals and 10 plants are found which are listed on the International Union for the Conservation of Nature Red List of Species, including two identified by the Alliance for Zero Extinction: the jocotoco antpitta *Grallaria ridgelyi* (IUCN, 2012) and Marañón poison frog *Excidobates mysteriosus* (Aguirre 2011).

The main income generation activities in the area are coffee, plantain, and maize agriculture, as well as cattle ranching (Municipalidad Distrital de San Jose de Lourdes 2007). Other income comes from timber, predominantly *Cedro* and *Podocarpus* spp. The human population of the Quanda micro-watershed consists of immigrant "colonos" that have been settling in the area for the last 30 years. According to the San Jose de Lourdes municipality's development plan, formal land titling by the central government is weak in the area,

although informal documentation issued by the local authority is recognized by the local population (Aguirre 2011; Municipalidad Distrital de San Jose de Lourdes 2007).

The area provides valuable ecosystem services, including the supply of water to 800 families living in the upper watershed, as well as the citizens of the San Jose de Lourdes urban centers and vicinities. The quality of the downstream water supply depends directly on activities upstream, where high quality forest ecosystems and functioning water utilities can provide improved filtration, and reduced soil erosion and sedimentation (Postel and Thompson 2005). Although families living downstream use water for drinking, cooking and bathing, poor water and sewage utilities in the upper watershed have led to high incidences of parasitism and morbidity (Aguirre 2011).

Upper watershed deforestation for small-scale cattle ranching, conventional agriculture, coffee plantations, and timber extraction is predominantly responsible for reduced water quality in Quanda. These land-use practices reduce the available habitat for threatened species and exacerbate the existing pressures on biodiversity (Aguirre 2011). Because these activities are critical for income generation and other livelihood factors, prioritizing conservation in the upper-watershed has been a challenge. In addition, the local power utility, Central Hidroeléctrica de Quanda, uses the Quanda water supply for electricity generation, producing around 12.5 megawatt hours per year to supply the power network composed by 40,600 connections in the urban centers of Jaen, San Ignacio, Bagua and Utcubamba. Observations have revealed that the quantity and regularity of water flowing into the Central Hidroeléctrica de Quanda has been declining (Aguirre 2011).

The local office of the non-governmental organisation Cáritas del Perú has been working in the province of San Ignacio for several years on agricultural and sustainable livelihoods projects. In late 2007, Cáritas and the German development agency, Deutsche Gesellschaft für Internationale Zusammenarbeit, began promoting the benefits of payments for ecosystem services schemes for forest conservation and

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clean water provision. Informational workshops about best practices and lessons learned from other countries were conducted by *Cáritas* to raise awareness amongst local authorities and farmers and encourage the establishment of communal or private “conservation areas.” Despite initial interest, progress was slow. In 2009, the organization began a partnership with Rare to assist in creating local Reciprocal Water Agreements, based on the principles of payments of ecosystem services (Wunder 2007) but focused on local norms of reciprocity amongst upstream and downstream communities.

Rare is an international conservation organisation that partners with local organizations to deliver social marketing programs, called “Pride campaigns,” to encourage and enable behaviour change towards conservation. Pride campaigns have been applied to numerous environmental problems in addition to adoption of Reciprocal Water Agreements, including fisheries replenishment, shore bird conservation, and sustainable fuel wood use, amongst others.

## ACTION

Starting in 2009, *Cáritas* and Rare began working together to design and launch a Pride Campaign with the aim of setting up a Reciprocal Water Agreement institution in the San Jose de Lourdes municipality. Within a Reciprocal Water Agreements framework, upstream and downstream communities mutually agree on the hydrological ecosystem services that should be maintained, and the locally-led governance, incentives and monitoring systems to accomplish it. The institution that is created incentivizes upstream farmers to set aside areas of riparian forest for conservation or restoration by compensating them with in-kind payments for their improved land-use practices, in order that water users downstream can ultimately benefit from a regular supply of clean water.

Pride Campaigns activate communities by using targeted messages and marketing strategies to build local support and social networks, and to facilitate communication amongst key constituencies (Jenks *et al.* 2010) and, in this case, acceptance of the Reciprocal Water Agreements institution. The campaigns thereby provide communities with the social incentives to avoid environmentally damaging behaviour as well as the technical knowledge to make the change economically viable. This is accomplished through an extensive planning process that includes the formulation of a campaign theory of change. The high-level theory of change begins with the outcome, a conservation result, and then works backwards to identify the targeted threat reduction and behaviour change that is needed to achieve the desired result and, ultimately, the social marketing approach required to inspire and enable that change. The social marketing approach is comprised of specific targets to improve the knowledge, attitudes and interpersonal communication of the target audiences and to remove the technical, economic and other barriers to change. Table 4 shows the logical sequence of this Theory of Change, along with the overarching objectives of Reciprocal Water Agreement campaigns.

The implementation of a Pride Campaign depends on Rare’s training of a Campaign Manager, a local leader who, in the case of Reciprocal Water Agreements, assumes responsibility for leading delivery of the social marketing program, negotiating with farmers and community stakeholders, supporting the organizational structure of the

Reciprocal Water Agreement, and inspiring mayors and local governments to provide political and financial support.

Reducing threats to the Quanda watershed necessitated increasing local knowledge about the value of forests, overcoming citizen indifference about environmental problems and law evasion, and reducing unsustainable agricultural practices. The Pride Campaign therefore started with a situation analysis, researching the socioeconomic conditions of farmers and water users as well as the drivers of deforestation and land-use change. This analysis helped to identify the key players in the upper and lower watershed and the barriers to change. The *Cáritas* team subsequently segmented the audience and measured the existing knowledge, attitudes and practices in the community to establish a baseline. The Campaign Manager and team worked with Rare advisors to finalize SMART (Specific, Measurable, Action-oriented, Realistic and Time-bound) objectives along the campaign Theory of Change.

Implementation began with the awareness elements of the marketing campaign. Campaign marketing messages in the initial phase raised awareness of the importance of water and the relationship between forest, water and electricity. Importantly, the promotional materials also carried the message of the potential of Reciprocal Water Agreements and the benefits of the incentive mechanism. With slogans such as “Arriba Conservamos – Abajo Aportamos” (Upstream we conserve – Downstream we pay) and “Si luz para siempre quiero tener, el bosque y sus aguas debo proteger” (If I want to have electricity, I must protect the forest and its waters), the campaign was officially launched in early 2010. Some of the marketing materials used included billboards, posters, t-shirts and baseball caps. Local magazines and theatrical events were also used to deliver messages in locations such as schools, fairs, marketplaces and chapels. The most powerful marketing tool was probably the use of radio stations that broadcast soap operas related to the Reciprocal Water Agreements and water conservation. In addition, a folk song was specially written to encourage the upstream population to sign conservation agreements and downstream users to support a tariff on the electricity bill for watershed conservation.

With the help of the Pride Campaign, *Cáritas* established partnerships between upstream farmers, downstream water users, municipal authorities, and the hydropower companies of Electro SAC and Electro Norte. Three community radio stations and one television channel were also strategic partners in the creation of the Reciprocal Water Agreements institution. The campaign messages and effort of Rare prompted the mayors of San Ignacio and San Jose de Lourdes to create a municipal ordinance whereby water and electricity users pay an additional tariff for “environmental services” in their electricity bill. These resources go directly to the water fund, which is administered by a Watershed Management Committee created to look after the agreements, payments scheme and monitoring requirements of land use and conservation interventions.

The Campaign Manager and his team conducted sociological surveys to inform and plan campaign activities as well as to evaluate its impact on the knowledge, attitudes and practices of the target audiences. Target audiences were divided into landowners (upstream) and electricity users (downstream). Using a stratified random sampling design, sample sizes were estimated using a 95% confidence level: 276 landowners were surveyed in the pre-campaign and 275 in the post-campaign; and 452 electricity users were surveyed pre-campaign and 460 post-campaign. Surveys were also conducted amongst landowners and electricity users at a

comparison site that did not have a Pride campaign to assess the causal attribution of changes to the campaign itself. The surveys controlled for key demographic data, such as age and education, to ensure that data were comparable across treatment and comparison sites as well as over the period of the pre- and post-campaigns.

## CONSEQUENCES

**Knowledge:** Knowledge increased significantly for three of the four primary objectives for this campaign (Table 1). Understanding the role of the Reciprocal Water Agreements as a strategy for forest conservation was particularly effective (Table 1). Increases in knowledge at the control site (Figures 1 and 2) suggest that campaign messaging may have been received in the control area or other activities were improving knowledge as well.

**Attitude:** Although there was an increasing trend in attitudes towards landowners willing to sign up for Reciprocal Water Agreements, this was not statistically significant. However, shifting attitudes among electricity users willing to pay for ecosystem services did not show a trend (Figure 8, Table 2). But at the comparison site, attitudes towards Reciprocal Water Agreements amongst landowners declined significantly, indicating that campaign activities in San Jose de Lourdes were more positive than is reflected in the not significant increase of only 7.9 percentage points. However, these minimal shifts in attitudes did not prevent the success of establishing an environmental services fee or of accomplishing

initial Reciprocal Water Agreement contracts amongst landowners (25 to date). Given the strongly documented link between changes in attitudes and in behaviours (Andreassen 1995, Johansson and Henningsson 2011), it is likely that the experiences of the initial signatories, and the attitudes they express to their neighbours about those experiences, over the next couple of years will have a strong influence on the ability to significantly increase the number of landowners with positive attitudes toward Reciprocal Water Agreements. These observations are also likely to be true amongst the downstream electricity users, where the baseline at the campaign site was already relatively high and did not decrease significantly.

**Interpersonal communication:** One of the strongest leading indicators of behaviour change is interpersonal communication – individuals will often validate their new behaviour within their social network prior to adoption (Vaughan and Rogers 2000). For two of the four interpersonal communication objectives, campaign activities led to significant increases in discussions among participants (Table 3). Because of the intense focus of social marketing on increasing discussions about the benefits, it is perhaps not surprising to see much larger increases in measured communications at the campaign compared with the comparison site (Figures 9 and 10), even if there was contamination of other campaign materials. The insignificant increase in interpersonal communication (according to the objective) amongst downstream electricity users (Figure 10) indicates that an emphasis on this objective in future campaign activities is likely to be an important driver of success.

**Table 1.** The pre- and post-campaign survey measurements of four Knowledge objectives at the campaign site, including calculated percentage point change and significance test.

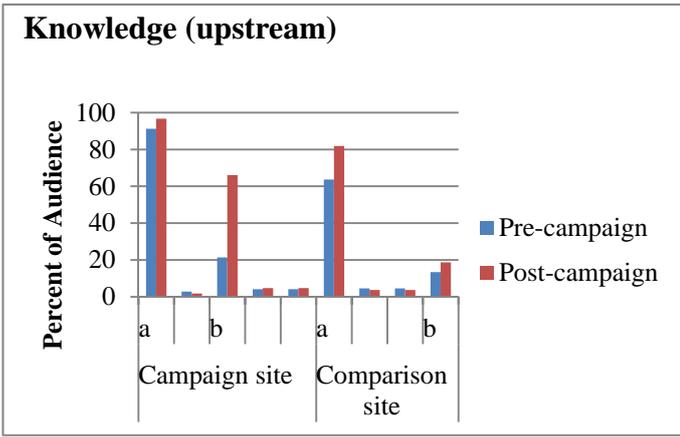
### Knowledge (campaign site)

	Pre-campaign	Post-campaign	Percentage point change	Significance (X2) at 95% conf. level
Percentage of landowners understanding the importance of conserving the forest and the production of electricity	91.2%	96.7%	5.5	No
Percentage of landowners understanding the ARA mechanism as a strategy for conserving the forest	21.4%	66.1%	44.7	Yes
Percentage of electricity users understanding the importance of conserving the forest and the production of electricity	75.7%	85.0%	9.3	Yes
Percentage of electricity users understanding the ARA mechanism as a strategy for conserving the forest	19.9%	31.8%	11.9	Yes

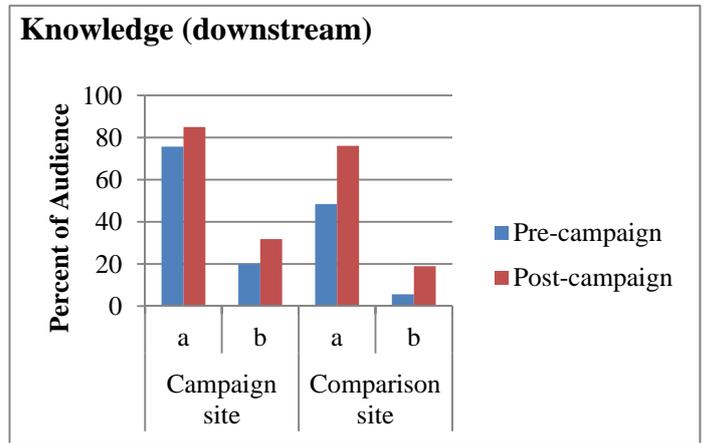
**Table 2.** The pre- and post-campaign survey measurements of four Knowledge objectives at the campaign site, including calculated percentage point change and significance test.

### Attitude (campaign site)

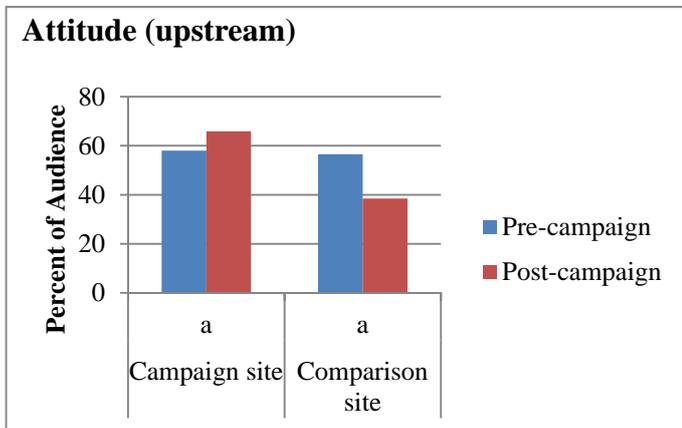
	Pre-campaign	Post-campaign	Percentage point change	Significance (X2) at 95% conf. level
Percentage of landowners who are willing to sign ARA contracts	58.0%	65.9%	7.9	No
Percentage of electricity users who are willing to pay extra to conserve the forest, in order to ensure the production of electricity	73.9%	68.1%	-5.8	No



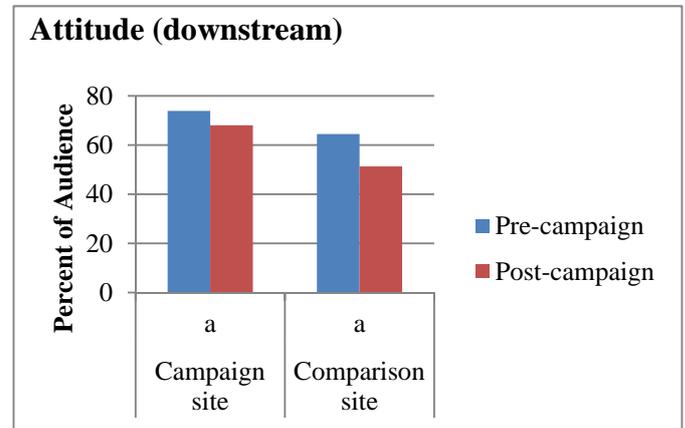
**Figure 1.** The pre- and post-campaign survey measurements of two Knowledge objectives for the upstream audiences at the campaign and comparison sites: (a) Percentage of landowners understanding the importance of conserving the forest and the production of electricity and (b) Percentage of landowners understanding the Reciprocal Water Agreement mechanism as a strategy for conserving the forest.



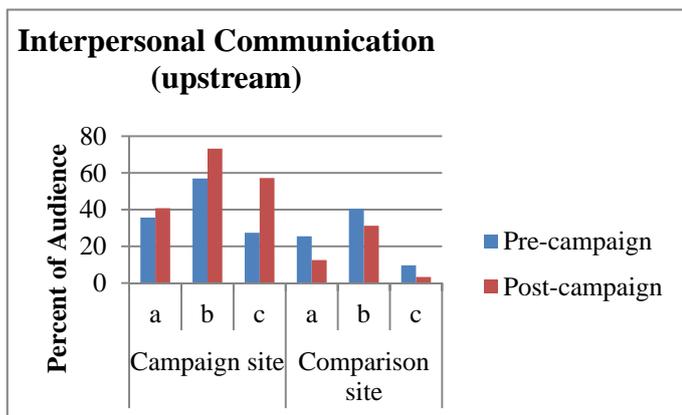
**Figure 2.** The pre- and post-campaign survey measurements of two Knowledge objectives for the downstream audiences at the campaign and comparison sites: (a) Percentage of electricity users understanding the importance of conserving the forest and the production of electricity and (b) Percentage of electricity users understanding the ARA mechanism as a strategy for conserving the forests.



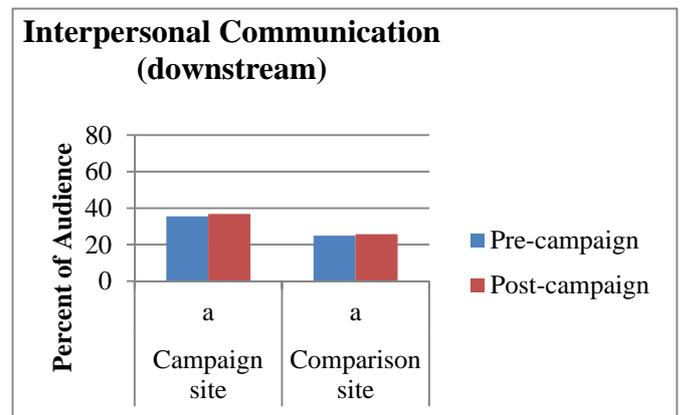
**Figure 3.** The pre- and post-campaign survey measurements of one Attitude objective for the upstream audiences at the campaign and comparison sites: (a) Percentage of landowners who are willing to sign Reciprocal Water Agreement contracts.



**Figure 4.** The pre- and post-campaign survey measurements of one Attitude objective for the downstream audiences at the campaign and comparison sites: (a) Percentage of electricity users who are willing to pay extra to conserve the forest, in order to ensure the production of electricity



**Figure 5.** The pre- and post-campaign survey measurements of 3 Interpersonal Communication objectives for the upstream audiences at the campaign and comparison sites: (a) Percentage of landowners who have, in the last 6 months, discussed environmentally friendly agricultural practices with others, (b) Percentage of landowners who have, in the last 6 months, discussed with others the importance of conserving the forest and (c) Percentage of landowners who have, in the last 6 months, discussed with others the benefits of a Reciprocal Water Agreement scheme.



**Figure 6.** The pre- and post-campaign survey measurements of 1 Interpersonal Communication objective for the downstream audiences at the campaign and comparison sites: (a) Percentage of electricity users who have, in the last 6 months, discussed with others the importance of conserving the forest for its relationship with the production of electricity.

(Table 3). Because of the intense focus of social marketing on increasing discussions about the benefits, it is perhaps not surprising to see much larger increases in measured communications at the campaign compared with the comparison site (Figures 9 and 10), even if there was contamination of other campaign materials. The insignificant increase in interpersonal communication (according to the objective) amongst downstream electricity users (Figure 10) indicates that an emphasis on this objective in future campaign activities is likely to be an important driver of success.

**Behaviour change, threat reduction and conservation result:** Preliminary indications are that the desired behaviour changes (Figure 1) are being achieved through the initial signing of 25 Reciprocal Water Agreement contracts amongst forest landowners that have to date protected 362 hectares of threatened forest habitat in the Quanda micro-watershed. The campaign initially targeted 500 hectares of forest, and the data indicate that there is significantly more willingness amongst landowners to increase the number of contracts, and thereby protected forest, in the coming years. As indicated above, and given that the behaviour is an entirely new amongst the audience, there is reason to believe that the rate of change of diffusion will continue to increase until a critical mass is reached. However, this will depend heavily on the experiences of the initial signatories and the attitudes which they communicate through their social networks (Rogers 2003).

These preliminary results suggest that a targeted behaviour change social marketing strategy can lead to quick adoption of Reciprocal Water Agreements in downstream communities, and protection of forest and riparian habitat in critical Andean ecosystems. Shifts in knowledge and interpersonal communication were particularly effective in connecting Reciprocal Water Agreements to forest protection as is demonstrated by this focus in messaging.

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#### REFERENCES

- Aguirre, H. (2011) Campaña Orgullo en la Microcuenca Quanda: Reporte Final (Master's thesis). [http://www.rareplanet.org/sites/rareplanet.org/files/campana\\_orgullo\\_en\\_quanda\\_-\\_reporte\\_final\\_-\\_parte\\_1\\_0.pdf](http://www.rareplanet.org/sites/rareplanet.org/files/campana_orgullo_en_quanda_-_reporte_final_-_parte_1_0.pdf)
- Andreasen, A.R. (1995) Marketing Social Change: Changing Behaviour to Promote Health, Social Development, and the Environment. Jossey-Bass, San Francisco.
- Holdridge, L. R. (1996) Ecologia basada en zonas de vida. Instituto Interamericano de Cooperación para la Agricultura, San José, Costa Rica.
- Jenks, B., Vaughan, P.W., and Butler, P.J. (2010) The evolution of Rare Pride: Using evaluation to drive adaptive management in a biodiversity conservation organization. *Evaluation and Program Planning*, **33**, 186-190.
- IUCN (2012) *Grallaria ridgelyi* (Jocotoco Antpitta). <http://www.iucnredlist.org/apps/redlist/details/150481/0>. Accessed November 28, 2012.
- Johansson, M., and Henningsson, M. (2011) Social-psychological factors in public support for local biodiversity conservation. *Society and Natural Resources*, **24**, 717-733.
- Municipalidad Distrital de San Jose de Lourdes (2007) Plan de Desarrollo Concertado de la Municipalidad Distrital de San

**Table 3.** The pre- and post-campaign survey measurements of four Interpersonal Communication objectives at the campaign site, including calculated percentage point change and significance test.

	Interpersonal Communication			
	Pre-campaign	Post-campaign	Percentage point change	Significance (X <sup>2</sup> ) at 95% conf. level
Percentage of landowners who have, in the last 6 months, discussed environmentally friendly agricultural practices with others	35.7%	40.8%	5.1	No
Percentage of landowners who have, in the last 6 months, discussed with others the importance of conserving the forest	57.0%	73.2%	16.2	Yes
Percentage of landowners who have, in the last 6 months, discussed with others the benefits of an ARA scheme	27.4%	57.2%	29.8	Yes
Percentage of landowners who have, in the last 6 months, discussed with others the importance of conserving the forest for its relationship with the production of electricity	35.5%	36.8%	1.3	No

- José de Lourdes al 2015. Unpublished municipal development plan.
- Postel, S.L., and Thompson Jr., B.H. (2005) Watershed protection: Capturing the benefits of nature's water supply services. *Natural Resources Forum*, **29**, 98-108.
- Rogers, E.M. (2003). *Diffusion of Innovations*, 5th ed. Free Press, New York.
- Vaughan, P. W. and Rogers, E. M. (2000) A staged model of communication effects: Evidence from an entertainment-education radio drama in Tanzania. *The Journal of Health Communication*, **5**, 203-227.
- Wunder, S. (2007) The efficiency of payments for environmental services in tropical conservation. *Conservation Biology*, **21**, 48-58.

# Driving adoption of payments for ecosystem services through social marketing, Veracruz, Mexico

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## SUMMARY

In the Central Coast of Veracruz, Mexico, expansion of sugar cane production, cattle ranching and urban development threatens the tropical deciduous forest that serves as stopover habitat for numerous species of migratory raptors, among them the peregrine falcon *Falco peregrinus*. To conserve the habitat of these key migratory bird species, and slow deforestation due to agricultural pressures, Pronatura Veracruz and Rare implemented a social marketing Pride campaign to motivate landowners to join a network of private conservation areas in exchange for ecosystem service payments under Mexico's national Payments for Ecosystem Services program. In an area where Payments for Ecosystem Services adoption had been slow to take off, initial results indicate that the application of social marketing methods facilitated a social change in the Actopan municipality of Veracruz and ultimately enabled the protection of more than 1,500 hectares of previously unprotected forest.

## BACKGROUND

The state of Veracruz covers an area of roughly 72,000 km<sup>2</sup>, with a coastline extending more than 650 km along the Gulf of Mexico. The Central Coast of Veracruz is a critical stopover site for millions of neotropical migratory birds, including raptors such as the peregrine falcon *Falco peregrinus*. The migration is most visible in the month of October, when the raptors make their way south for the winter. In addition, the forests of Veracruz are home to a number of threatened and endangered mammal and reptilian species, including the Gulf Coast jaguarondi *Puma yagouaroundi cacomitli*, the northern tamandua *Tamandua Mexicana*, and the Morelet's crocodile *Crocodylus moreletii*. The biological significance of the region is evidenced by the Ramsar designation of more than 400,000 hectares of wetland habitat throughout Veracruz, roughly 1,400 of which are situated in the Actopan municipality where the Pride campaign took place (Ramsar 2012).

Despite the biological significance of the state, agricultural expansion (especially sugar cane production and cattle ranching) and urban development have threatened forest ecosystems throughout much of Veracruz (Martinez *et al.* 2009; Williams-Linera 2007). For example, the expansion of informal settlements around the inland city of Xalapa has reduced cloud forest cover in the municipality to only 7.6 % (Benítez *et al.* 2012). Prior to Pronatura Veracruz' Pride campaign, only 3 sites, totalling less than 100 hectares, in the Central Coast of Veracruz were registered as Private Conservation Areas under Mexico's national Payments for Ecosystem Services program, ProÁrbol (Balcazar Arias 2010).

In 2003 and 2004, Mexico's National Forestry Commission, CONAFOR, launched two payments for ecosystem services initiatives: the Hydrological Ecosystem Services Program and

the Program to Develop Ecosystem Services Markets from Carbon Sequestration and Biodiversity (CONAFOR 2011). In 2006, these two programs were merged under the ProÁrbol program which implements its strategy through several distinct financing and institutional schemes. In spite of the immense effort of the federal government to implement Payments for Ecosystem Services schemes over the last few years, and some early successes, Corbera *et al.* (2009) have identified that capacity has often been a key barrier to adoption and success of Payments for Ecosystem Services at the local level. Accordingly, Payments for Ecosystem Services schemes need to secure a minimum level of capacity and understanding across the actors involved so that they understand what Payments for Ecosystem Services is actually about and what should be delivered (Corbera *et al.* 2009). In addition, Payments for Ecosystem Services projects, even when implemented nationally, must be firmly rooted in, and indeed owned by, the communities in which they are implemented.

Mexico, with its vast diversity of ecosystem types, has a long history of deforestation. Rates between 1976 and 2000 averaged 263,570 ha/year for tropical forests and 545,000 ha/year for all ecosystem types (Bray *et al.* 2005, Corbera 2009). And as recorded above, the country has experienced mixed results with implementing Payments for Ecosystem Services to slow deforestation. Many of the challenges have arisen from lack of capacity and buy-in at the local level. In a country where roughly 80 % of forests are legally titled to local communities (Corbera 2009), almost any effort to slow deforestation in Mexico is required to be community-based (Klooster and Masera 2000).

## ACTION

In 2008, Pronatura Veracruz began partnering with Rare, a non-profit based out of Guadalajara, to apply Rare's social marketing methodology, called 'Pride', in order to encourage

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**Figure 1.** The theory of change from Pronatura Veracruz’ Pride campaign, in which high-level objectives were set to improve the knowledge, attitudes, and interpersonal communication of local landowners and to remove the prevailing barriers to change.

private landowners in the municipality of Actopan to register their land as Private Conservation Areas, under the ProÁrbol system. Rare applies the Pride methodology globally to ‘inform and motivate people to adopt both a conservation ethic and specific behavioral practices that are less environmentally damaging’ (Jenks *et al.* 2010). Pride campaigns work by employing marketing techniques from the private sector and tailoring them to the targeted social good. They are based on the theory that threatening behaviors can be reduced, and replaced by sustainable behaviors, by educating people about the costs and benefits of alternative behaviors, and inspiring them to take pride in their local environment and resources. So by fostering new social norms, this enables them to change by removing barriers that stand in the way, whether they are technical, social, political or other. The purely economic



**Figure 2.** The Pride campaign logo, displaying the campaign slogan “Certifica tu tesoro” [Register your treasure]

rationale for participating in Payments for Ecosystem Services in Mexico has been slow to gain traction in certain communities and regions, so the hypothesis for Pronatura and Rare was that adoption of Payments for Ecosystem Services in Actopan could be encouraged via a social marketing approach to behavior change. Therefore, the organizations hoped that by educating the private landowners about the importance of tropical deciduous forest and fostering new social norms geared toward protecting it, they could ensure that within two years, at least 500 hectares of tropical deciduous forest in the Central Coast of Veracruz would be registered as Private Conservation Area and protected from deforestation.

Pronatura Veracruz staff worked with Rare program managers to develop and apply a comprehensive Theory of Change for this approach, outlined in Figure 1. A variety of techniques, approaches and media were used to achieve the Knowledge, Attitude and Interpersonal Communication goals of the campaign, including posters and billboards displaying the campaign slogan, ‘Certifica tu Tesoro [Register your treasure]’ (Figure 2). Radio spots, television advertisements, calendars, school visits and even a campaign song were created to deliver key information and reinforce the campaign messages. In addition, the campaign team led a visit to a local bird observatory to inspire individuals to appreciate their local environment and hosted events and festivals to rally community support. One of the key features of a Pride campaign is a ‘flagship’ species : a local charismatic animal or plant species, that is chosen to provide an empathetic symbol of the local biodiversity, and that is used in all of the messages and activities (Jenks *et al.* 2010). Pronatura staff selected the peregrine falcon *Falco peregrinus* as the campaign’s flagship species and created a mascot, named Peri, to represent the peregrine falcon and serve as the campaign ambassador at key events (Figure 3).

Having employed the above techniques to generate buy-in amongst the local community, the campaign team subsequently sought to remove the prevailing barrier to adoption, that is the lack of technical capacity at the local level for participating in a Payments for Ecosystem Services scheme. They did this by



**Figure 1.** Peri the peregrine falcon, the Pride campaign mascot, posing at a campaign event with 3 local landowners from the Actopan municipality.

organizing a series of meetings at which landowners could learn about the processes involved with registration and share experiences. The team also used these meetings to allow technical staff to collect and administer documentation for registration, so that landowners themselves would not have to absorb those costs. The hope was that with this combination of approaches, the campaign would inspire and enable numerous landowners to sign Private Conservation Area agreements and protect a portion of their land from deforestation.

The Pronatura Veracruz team conducted sociological surveys at the beginning (May 2009) and end (July 2010) of the campaign to assess whether the campaign led to any significant changes in knowledge, attitudes and interpersonal communication amongst the target audience. Household surveys used a stratified random sampling design to test for indicators along the campaign theory of change (Figure 1).

Specific survey questions were designed to test each objective along the theory of change. For example, for the campaign objective concerning knowledge of the threat of deforestation, respondents were asked a filter question asking

whether they believe there are any threats to the forest in their region, and if they answered yes, they were subsequently asked a multiple choice-multiple response question about which threats they perceived to be most significant. Surveys also controlled for key demographic data to ensure that pre- and post- surveys were comparable. Sampling limitations, particularly around the inability to reach many landowners during the post-campaign survey, reduced the level of confidence in the significance of some results. There was also a lower response rate than expected (about 20% refused to respond in both pre- and post-surveys), but evidence is strong that additional surveys would support similar conclusions, particularly given the consistency and size of various changes. This is partly because it appears that the survey refusals were most likely due to religious differences between respondents and interviewers, and not due to any bias for or against the campaign itself.

## CONSEQUENCES

**Knowledge:** Knowledge was increased along all four metrics measured by the sociological survey, though only one of these increases was significant at the 95% confidence level (Table 1). The understanding amongst landowners that deforestation is a threat to Veracruz' tropical deciduous forest increased 27 percentage points, from 36 % to 63 %. Knowledge about the environmental benefits of tropical deciduous forest as well as the concept and benefits of Private Conservation Area registration all increased by 10 or more percentage points, but larger samples are needed to determine whether these results are significant at the 95% confidence level. Interestingly, the baseline of knowledge about the *benefits* of Private Conservation Area registration (61 %) was more than 2.5 times the baseline of fully understanding the *concept* of Private Conservation Area registration. The implications of this difference are uncertain, but it potentially reflects an indication that the biggest barrier to adoption is not so much a lack of understanding about the benefits but rather a lack of the technical capacity to do it.

**Table 1.** The pre- and post-campaign survey Knowledge measurements of 4 Knowledge objectives, including calculated percentage point change and Chi Square test.

Knowledge				
	Pre-campaign (n=138)	Post-campaign (n=85)	% point change	Chi Square Significance at 95% conf. level
% of landowners understanding the environmental benefits of tropical deciduous forest	19%	29%	10	N
% of landowners understanding that deforestation is a threat to tropical deciduous forest	36%	63%	27	Y
% of landowners understanding the concept of 'Private Conservation Area'	24%	41%	17	N
% of landowners understanding the benefits of registering land as a 'Private Conservation Area'	61%	76%	15	N

**Attitude:** The pre-campaign survey found that 34 % of landowners expressed a wish to register land as Private Conservation Area, additional evidence suggesting that a total lack of willingness was not the only barrier to adoption. That said, the post-campaign survey found 47 % wishing to register land, suggesting a 13 percentage point increase as a result of campaign activities. Again, additional surveying of a larger sample is necessary to confirm the statistical significance of this result.

**Interpersonal Communication:** The biggest and most significant changes occurred in the measurements of interpersonal communication. Social marketing theory and research have demonstrated that generating communication about behavior change amongst individuals in a social unit is an essential element in bringing that behavior change to fruition (Andreasen 1995; Jenks *et al.* 2010; Rogers 2003). This research shows that when the change involves a considerable change of lifestyle or livelihood, the individual has not demonstrated preparedness to make the change until she or he has discussed it with others in her or his social unit. In this case, the Veracruz campaign team observed a 27 percentage point increase in landowners discussing the benefits of tropical deciduous forest over the past 6 months and a 35 percentage point increase in those discussing Private Conservation Area registration, a significant indication of an increase in preparation to make the commitment (Table 2).

**Behaviour change and conservation:** The campaign team set a goal of at least 10 landowners signing Private Conservation Area agreements by the end of the campaign, for a total land area of at least 500 hectares. By July 2010, 14 landowners had done so, signing agreements to protect a total of 1,584 hectares, more than three times as many as the campaign team had hoped. Given the considerably low participation in Payments for Ecosystem Services prior to the campaign, the results provide strong preliminary evidence that the campaign played a significant role in creating the social conditions and removing capacity limitations to drive meaningful increase in the participation in Payments for Ecosystem Services in the Central Coast region of Veracruz.

The results of this study suggest that the social marketing approach can be an effective tool for driving greater participation in, and adoption of, Payments for Ecosystem Services, particularly in areas where the administration of the program is highly distinct from its implementation. Local buy-in and capacity is essential to understand the nature of the program as well as the means for implementing it. A further hypothesis suggests that social marketing can be used to supplement the opportunity cost of conservation versus land use change with the non-monetary value of social capital. Social surveys involving a larger research sample, as well as research implementation at a control site, will be needed to strengthen the case that social marketing provides a useful channel through which to clarify the benefits exchange between communities and national administrators in

implementing the Payments for Ecosystem Services and thereby drives greater participation.

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## REFERENCES

- Andreasen, A.R. (1995) *Marketing Social Change: Changing Behavior to Promote Health, Social Development, and the Environment*. Jossey-Bass Publishers, San Francisco.
- Balcazar Arias, A. (2010) *Reporte final de la campaña por el orgullo en la costa central de Veracruz, corredor migratorio de importancia mundial* (Master's thesis). [http://www.rareplanet.org/sites/rareplanet.org/files/reportefinal\\_veracruz\\_aprobado.pdf](http://www.rareplanet.org/sites/rareplanet.org/files/reportefinal_veracruz_aprobado.pdf) (accessed 2012).
- Benitez G., Perez-Vazquez A., Nava-Tablada M., Equihua M., Alvarez-Palacios J.L. (2012) Urban expansion and the environmental effects of informal settlements on the outskirts of Xalapa city, Veracruz, Mexico. *Environment and Urbanization*, **24**, 149-166.
- Bray, D.B., Merino-Pérez, L., and Barry D. (2005) Community managed in the strong sense of the phrase: the community forest enterprises of Mexico. In: D.B. Bray, L. Merino-Pérez & D. Barry (eds.) *The Community Forests of Mexico. Managing for Sustainable Landscapes*. University of Texas Press, Austin.
- CONAFOR (Comisión Nacional Forestal de México) (2011) *Ecosystem Services and Climate Change*. Gobierno Federal de México. [www.conafor.gob.mx](http://www.conafor.gob.mx) (accessed )
- Corbera, E., González Soberanis, C. & Brown, K. (2009) Institutional dimensions of Payments for Ecosystem Services: An analysis of Mexico's carbon forestry programme. *Ecological Economics*, **68**, 743-761.
- Jenks, B., Vaughan, P.W. & Butler, P.J. (2010) The evolution of Rare Pride: Using evaluation to drive adaptive management in a biodiversity conservation organization. *Evaluation and Program Planning*, **33**, 186-190.
- Klooster, D. & Masera, O. (2000) Community forest management in Mexico: Carbon mitigation and biodiversity conservation through rural development. *Global Environmental Change-Human and Policy Dimensions*, **10**, 259-272.
- Martinez, M.L., Pérez-Maqueob, O., Vázquez, G., Castillo-Campos, G., García-Franco, J., Mehltretera, K., Equihua, M. (2009) Effects of land use change on biodiversity and ecosystem services in tropical montane

- cloud forests of Mexico. *Forest Ecology and Management*, **258**, 1856-1863.
- Rosario Landgravea (2009) Effects of land use change on biodiversity and ecosystem services in tropical montane cloud forests of Mexico. *Forest Ecology and Management*, **258**, 1856-1863.
- Ramsar Convention on Wetlands. (2012) The list of wetlands of international importance. Retrieved from [www.ramsar.org](http://www.ramsar.org) (accessed 2012).
- Rogers, E.M. (2003) *Diffusion of Innovations*. Free Press, New York.
- Williams-Linera G. (2007) El bosque de niebla del centro de Veracruz: ecología historia y destino en tiempos de fragmentación y cambio climatic. *Instituto de Ecología, A.C.-CONABIO*, **208**.

# Impact of the 'My Community' communications intervention on changing human behaviour related to surface water contamination in Loja Province, Ecuador

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## SUMMARY

PCI Media Impact formed a coalition of 13 local organizations in Loja Province, Ecuador, in order to implement a My Community communications intervention to reduce contamination of the local surface drinking water supply. Contamination was caused by sewage from farm animals, deforestation causing soil erosion, and improper disposal of toxic wastes such as batteries. The My Community intervention was tripartite consisting of (1) an entertainment-education radio drama, (2) accompanying radio talk and call-ins, and news programs on local media outlets, and (3) the formation of EcoClubs in local schools. Listenership to the entertainment education radio drama was high (62%) among the target audience, and 100 students joined one of the 7 EcoClubs that were formed. Survey respondents reported substantial improvements in knowledge, attitude and behaviour related to solid waste pollution, including a 26-percentage point increase in respondents who reported that they had recycled their batteries. More than 5,000 batteries were collected in a battery collection drive.

## BACKGROUND

Ecuador is among the poorer countries in Latin America, with an average per capita gross national income of \$8,100 USD, and 13% of its people lived on less than \$2 USD per day in 2010 (Population Reference Bureau 2011). In the communities of Celica and Pindal, average monthly incomes are about \$100 to \$160 USD, earned mainly through agricultural work. This income is insufficient to support a household as the cost of providing basic goods for a four-person household was estimated at \$435 USD in December 2012 (Instituto Nacional de Estadísticas y Censos de Ecuador, 2012). However, households are often comprised of six or more people and have an average of only two income providers. The poor economic situation at the site has historically made environmental concerns a low priority for residents who have had limited resources to address them.

Water quality and water supply are serious environmental issues in Loja Province with negative ramifications for local wildlife, human health, and economies. Most agriculturalists in the Province grow row crops, such as corn, and raise livestock, such as pigs. Native forests are felled to create cropland, and this deforestation increases the rate of surface run-off causing soil erosion and loss of soil productivity. This rapid loss of water also means that the water supply becomes more variable and less reliable. Further, the use of agrochemicals, sewage from farm animals, and improper disposal of solid waste, such as batteries that contain toxic metals, including mercury, have caused contamination of the rivers that provide people with their water supply and fresh fish.

Toxic metals from improperly disposed batteries can leach into surface and ground water. Microorganisms convert elemental mercury to methyl mercury, which is known to bioaccumulate in insects, fish, and fish-eating organisms, including birds and humans (Driscoll *et al.* 2007). Mercury is a powerful neurotoxin that can lead to a wide range of health problems causing harm to the brain, heart, kidneys, lungs and immune system (MedicineNet.com 2012). It is especially important to keep mercury exposure low for pregnant and

nursing women. In wildlife, mercury has been shown to cause adverse behavioural, physiological, and reproductive effects at the individual level and can impact population sizes (Driscoll *et al.* 2007).

According to Fund for the Protection of Water (FONAG 2011), batteries cause high levels of water pollution: 'A mercury battery contaminates 600,000 litres of water (volume consumed by a family in one and a half years). An alkaline battery contaminates 167,000 litres of water. A zinc battery contaminates 12,000 litres of water, and a lithium battery contaminates approximately 3 thousand litres (amount of water consumed by a family in 3 days)'.

PCI Media Impact is a non-governmental organization based in New York that utilizes the entertainment-education strategy, developed by Miguel Sabido in Mexico during the 1970s, to motivate human behaviour and social change related to reproductive health and environmental challenges (PCI Media Impact 2011). The strategy incorporates educational messages within an entertaining media program, such as a radio drama, in order to attract large audiences and then educate and motivate audience members to adopt new or alternative pro-social behaviours (Singhal & Rogers 1999). In PCI Media Impact's application of entertainment education, characters are designed as role models that portray the pro- and anti-social behaviours, and their related consequences, in a direct application of social cognitive theory (Bandura 1994). Audience members are expected to most closely identify with transitional role models who evolve over the course of the drama from anti-social behaviours to ultimately adopt the promoted pro-social behaviours and are then rewarded in the storyline for doing so.

PCI Media Impact's My Community approach incorporates two additional strategies to reinforce the entertainment education programme, (1) interactive talk radio shows in which more didactic information can be disseminated and audience members may call in with questions to be answered by local experts, and (2) a community mobilization component in order to provide audience members with on the ground services and resources that will enable them to actualize their pro-social behavioural intent. This community mobilization removes practical and/or logistical barriers to behaviour change that can

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block an individual's ability to change behaviour. The My Community tripartite approach was first applied by PCI Media Impact in conjunction with their Indian radio drama, Tauru, which was associated with substantive changes in family planning related knowledge, attitudes and behaviours, including large increases in sales of condoms (between 227% and 680%) and contraceptive pills (between 200% and 580%) in participating villages (Singhal 2010).

## ACTION

PCI Media Impact's My Community project was implemented in 8 countries in Latin America from 2005 to 2010. The My Community approach was implemented in a 5-step process (Torres 2008):

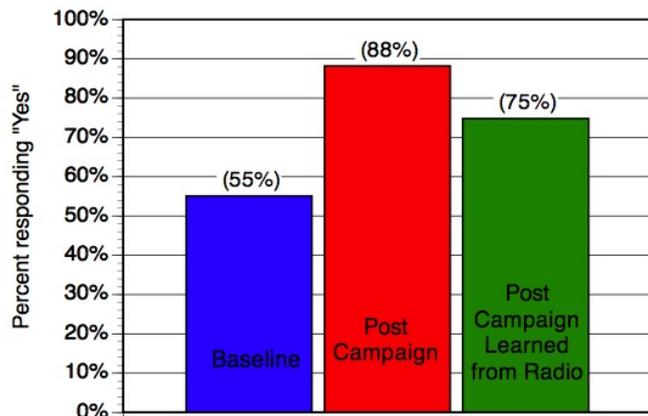
1. *Coalition building*: Applications to form a coalition were solicited through a wide network in Latin America. Coalitions were required to include a service provider, a community radio station, and local, grass-roots organizations.
2. *5-Day intensive training*: Two to three representatives of each coalition received 5 days of training by PCI Media Impact in entertainment education, social marketing, and other communication strategies that included both a classroom component and an experiential learning component in which the participants wrote and produced a 5-7 minute entertainment education, drama.
3. *Project design*: Each coalition prepared a business plan in conjunction with PCI Media Impact consultants, and applied for seed grants of up to \$15,000 USD.
4. *Implementation*: PCI Media Impact assigned a local technical consultant to all successful grant winners, and held local workshops to support the production of the entertainment education drama series by developing a values grid to guide educational issue selection, a character map, dramatic storylines, and other communication components of the project.
5. *Impact evaluation*: Monitoring and impact research was conducted using both qualitative and quantitative data sources.

A total of 62 radio-based campaigns were conducted in Latin America. Each *My Community* intervention promoted pro-social behaviours related to priority issues identified by the coalition. In Loja Province, Ecuador, there were 13 community-based organizations in the coalition, including 7 schools. The lead partner was Radio Integración, and over three years, a total of 180 people received training in communication strategies by PCI Media Impact. Between 2008 and 2010, Radio Integración produced and broadcast a 1-hour long radio magazine *Desafíos* (*Challenges*) twice per week. In each of the three years, 17 to 20 episodes of a radio drama, *Así Somos* (*The Way We Were*) were integrated into *Desafíos* (a total of 57 episodes). The radio magazine also had songs, call-ins, and talk shows that supported the radio drama's educational themes. There was a potential total audience of 40,000 people for the radio programs in the Puyango municipality.

The radio program initially targeted rural communities of Loja Province. In 2009, the plot of *Así Somos* focused on a family struggle that emerges when a son, Felipe, inherits the land belonging to his recently deceased father, Don Rodolfo. Felipe's uncle, Clodomiro, persuades the naïve Felipe to allow him to manage the land with the intention of deforesting it. However, Felipe's girlfriend, Elena, a community leader, challenges Clodomiro to prevent deforestation in order to protect the community's water source. Elena goes to the Environmental Inspector to stop the deforestation, but Clodomiro has bribed the inspector, and so Clodomiro is free to do what he wishes with the land. However, children in the community form an EcoClub to organize the community in support of protecting the land and their water source. The plot evolved to deal with environmental contamination by improperly disposed batteries and encouraged family participation in environmental activities. The EcoClub in the drama organized the recycling of batteries, collection of solid waste, and the promotion of reusing plastic items, providing role models of how this might be done by listeners. In 2010, in the third set of episodes, the drama focus switched to reproductive health issues.

In addition to the radio drama, *My Community* support programs encouraged people to participate in activities through: educational radio spots about caring for the environment, planting trees to reforest deforested areas, recycling batteries, and not throwing waste in the river; promotional radio spots about the EcoClubs, their activities and the plans they were executing; forums for "The Day of the Tree" and "Biodiversity," led by Naturaleza y Cultura Internacional and Departamento de Gestión Ambiental, two coalition partners; the formation of EcoClubs in 7 of the schools that were coalition partners; press articles with information about the project and environmental activities going on in the schools' EcoClubs; and, observation tours with the students of the EcoClubs to learn about the watershed and actions that impacted it.

The entertainment education intervention was evaluated with a pre-post panel survey of residents aged 12 years or older (N = 499; 488); personal interview questionnaires were administered in April and December 2009 in Puyango municipality. A stratified random sample was selected by first randomly selecting three communities (parraquias) within Puyango, and then three blocks (or sectors) within each community were randomly chosen. Houses were selected systematically moving around the block in a consistent direction (e.g. clockwise). One female and one male were randomly selected in each house. The same respondents were re-interviewed in the post survey, and only 11 respondents (2%) were lost between surveys. The samples were approximately 50% male and 50% female. Sixty-two percent of survey respondents reported listening to *Así Somos* in the post survey, and 48% of listeners reported having participated in one of the events organized by *Desafíos*, mostly at their school or in a public plaza or other public space. One-third of respondents reported that they had requested one of the services that were recommended by *Desafíos* (the questionnaire did not ask about which services were requested, but services offered included support for the protection of water resources and materials for planting gardens). Sixty-six percent of listeners reported that they had talked to someone else to recommend something positive that they had learned from *Así Somos*. This is consistent with other findings that the stimulation of interpersonal communication about the educational content of radio dramas is one of the largest effects



**Figure 1.** Response rates to the question whether the respondent knew the consequences of improper disposal of batteries on streams and rivers : baseline, post campaign and percentage of respondents who reported learning about this from the radio.

that may trigger behaviour change (Vaughan & Rogers 2000).

## CONSEQUENCES

In the post survey, 96% of listeners correctly identified environmental conservation as the main educational theme of the radio drama. There were strong gains in knowledge, attitude and behaviour reported between the pre- and post-intervention surveys. These included the percent of respondents who were aware of the recycling campaign for batteries and plastics increased from 14% to 71%, and 72% of aware respondents reported learning this from the *My Community* intervention; the percent of respondents who were aware of the negative impact on rivers and streams of improper disposal of batteries and plastic bags increased from 55% to 88%, and 75% of aware respondents reported learning this from the *My Community* intervention (Figure 1); the percent of respondents who were willing to participate in the collection of used batteries increased from 70% to 85%, and 79% of willing respondents attributed this willingness to the *My Community* intervention; the percent of survey respondents who reported recycling batteries increased from 27% to 53%, and 52% of recycling respondents attributed this behaviour to the *My Community* intervention; and, the percent of survey respondents who reported reusing plastic bottles/bags increased from 34% to 75%, and 57% of reusing respondents attributed this behaviour to the *My Community* intervention.

Over 100 students joined one of the 7 EcoClubs that had formed by 2009 to actively promote natural resource conservation. The clubs ran a battery collection campaign (mingas), which collected over 5,000 batteries (Figure 2). The clubs also promoted the free services offered by the Department of Environmental Management, and worked with the municipality of Puyango to donate and distribute trash cans for household waste disposal. The EcoClubs provided a forum within which youth could take action in support of their new desires to protect their local river and their water source from contamination.

*My Community* generated a lot of support from opinion leaders in the province, as this quote suggests: 'As a school authority, it is our mission to make spaces such as in the radio station available to students where they can interact with other students to talk about issues such as ecology or sexual health.



**Figure 2.** Children participate in the battery collection campaign. (Photo: Lindsey Wahlstrom).

The radio programs also generated a large number of calls supporting the environmental work. Two examples are given below:

*'The radio drama has allowed us to create awareness in those of us who live in this community of Carrizal. Here we have a river basin in which all types of solid waste and trash are thrown and it doesn't matter to anyone. As we heard on the radio what happened in Pampa Pelada because of throwing garbage, here we told people to listen to the programme and now we see that the pollution is under control because the people that live downstream use this water and we can't pollute it.'* [Víctor Guillín, Resident of Carrizal in a call to the radio station].

*'In Vicentino there are lots of pig farms and all of the waste goes into the Rabiya basin. This basin starts in Vicentino and goes through Arenal and arrives at the Puyango River and pollutes all of these sectors. Because there was an EcoClub here and with the help of the radio, they spoke to the authorities to control this pollution. They obligated them to not build pig farms near the basin and those that are there should build septic tanks or they faced a fine and their animals were taken away.'* [María Rojas, Resident of Vicentino in a call to the radio station].

Some community members failed to support the environmental initiatives that were first identified for the *My Community* program in Ecuador because they felt the economic circumstances of local people should be the development priority. However, linking the environmental concerns to

health and water supply challenges helped to alleviate some of these concerns.

The entertainment education strategy has been implemented by many organizations around the world, primarily to promote public and reproductive health initiatives. Many impact studies have found it to have positive and substantive impacts on behaviour change (Rogers *et al.* 1999). PCI Media Impact's *My Community* approach integrates the entertainment education strategy with more didactic informational programming and on-the-ground community mobilization to support and reinforce the entertainment education component in a tripartite intervention. We show here that it is a viable strategy to address environmental concerns as well as public health concerns.

## ACKNOWLEDGEMENTS

We would like to thank PCI Media Impact's coalition partner organizations in Ecuador for the important role each played in implementing this intervention by supporting the formation of EcoClubs, conducting workshops, radio program development and promotional activities. They are the Naturaleza y Cultura Internacional (Nature and Culture International), the Departamento de Gestión Ambiental de Puyango (Department of Environmental Management of Puyango), the Instituto Nacional de Economía Popular y Solidaria (National Institute of Popular Economy and Solidarity), and the Colegios del Cantón Puyango (Puyango High Schools), the seven schools that formed EcoClubs.

## REFERENCES

- Bandura, A. (1994) Social cognitive theory of mass communication. Pages 1-90 in Bryant, J. & Zillman, D. (eds.) *Media Effects: Advances in Theory and Research*. Lawrence Erlbaum Associates, Mahwah, NJ.
- Driscoll, C.T., Han, Y., Chen, C.Y., Evers, D.C., Lambert, K.F., Holsen, T.M., Kamman, N.C. & Munson, R.K. (2007) Mercury contamination in forest and freshwater ecosystems in the northeastern United States. *BioScience*, **57**, 17-28.
- FONAG (2011) Fund for the Protection of Water – FONAG, ¡Ponte pilas ...a recolectar pilas usadas! (*Get with it...collect your used batteries*) <http://www.fonag.org.ec/portal/lang-en/noticias/4-noticias/56-campana-i-ponte-pilas-a-recolectar-pilas-usadas.html> (accessed 21 May 2012).
- Instituto Nacional de Estadísticas y Censos de Ecuador (2012) <http://www.ecuadorencifras.com/cifras-inec/canastaFamiliar.html#tpi=348> (accessed 21 May 2012).
- MedicineNet.com (2012) [http://www.medicinenet.com/mercury\\_poisoning/article.htm](http://www.medicinenet.com/mercury_poisoning/article.htm) (accessed 21 May 2012).
- PCI Media Impact (2011) [http://mediainpact.org/?page\\_id=160](http://mediainpact.org/?page_id=160). (accessed 21 May 2012).
- Population Reference Bureau (2011) <http://www.prb.org/DataFinder/Geography/Data.aspx?loc=347>. (accessed 21 May 2012).
- Rogers, E.M., Vaughan, P.W., Swalehe, R.M.A., Rao, N. Svenkerud, P. & Sood, S. (1999) Effects of an

- entertainment-education radio drama on family planning behaviour in Tanzania. *Studies in Family Planning* **30**, 193-211.
- Singhal, A. & Rogers, E.M. (1999) *Entertainment-Education: A Communication Strategy for Social Change*. Lawrence Erlbaum Associates, Mahwah, NJ.
- Singhal, A. (2010) *Riding High on Tauru Fever: Entertainment-Education Broadcasts, Ground mobilization, and Service Delivery in Rural India*. Entertainment-Education and Social Change Wisdom Series, 2010. Oxfam Novib, Den Haag, The Netherlands.
- Torres, S.C. (2008) *Ke Ondas Con Tu Vida (What's up with your Life): A monitoring and evaluation case study*. MA Capstone paper submitted to the School for International Training, Brattleboro, VT.
- Vaughan, P.W. & Rogers, E.M. (2000) A staged model of communication effect: Evidence from an entertainment-education radio soap opera in Tanzania. *Journal of Health Communication* **5**, 203-227.

# Effectiveness of a social marketing strategy, coupled with law enforcement, to conserve tigers and their prey in Nam Et Phou Louey National Protected Area, Lao People's Democratic Republic

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## SUMMARY

The Nam Et Phou Louey National Protected Area in the Lao People's Democratic Republic contains the last confirmed breeding population of tigers (*Panthera tigris*) in Indochina. There are two main threats to tigers, direct killing of tigers and the illegal hunting of wild ungulates, the tigers' principle prey. Villagers living around the National Protected Area rely on these same ungulates as an important source of protein in their daily diet. The illegal hunting of tigers and prey for commercial trade is unsustainable and is driven by a lack of ownership by local villagers who engage in illegal activities and by government agencies that do not enforce the laws. To reduce these threats the Nam Et Phou Louey National Protected Area is using a social marketing campaign in parallel with traditional enforcement to change the behavior of illegal hunters, village members, and government officials. To determine campaign effectiveness, a survey instrument was developed to measure knowledge, attitudes and behavior change, which included both a control and pre and post surveys of target audiences. The pre and post surveys indicate a significant shift along the theory of change from knowledge to behavior change. The assumption is that over time this shift will also lead to threat reduction to, and thus increase of, tiger and prey populations.

## BACKGROUND

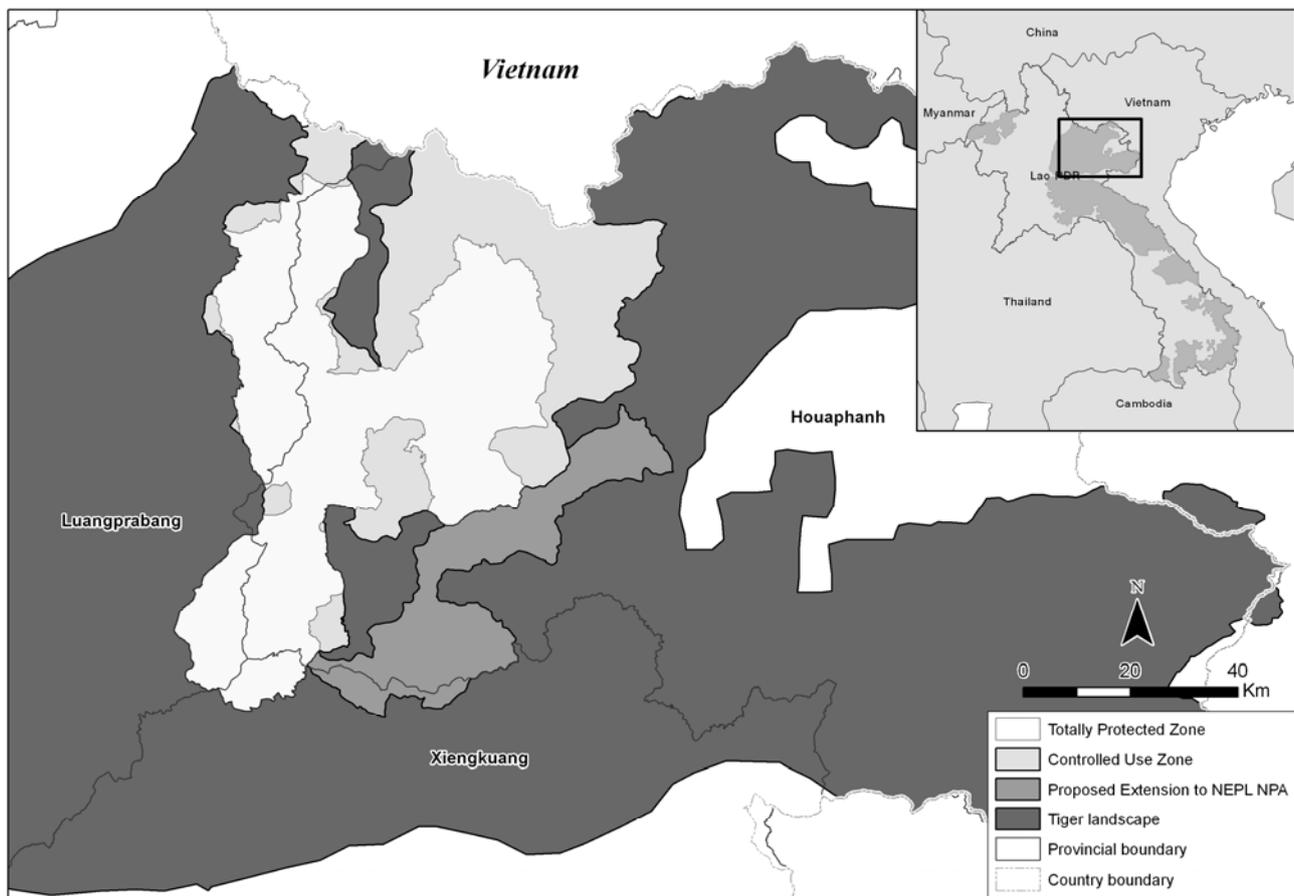
Indochinese tiger *Panthera tigris corbetti* populations in Southeast Asia are much reduced from their historical numbers and range (Rabinowitz 1999). There is now only one known population east of the Mekong River, which is in the 5,950 km<sup>2</sup> Nam Et Phou Louey National Protected Area in northern Lao People's Democratic Republic (Walston, Robinson et al. 2010) (Figure 1). The Tiger National Strategy and Action Plan identifies Nam Et Phou Louey as a key site to conserve tigers for Lao People's Democratic Republic and the rest of Indochina (GoL 2010).

Although Nam Et Phou Louey was established for maintaining viable populations of tigers and other critically important wildlife, the poaching of wildlife within the National Protected Area, which is driven by commercial trade networks, poses a significant threat to both tigers and their ungulate prey. Before active management of the National Protected Area began in 2000, villagers reported weekly commercial trade in wildlife products with Vietnamese traders (Davidson 1998). Gall bladders of gaur *Bos frontalis* and the antlers of the Sambar Deer *Cervus unicolor* were among the products commonly sold (Vongkhamheng 2002). Today, Sambar, Muntjac *Muntiacus spp.*, and Eurasian Wild Pig *Sus spp.* meat are still illegally traded from villages bordering the National Protected Area and transported by bus or truck for sale in urban restaurants and markets, 2 to 12 hours away. These threats escalated in 2011 when the government rebuilt and widened an old road, which increased access to a part of the Totally Protected Zone in the National Protected Area, that harbored breeding tigers and large ungulate populations (Johnson et al. 2012).

The consumption of ungulates for subsistence by local communities presents an additional barrier to tiger conservation (ICEM 2003, Johnson et al. 2006). Recent studies indicate that consumption of wild meat, especially by villagers in the Controlled Use Zone of the National Protected Area is as much as 50% of household meat consumption and will likely remain an essential component of human food security until livestock husbandry can be improved (Krahn & Johnson 2007, Johnson et al. 2010). The Controlled Use Zone is land in the National Protected Area adjoining the Totally Protected Zone where previously settled people may live and carry out livelihood activities in accordance with the management rules of the National Protected Area. The National Protected Area, Totally Protected Zone is a restricted area where animal and plant species may not be removed, unless local authorities and the Ministry of Agriculture & Forestry provide special permission (MAF 2001) (Figure 1). Other analyses show that tiger poaching is closely tied to village cattle grazing practices in the National Protected Area (Johnson et al. 2006, Lynam et al. 2006). The evidence indicates that villagers use semi-permanent settlements in grazing areas near and within the National Protected Area, Totally Protected Zone to opportunistically kill tigers with wire snares and metal leg hold traps, and also to hunt tigers' prey. In light of these findings, efforts to improve villagers' positive perception of tiger and prey conservation are needed.

In Nam Et Phou Louey, a baseline survey in 2003-2004 estimated that a minimum of seven and possibly as many as 23 tigers were present in the total effective sampled area of the Totally Protected Zone (Johnson et al. 2006). The goal for tigers and prey is to increase tiger abundance by a minimum of 50% by 2015 and to increase prey populations to levels sufficient to support the increased tiger population. To reach this goal, objectives are to: i) reduce killing of tigers and prey in the National Protected Area, ii) reduce the use of fire arms

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**Figure 1.** Map of the Nam Et Phou Louey National Protected Area and surrounding Tiger Conservation Landscape.

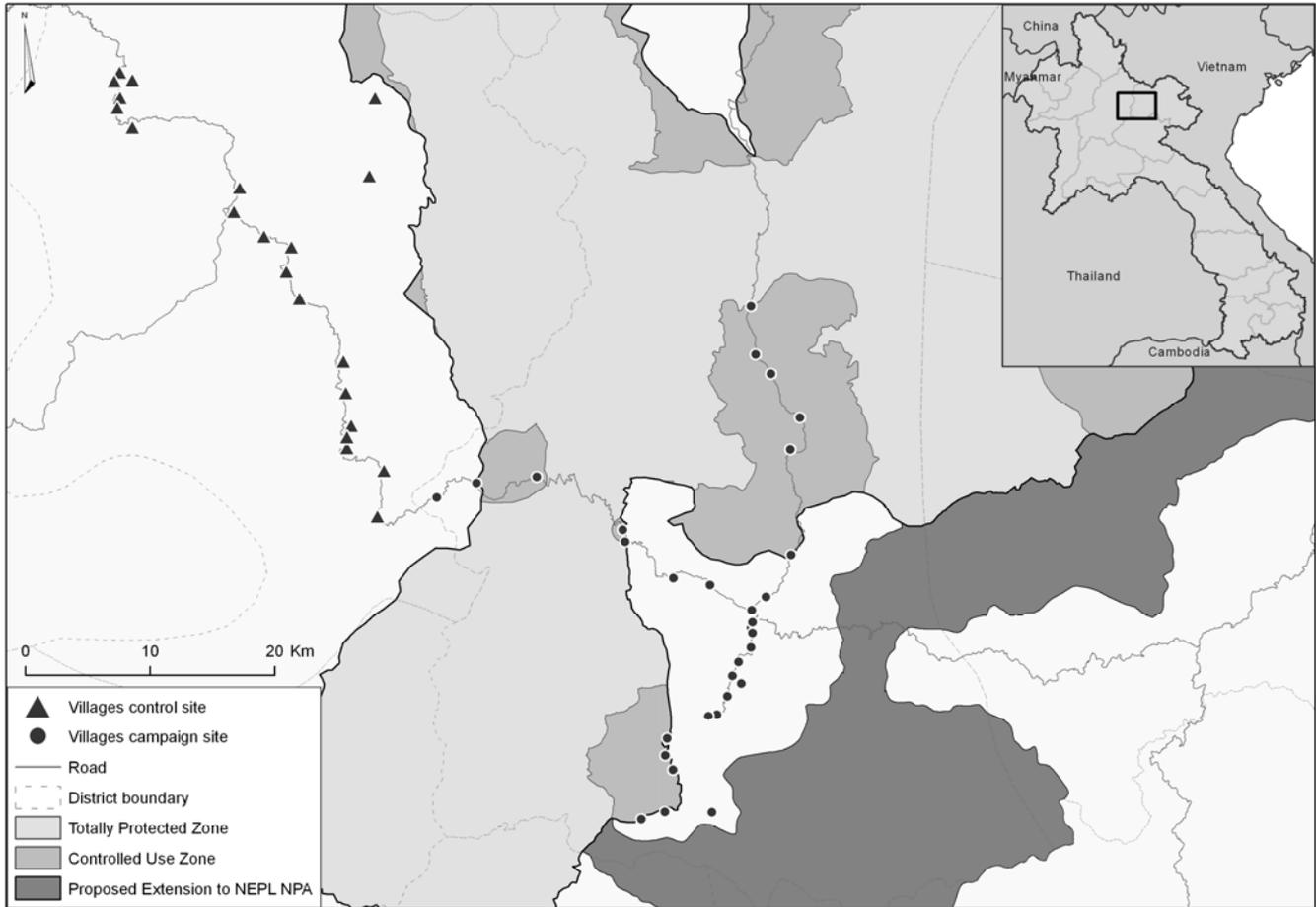
for killing tigers and prey, iii) stop hunting in the Totally Protected Zone and of protected species (including tigers and large prey) outside the Totally Protected Zone, and iv) to stop illegal trade of tiger prey from the National Protected Area (Johnson 2012). Two major strategies – wildlife law enforcement and conservation outreach – are currently being used to achieve these objectives. To assess progress towards these goals and the effectiveness of these strategies, National Protected Area teams monitor the status of tiger and prey populations and threats in the Totally Protected Zone and across the greater tiger landscape (Johnson *et al* 2012).

The Wildlife Conservation Society has worked with the Government of the Lao People's Democratic Republic in the Nam et Phou Louey on the Tiger Conservation Project (hereafter called "the project") since 2002. The project conducted conservation outreach activities from 2004-2009 in more than 100 villages in five districts around Nam et Phou Louey. The conservation activities and materials that were used were billboards, posters and village visits. The purpose of the project was to ensure that villagers in five of the seven districts bordering the National Protected Area, Totally Protected Zone became aware of the guidelines for natural resource use in the Controlled Use Zone. The National Protected Area conservation outreach team then worked with each village to negotiate the boundary between the Totally Protected Zone and their Controlled Use Zone. The National Protected Area staff created and posted 150 signs marking the Totally Protected Zone boundary to further inform villagers about the boundary location.

## ACTION

From April 2009 to August 2010, a social marketing campaign was designed and conducted in 36 target villages (treatment site) in Viengthong district, Houaphan province. Concurrently with the campaign, 21 villages in Viengkham district, Luang Prabang province were selected as a control site (Figure 2). The two sites were selected to have the same gender ratio, age group distribution, target audiences, religion, residence type, family size, geographic locality, and ethnicities. The National Protected Area management has applied law enforcement and conservation outreach activities at both sites. Both have National Protected Area guard posts with constant foot patrol effort in the Totally Protected Zone adjacent to the villages.

A Rare pride "campaign" is a program that uses social marketing (Andreasen 1994) methods to motivate change in human behavior to achieve biodiversity conservation results, especially, in developing countries (Jenks, Vaughan *et al.* 2010). The Nam et Phou Louey campaign developed a Theory of Change following the Rare pride program framework to illustrate the desired outcomes of the campaign (Table 1). A "Theory of Change" is defined as "a systematic and cumulative study of the links between activities, outcomes, and contexts of the initiative" (Connell & Kubisch 1998). This paper presents the monitoring results of the first five stages of the Theory of Change. The project anticipates that it will take more time to observe and evaluate change in the final two stages, Threat Reduction and Conservation Results.



**Figure 2.** Map showing the location of the 36 villages in Viengthong District where the social marketing campaign was implemented (treatment site) and 21 villages in Viengkham District (control site), bordering the Nam Et Phou Louey National Protected Area, Lao People’s Democratic Republic.

**Table 1.** Theory of change of Nam et Phou Louey social marketing campaign

<b>K</b>	+	<b>A</b>	+	<b>IC</b>	+	<b>B</b>	→	<b>B</b>	→	<b>T</b>	→	<b>C</b>
<p>Hunters and villagers increase their knowledge of hunting regulations and the importance of following them for food security in the local villages.</p> <p>Hunters, villagers and government officers become aware of the penalties and risks of breaking wildlife regulations.</p> <p>Hunters, villagers and government officers know the benefits of following wildlife regulations and benefits of reporting people who break the regulations.</p>		<p>Hunters and villagers feel greater ownership over their natural resources and agree that the hunting regulations are important for ensuring local food security. In particular they agree that hunting for trade is wrong as it robs the local community of their food.</p> <p>Government officers agree that all forms of illegal hunting and trade are a serious offence and they should be part of the solution rather than the problem.</p>		<p>Hunters and villagers talk to each other about benefits of following regulations for food security and the need and rewards of reporting poachers.</p> <p>Hunters talk about hunting regulations and penalties and risks of getting caught.</p> <p>Government officers talk about following and enforcing wildlife crime regulations.</p>		<p>Villagers in each community will put pressure on hunters who hunt illegally (using modern weapons and equipment in village use area and National Protected Area core zone and/or hunting for trade) to stop.</p> <p>Government officers endorsed by the District Governor will improve the enforcement system with regards to wildlife trade through closer collaboration, better role division and enforcement procedures.</p>	→	<p>Hunters will only hunt legally (hunt muntjac and wild pig in village use area using traditional equipment for food) and will stop hunting in the core zone, with modern equipment, for trade, and in other people’s village use areas)</p> <p>Villagers, hunters and government officers report all illegal hunting to WCU.</p> <p>Government officers will follow and enforce the wildlife regulations</p>	→	<p>Illegal hunting (hunting with modern equipment, in the core zone, in other communities’ village use areas or for trade, and hunting illegal species) of tiger prey species is reduced or eliminated</p>	→	<p>Tiger prey (Guar, Sambar Deer, Serow, Muntjac and Wild Pig) population increase allowing tiger populations to increase.</p>

### Social marketing campaign design and implementation

A conceptual model (Margoluis *et al.* 2009) was used to design the Nam et Phou Louey social marketing campaign in April 2009 during a meeting with 31 stakeholders from different sectors of government, NGO and village representatives. The stakeholders provided ideas and experiences to validate and adapt existing conceptual models originally developed by the project in 2007 (Johnson & Saypanya 2007). Discussion and small group work were used to identify the direct causes and indirect threats of ungulate decline, which includes Guar, Sambar Deer, Serow *Capreolus milneedwardsii*, Muntjac and Eurasian Wild Pig.

In May 2009, another stakeholder meeting was held with forestry section, village headmen, village elders, biologists and conservationists (national and international). Participants ranked threats to tigers and their prey, resulting in a prioritized list of human induced threats. Illegal hunting in the Controlled Use Zone and the National Protected Area Totally Protected Zone was identified as the *highest* ranked threat to be

addressed in the social marketing campaign. The threat ranking resulted in the selection of two interventions that were expected to be more effective than others and included, i) implement a social marketing campaign and, ii) increase the effectiveness of law enforcement to mitigate illegal hunting and wildlife trade, while promoting public participation in reporting wildlife crime through a telephone hotline. In addition, the conceptual modeling meeting revealed that the major barrier for public participation was a lack of options for reporting illegal actions. Thus, the idea of wildlife crime hotline was introduced to gain public support for reporting illegal hunting and wildlife trade. The Pride campaign was proposed as the tool to promote public reporting to the hotline.

The results of the two stakeholder meetings and pre-survey identified three important audiences who influence the threat of illegal hunting: illegal hunters, villagers and government officers. Illegal Hunters were identified as those villagers who were believed to have the potential to be illegal hunters because the government issues them guns to provide village

**Table 2.** Materials and activities used in the Nam et Phou Louey social marketing campaign

Materials	Connection between campaign materials and activities with key messages on behavior change.
Awning	Placed in fantastic location and very visible. Message reminds the Government Officers to enforcement the laws strictly.
Billboard	
Poster	Visually strongly and relates directly to the action to reinforces the slogan and very applicable to the target audience – people identify with it
Sticker	Direct action. The stickers will be mobile materials, because they will be put on motorbikes and cars so they will be travel every the vehicles go, this can affect more audiences.
Pledge for conservation certificate	The pledge will be notification of the target audience to remember what they have pledge in front of the Muntjac mascot before they go to hunt every time.
Notebook	2,500 note books targets government officers and illegal hunters. Presents all support points.
Campaign album	1,000 campaign albums were distributed to all audiences where electricity is accessible. Knowledge of threats and direct actions for audiences.
Storybook	5,000 storybooks were provided to every household to target villagers and illegal hunters.
Mascot	Muntjac mascot was the campaign ambassador. Links the mascot to all of the campaign materials
T-shirt, bags and jackets	The t-shirts, bags and jackets are mobile materials, because they will worn by people so they will be travel every the people who wear them go, this can affect more audiences.
Activities	
Village visit (Puppet show, Hunting game)	Puppet show was performed before storybooks were given to audiences. The storyline of the puppet show is the same of the storybooks. This visual game was applied to get participation from villagers and hunters so they know legality of hunting.
Concert	Famous pop stars of the campaign album performed at the concert in from of approximately, 3,000 people.
Illegal hunting workshop 1 & 2	These interactive workshops aimed to provide direct contact with illegal hunters.
Government workshop	These workshops were held at the center of the district.
Leaders workshop	
Spot on public address system	5 radio spots were displayed through public address system every evening.

**Table 3.** Example of questions that the villager audience was asked to measure change in each stage of the Theory of Change in the Nam et Phou Louey social marketing campaign

Stage of Theory of Change	Examples of questions included in the survey instrument
Knowledge	“Why do you think ungulates (muntjac and wild board) are important to you?”
Attitude	“I am going to read you a series of statements and I would like you to tell me whether you "strongly agree, agree, neutral, disagree or strongly disagree" with each statement.” “Outsiders who come to hunt in your Controlled Use Zone should not be punished.”
Interpersonal Communication	“In the past 6 months, have you talked to anyone about how to increase Muntjac and wild pig populations in your Controlled Use Zone? If you have, please tell me all of the people with whom you have talked to about this”
Barrier Removal	“In the past 6 months, have you heard of anyone receiving a fine for illegal hunting and wildlife trade?”
Behavior Change	“In the past 6 months, have you reported someone who was hunting for trade?”

Social Marketing campaign	Knowledge	Attitude	Interpersonal Communication	Barrier Removal	Behavior Change	Threat Reduction	Conservation Result
ToC	General villagers are aware that reporting illegal hunting & trade is their responsibility and they will get benefits from reporting	General villagers agree to report illegal hunting and wildlife trade	Villagers talk to one another and illegal hunters about illegal hunting and wildlife trade, and the benefits they get from reporting illegal activities	If general villagers allow illegal hunters keep practicing they will lose opportunity to consume wildlife	Report illegal hunting (hunting for trade, in the core zone, using modern equipment/weapons)	Reduce illegal hunting for trade with modern equipment	Increase ungulates (Muntjac and wild pig)
SMART objective	By the end of August 2010, % of villagers who respond that muntjac and wild pig are important food for people will increase to 20.5%	By the end of August 2010, % of villagers who say, "Not agree" that outsiders who hunt in their village use area should not be punished will increase to 20.5%	By the end of August 2010, % of villagers who have talked about how to increase muntjac and wild pig population in their village use area will increase to 49.9%	By the end of August 2010, % of villagers who have heard of anyone receiving a fine for illegal hunting will increase to 69.1%	By the end of August 2010, % of villagers who have reported someone illegally hunt for trade will increase to 15%		
Result	Pre-survey-Post-survey Treatment: 8.3%-51.7% Control: 9.0%-44.3%	Pre-survey-Post-survey Treatment: 42.4%-87.9% Control: 89.1%-87.0%	Pre-survey-Post-survey Treatment: 37.2%-57.3% Control: 38.9%-44.3%	Pre-survey-Post-survey Treatment: 44.9-68.8% Control: 38.7%-33.9%	Pre-survey-Post-survey Treatment: 4.8-9.3% Control: 7.0%-4.7%		

**Figure 3.** Results chain illustrating Nam et Phou Louey project assumptions about how social market campaign activities will result in changes in knowledge, attitudes and interpersonal communication of villagers, one of the campaign target audiences, which would in turn lead to behavior change and threat reduction such that conservation results are achieved. On the bottom, pre and post survey results showing observed changes in knowledge, attitude, interpersonal communication, barrier removal (reporting to hotline) and behavior of villagers in the campaign (treatment) and control sites.

security but they may instead use the guns to illegally hunt. Villagers are all villagers and include legal hunters. Government Officers are identified as authorities that influence the enforcement of the legislation governing illegal hunting and trade, which includes government officers who may influence the legal process including police, military, National Protected Area, financial, agriculture and forestry, judiciary officials (Table 3). In this paper we specifically focus and present the results from campaign impacts on only the Villager group.

The Theory of Change was broken down into a results chain for each audience (see Figure 3). The results chain is based on the assumption that before adopting a new behavior a person moves through a series of stages (Vaughan & Rogers 2000), which include pre- contemplation, contemplation, preparation, validation, action, and maintenance. The results chain is therefore a framework to outline the results that need to occur to move the campaign audience through the different stages of behavior in order to achieve the desired behavior change. The assumption is that once the audience has gained the necessary knowledge in relation to the desired behavior change, the audience has also gained a favorable attitude towards the idea of adopting the desired behavior, has been able to talk about the pros and cons of adopting the behavior to others, and will be ready to adopt the new behavior. The Theory of Change and results chain further identify any barriers that must be overcome for the audience to be able to adopt the desired behavior that could be either emotional or physical barriers to behavior change. The Theory of Change further spells out the assumptions made in terms of what threat reduction is assumed to occur once the behavior change is adopted and the conservation result the campaign aims to achieve. Since not all individuals in a target audience will be at the same stage of behavior, activities and messages need to

reach all groups in all different stages of behavior change. Results chains for each audience were used to create objectives that were *specific, measurable, achievable, realistic and time-bound* (Margolius and Salafsky 1998) for each target audience and helped inform the questions of the survey prior to audience collection.

The Muntjac was chosen as the flagship species (Clucas *et al.* 2008) because it can be legally eaten and does not threaten livestock and crops as tiger and other ungulates do. A logo with the image of the Muntjac was designed, tested and selected by members of the campaign audiences. Several slogans were created, tested and selected by the same group. The final slogan was "*Hunt for eating – Not extirpation*". This slogan/logo combination was designed to support the legal hunters to continue adhering to legal practices, while targeting the illegal hunters to shift from illegally practices to legal hunting.

The specific messaging for each audience was created. It was envisioned that the campaign would build pride in the legal hunters and villagers to put peer pressure on the illegal hunters, while creating an avenue for them to report to appropriate government officers (Figure 3). Similarly it was assumed that the messaging would encourage government officials to respond to illegal hunting as reported by the villagers. To do this, several key messages were brainstormed from various group discussions, deriving key messages for illegal hunters, villagers, and government officers. These messages were taken to the respective audience for discussion, confirmation and prioritization. The key message selected for each target audience were; i) Illegal Hunter: "*Use the right tools to hunt managed species in Controlled Use Zone, out of mating season, for personal consumption only*", ii) Villagers: "*The wildlife food of the villagers is declining – I will report every time I see illegal hunting and wildlife trade*" and iii)

Government officers: “I will follow up on all hunting and wildlife trade criminal cases, because I am a dedicated government official who does not buy or sell wildlife.”

Throughout the campaign timeline, village visits, printed media materials, media activities, workshops, events, and meetings were produced, implemented and used as the channels to deliver the campaign slogan and key messages to target audiences (Table 2). The campaign utilized many different and diverse types of activities and materials to deliver the slogan and key messages to the appropriate target audiences and we reinforced them through multiple channels to ensure target audiences retained the campaign and to maintain the momentum of the campaign fever by continuing to engage audiences with different campaign materials and activities, while removing any possible barrier from the target audiences.

#### **Barrier Removal - Wildlife Crime Unit and Hotline Design and Implementation**

The Pride campaign sought to promote reporting of illegal hunting and wildlife trade, while encouraging government officials to respond to the cases reported. To do so, it was determined that the existing National Protected Area Wildlife Crime Unit that was created in 2007 needed to be revived and a mechanism created to better facilitate the reporting of illegal activities to the Nam et Phou Louey enforcement unit. Lessons learned from the initial years of Wildlife Crime Unit implementation indicated that villagers often found it very difficult to communicate with the Wildlife Crime Unit, and even with successful communication the Wildlife Crime Unit often ignored the reports due to the lack of a point person responsible for the mobilizing the enforcement efforts. During the conceptual model and results chains activities, it was recognized that a weak local enforcement unit would act as a barrier to an effective outreach campaign achieving the desired conservation results. Therefore the outreach team felt compelled to assist the Nam et Phou Louey and the Wildlife Crime Unit in redefining the Wildlife Crime Unit mandate, assigning roles and responsibilities to increase effectiveness. The revised Wildlife Crime Unit consisted of the heads of district agencies such as Agriculture and Forestry, Commerce, Financial, Police and representatives from the Nam et Phou Louey Management Unit.

The creation of a hotline to facilitate the reporting of illegal hunting and trading acted as the catalyst between the Nam Et Phou Louey enforcement and outreach efforts. The campaign promoted the hotline and Wildlife Crime Unit by branding all campaign materials and activities with the hotline number. The campaign further promoted the Wildlife Crime Unit activities by conducting press releases about each case of illegal hunting and wildlife trade. A threat of a press release became a strong tool to encourage perpetrators to pay fines.

Press releases of wildlife crime cases were publicized through loudspeakers via the public address system in the district town.

#### **Monitoring the effectiveness and impacts of the social marketing campaign and the wildlife crime unit.**

To evaluate whether audiences in the campaign and control site had been exposed to campaign materials and activities, audiences were asked to report if they had seen and/or received campaign materials or attended events. The campaign evaluated the effectiveness of the campaign methods by assessing change in the first five stages of the Theory of Change (Figure 3) (Kleiman et al. 2000 & Vaughan et al. 2003) using a survey instrument that included questions to measure the change in *knowledge* (13 questions), in *attitude* (33 questions), in *interpersonal communication* (four questions), in *barrier removal* (six questions), and in the *change in behavior* (11 questions). In this paper we report on results from only one target audience “Villagers”. However all questionnaires, supplemental materials, and references can be obtained from <http://www.rareplanet.org/en/resource/pre-and-post-campaign-questionnaires?type=campaign> and examples of questions are shown in Table 3.

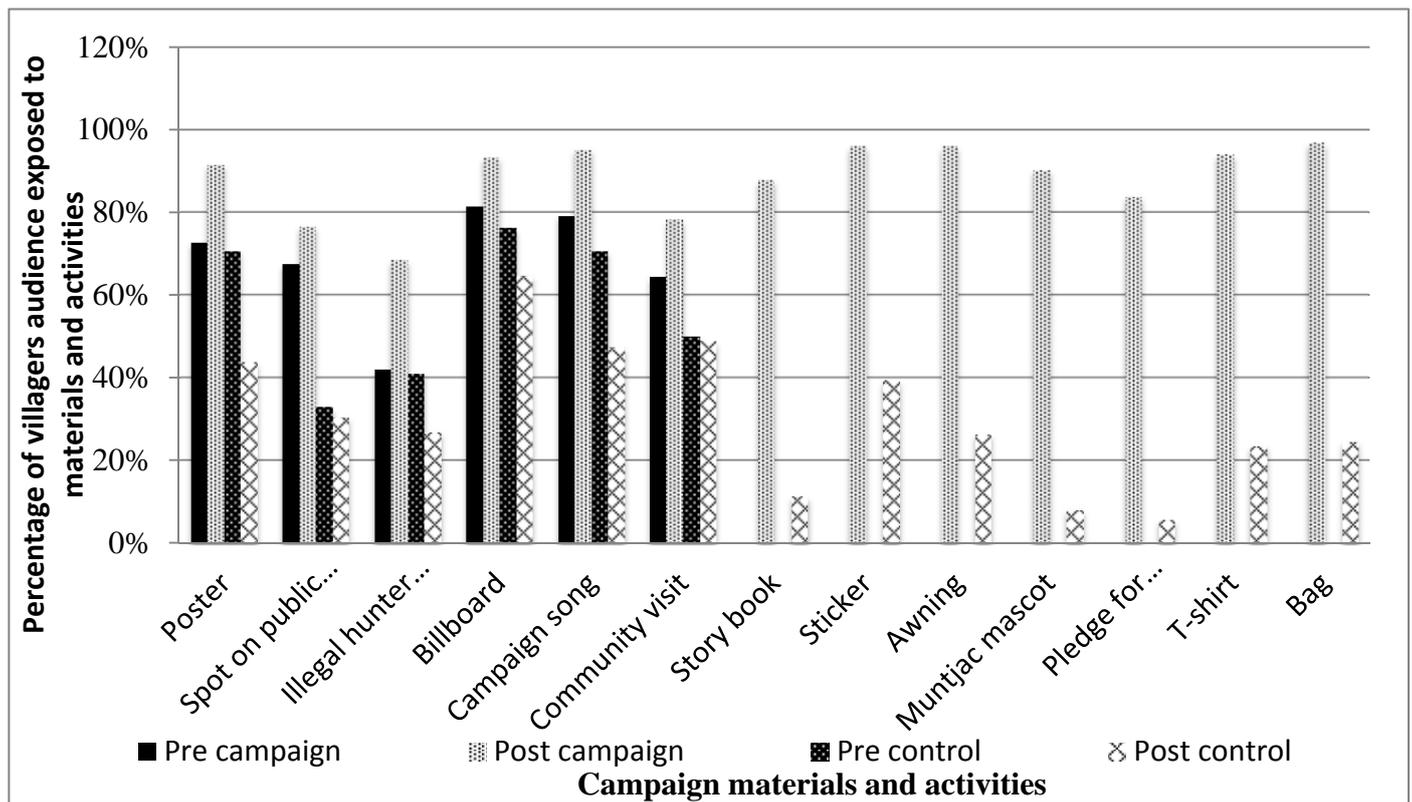
Pre-campaign surveys were conducted with a total of 615 people representing the Hmong, Khamu and Lao Loum ethnic groups in the campaign site and 570 people in the control site who met the same criteria. The representation of each ethnicity was based on the percentage of the total population. Pre and post surveys for both sites were implemented in the same locations with the same sample size. Anyone over 15 years old was randomly interviewed, and the same number of women as men. Village militia and police were surveyed in each village as potential illegal hunters.

Surveys were administered from July 13 – 21, 2009 (campaign site) and July 24 – 30, 2009 (control site) by ten enumerators, of which eight were national WCS staff and two were national volunteers, all of whom were trained before conducting the pre surveys. Fourteen months later, 13 enumerators, of which seven were new WCS national staff, one volunteer and five WCS conservation outreach staff from the previous year conducted the post surveys from September 19 – 24, 2010 (campaign site) and from September 28 – October 6, 2010 (control site). Responses of audiences from the pre and post campaign surveys were evaluated for significant change (Chi-square 95% or above).

Prior to implementing the Wildlife Crime Hotline an Excel database was created and used to track patrolling activities, responses to reports, cases closed and prosecutions. The coordinator of the hotline and Wildlife Crime Unit also created a logbook for the hotline. The logbook included incoming telephone number, time, date, length of call, type of report and responses to the hotline. The hotline coordinator entered data

**Table 4.** Statistical analysis on exposure to campaign materials, events and activities

Exposure	Chi squared		Degrees of freedom		P-value	
	Treatment	Control	Treatment	Control	Treatment	Control
<b>Billboard</b>	37.0050	2.4220	1.00	1.00	0.0001	0.1196
<b>Poster</b>	65.5240	21.2880	1.00	1.00	0.0001	0.0001
<b>Spot on public address system</b>	58.2290	9.8690	1.00	1.00	0.0001	0.0001
<b>Campaign song</b>	58.1620	6.3410	1.00	1.00	0.0001	0.0118
<b>Community visit</b>	33.7500	3.0420	1.00	1.00	0.0001	0.0812
<b>Participate illegal hunter workshop</b>	67.1900	3.8560	1.00	1.00	0.0001	0.0496



**Figure 4.** The reported exposure of Villager audience to campaign activities and materials in campaign and control sites before and after (pre and post) implementation of the campaign.

into both the logbook and the monitoring Excel database and created reports to Nam et Phou Louey Management Unit.

## CONSEQUENCES

Pre and post survey results were used to compare the exposure of the Villager audiences to Pride campaign materials and activities at the campaign and control sites (Figure 4). There was a significant increase in villager exposure to the poster, the public address system spot, and the illegal hunting workshop (Table 4).

Some materials and activities including billboards, the campaign song and the village visit had a high percentage of exposure in both the campaign and control sites. This is likely because the Villager audience had been exposed to these same types of materials and activities when they were used by the National Protected Area outreach team from 2004-2009 prior to the campaign. It is also possible that audience were confused between the campaign song and other wildlife songs broadcast by the Lao National Radio station through a different WCS project, the “Friends of Wildlife” program. A 2005 impact assessment of the radio program (Saypanya *et al.* 2005) showed that 40% of the population in the control and campaign sites listened to the radio and that the Friends of Wildlife program was ranked fourth highest out of 14 programs that people reported listening to.

The quantitative survey results (Figure 3) from a subset of questions asked to the villager audience (Table 3) indicate that the campaign was effective in significantly increasing the knowledge, attitude, interpersonal communication of the villager audience at the campaign site, which in turn led to significant change in both barrier removal and behavior of the campaign audience.

*Knowledge:* The proportion of the village audience that exhibited knowledge about the importance of ungulates as food increased significantly in both the campaign and control sites (Table 5). The increase at both locations may be the consequence of the National Protected Area doing similar outreach activities from 2004-2009 in both the campaign and control sites. In addition, villagers in these two sites are in frequent communication so it is possible that the knowledge of villagers in the control site was also influenced by the change in knowledge at the campaign site.

*Attitude:* There was a significant increase in the proportion of the village audience at the campaign site indicating that illegal hunting and trade should be punished, which was likely influenced by more people being knowledgeable about the importance of ungulates as a food source. In contrast, in the control site the proportion of the villager audience exhibiting an attitude that illegal activities should be punished was high in both the pre and post survey and did not significantly increase (Table 5). Even though similar outreach activities were done in both sites prior to the campaign, these activities were not as intensive and did not seem to have the same lasting effect in the campaign site as they appear to have had in the control site. We think this may be because the district in the control site has always been more supportive of the National Protected Area regulations than the district in the campaign site. Thus, the campaign site may have required an intensive campaign effort to see significant change in attitude.

*Interpersonal Communication:* There was a significant increase in reports of interpersonal communication among the villager audience in the campaign site about how to increase ungulate populations by reducing illegal hunting post survey but not in the control site (Table 5). This suggests that the

exposure to the campaign materials and events (e.g., the Public Announcement system spots), along with changes in knowledge and attitude did lead to more communication in the campaign site. In the control site, even though a relatively large proportion of the villager audience were knowledgeable and felt that illegal activities should be punished, interpersonal communication did not change because exposure to campaign materials and events was low.

**Barrier removal:** There was a significant increase at the campaign site in the percentage of the villager audience that reported hearing of someone receiving a fine for illegal hunting and trade, but not in the control site where there was little change (Table 5). This suggests that reporting and enforcement to restrict illegal hunting and trade had increased in the campaign site relative to the control site.

**Behavior Change:** The number of villagers responding that they had reported someone for illegally hunting for trade increased significantly in the campaign site as compared to the control site where there was no significant increase in reporting (Table 5). These results provide strong evidence that the campaign was effective in ultimately changing behavior of villagers in the campaign site to take action against illegal hunting and trade. Even though, we initially observed that knowledge and attitude towards illegal hunting and trade in the control site was generally positive, the absence of the campaign events and materials, and the Wildlife Crime Unit hotline did not result in significant behavior change in the control site.

There are also qualitative indications that the campaign was effective in changing the behavior of villagers. In one case, a village hunter that was arrested and fined by Wildlife Crime Unit felt that he was innocent so he appealed to the Wildlife Crime Unit that he had been wrongly accused of hunting illegally. In making his case, he confidently explained that he had used a legal weapon, a machete to kill a hog badger *Arctonyx collaris*, a legal species to hunt, in his own village use zone and for his family's consumption, not for trade. The authorities responded that while he had complied with most of the laws he broke only one rule, which was hunting during a closed season. This example illustrates how village hunters had changed as a result of the social marketing campaign messaging. Even though the hunter had broken one of the hunting regulations he was confident to appeal because he felt he had followed the principles of legal hunting promoted by the campaign.

We also found anecdotal evidence of the campaign's effectiveness in the interpersonal communication between the campaign audience and people from outside the campaign area that had not been exposed to campaign materials and activities.

These outsiders criticized the campaign slogan saying that it encouraged more hunting whereas those that had been exposed to the campaign materials and activities understood the principles of sustainable hunting practices that were represented in the slogan.

The outreach team also interviewed one hunter and one general villager to get their feedback on the campaign. The hunter used to hunt and trade illegally, but because of the campaign had stopped. He told the Wildlife Crime Unit on the identity of key perpetrators, how they move around the district, and reported illegal activities that led to multiple arrests. He said he thought the campaign was targeted at the correct audiences and appreciated the campaign organizer's contact time with the communities. He felt the hotline number was a very effective way to report illegal activities and said, "If we continue reporting this way the wild animals in the Nam et Phou Louey National Protected Area will increase." The general villager appreciated the size and scale of the campaign, which the district never had before. He said the activities were good to encourage people to begin using natural resources, especially wildlife more sustainably.

Public response to the Wildlife Crime Unit hotline also indicates that the campaign was effective in facilitating public reporting of illegal hunting and trade. While the hotline was in operation during the campaign (May – October 2010) more than 250 people called the hotline number. Out of these, 82 calls reported illegal hunting and wildlife trade, which led to 22 perpetrators being arrested and the cases turned over to the Wildlife Crime Unit for resolution and closure. The other 60 calls did not lead to sufficient information for the Wildlife Crime Unit to respond. The 168 calls that were not reporting wildlife crime were mostly from concerned citizens who were checking to see if the hotline was real, reachable and responsive. Most of the invalid calls were made just after the hotline was created and promoted at the beginning of the campaign.

## CONCLUSIONS

The assumptions in the conceptual model, the theory of change and results chains proved to be accurate. The pre and post surveys indicate a significant shift along the theory of change from knowledge to behavior change. Over time this shift should also lead to threat reduction to, and thus potential increase of, tiger and prey populations.

The change in interpersonal communication as a result of the campaign is particularly impressive. Anecdotally, we see that target audiences and outsiders still debate the campaign slogan 18 months after the post survey. The district governor of the campaign site regularly reminds Nam et Phou Louey staff that the campaign was effective at changing people's

**Table 5.** Statistical analysis on Theory of Change

Theory of Change	Chi squared		Degrees of freedom		P-value	
	Treatment	Control	Treatment	Control	Treatment	Control
<b>Knowledge</b>	106.497	80.403	1.00	1.00	0.0001	0.0001
<b>Attitude</b>	168.620	0.545	1.00	1.00	0.0001	0.4606
<b>Interpersonal Communication</b>	28.088	2.070	1.00	1.00	0.0001	0.1502
<b>Barrier Removal</b>	41.441	1.589	1.00	1.00	0.0001	0.2075
<b>Behavior change</b>	4.910	1.458	1.00	1.00	0.0267	0.2273

behavior but activities need to be maintained and expanded to new areas and that the project should build a statue of the Muntjac mascot to help keeping the campaign momentum to maintain changed behaviors. He suggests minor changes to the campaign slogan in line with the original campaign objectives, thus suggesting that he has also moved along the theory of change to a new stage.

Before the campaign, villagers rarely openly displayed their crossbows because they were unsure of their legality. Overt displays of villagers carrying their legal hunting equipment (crossbows) in front of the Wildlife Crime Unit suggests that villagers now understand the laws and find confidence in subsistence hunting.

In parallel with the effectiveness of the campaign there are several challenges. The first is that enforcement activities are risky and Wildlife Crime Unit staff are reluctant to take action at times. It is difficult to find strong leadership and staff with sufficient time to commit to the work. Without a strong Wildlife Crime Unit it is difficult to maintain the barrier removal that is necessary to support the campaign. A second challenge is communications between the hotline network and the Wildlife Crime Unit where cell phone coverage is limited and sometimes non-existent in some campaign locations. Third, the incentives for hotline reporters must be paid in a timely fashion and at times, the Wildlife Crime Unit is slow or non-responsive at rewarding reporters. If the informant network is not maintained, the Wildlife Crime Unit cannot keep abreast of illegal activities. Tracking unpaid fines is challenging and a new mechanism is needed to ensure that fines are paid and are announced on the district's public address system.

Although our monitoring indicates that the social marketing campaign was effective in contributing to behavior change that has led to an increase in reporting and punishment of wildlife crime, it is still not certain if these actions will be sufficient to achieve our threat reduction objectives or the goals for our targets. Preliminary results from recent biological surveys estimate that large ungulate populations in the National Protected Area are increasing but that tiger abundance has declined (Johnson *et al.* 2012).

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## REFERENCES

- Andreasen A. R. (1994) Social Marketing: Its Definition and Domain. *Journal of Public Policy & Marketing*, **13**, 108-114.
- Clucas B., McHugh K. & Caro T. (2008) Flagship species on covers of US conservation and nature magazines. *Biodiversity and Conservation*, **17**, 1517-1528.
- Connell J. P. & Kubisch A. C. (1998) Applying a theory of change approach to the evaluation of comprehensive community initiatives: progress, prospects, and problems. *New Approaches to Evaluating Community Initiatives*, **2** (15-44).
- Davidson P. (1998) *A Wildlife and Habitat Survey of Nam Et Phou Louey National Biodiversity Conservation Areas, Houaphanh Province, Lao People's Democratic Republic*. CPAWM / WCS Cooperative Program, Vientiane.
- GoL. (2010) *National Tiger Action Plan for Lao People's Democratic Republic 2010-2020*. Division of Forestry Resource Conservation, Department of Forestry, Ministry of Agriculture and Forestry, Vientiane.
- ICEM. (2003) *Economic benefits of protected areas: field studies in Cambodia, Lao People's Democratic Republic, Thailand and Vietnam Review of Protected Areas and Development in the Lower Mekong River Region*. International Centre for Environmental Management, Indooroopilly, Queensland..
- Jenks B., Vaughan P. W. & Butler P. J. (2010) The evolution of RarePride: Using evaluation to drive adaptive management in a biodiversity conservation organization. *Evaluation and Program Planning*, **33**, 186-190.
- Johnson A. (2012) A Landscape Summary for the Nam Et-Phou Louey National Protected Area, Lao People's Democratic Republic. Pages 73-90 in: T.C.H..SunderlandJ. Sayer & H. Minh-Ha (eds.), *Evidence-based conservation: lessons from the lower Mekong*. Earthscan, London.
- Johnson A., Hansel T & Goodrich J. (2012) *Tigers Forever in the Nam Et-Phou Louey National Protected Area, Lao People's Democratic Republic* (August 2012). Presentation at the Tigers Forever Annual Meeting, Bangkok, Thailand.
- Johnson A., Krahn J. & Seateun S. (2010) *Finding the Linkages between Wildlife Management and Household Food Consumption in the Uplands of Lao People's Democratic Republic: A Case Study from the Nam Et-Phou Louey National Protected Area*. New York: Wildlife Conservation Society - TransLinks Program
- Johnson A & Saypanya S. (2007) *Strategic planning workshop to develop a conceptual model, monitoring framework and annual workplan for the Nam Et-Phou Louey National Protected Area*. Vientiane, Lao People's Democratic Republic: Wildlife Conservation Society and the Nam Et-Phou Louey Protected Area Management Unit.
- Johnson A., Vongkhamheng C., Hedemark M. & Saithongdam T. (2006) Effects of human-carnivore conflict on tiger (*Panthera tigris*) and prey populations in Lao People's Democratic Republic. *Animal Conservation*, **9**, 421-430.
- Kleiman D. G., Reading R. P., Miller J. B., Clark W. T., Scott J. M., Robinson J., Wallace L. R., Cabin J. R. & Felleman F. (2000) Improving the Evaluation of Conservation Programs. *Conservation Biology*, **14**, 356-365
- Krahn J. & Johnson A. (2007) Food security and wildlife management. *Juth Pakai*, **9**, 17-33.
- Lynam J., Venevongphet & Saypanya S. (2006) *Towards a wildlife protection strategy for the Nam Et Phou Louey National Protected Area Based on results from a workshop help at Viengthong District*. Vientiane: Wildlife Conservation Society.
- MAF (2001) *Regulation on the management of national biodiversity conservation areas (NBCAS), aquatic and wild life*. Vientiane: Ministry of Agriculture and Forestry.
- Margoluis R. & Salafsky N. (1998) *Measures of success: designing, managing, and monitoring conservation and development projects*. Island Press, Washington D.C..

- Margoluis R., Stem C., Salafsky N. & Brown M. (2009) Using conceptual models as a planning and evaluation tool in conservation. *Evaluation and Program Planning*, **32**, 138-147. doi: 10.1016/j.evalprogplan.2008.09.007
- Rabinowitz A. (1999) The status of the Indochinese tiger: separating fact from fiction. Pages 148-165 in: J. Seidensticker, S. Christie & P. Jackson (eds.), *Riding the tiger: tiger conservation in human-dominated landscapes*. Cambridge University Press, Cambridge.
- Saypanya S., Hansel T & Duangsavanh S. (2005) *Mass Media Conservation Outreach in Lao People's Democratic Republic*. Wildlife Conservation Society, Vientiane.
- Vaughan C., Gack J., Solorazano H. & Ray R. (2003) The Effect of Environmental Education on Schoolchildren, Their Parents, and Community Members: A Study of Intergenerational and Intercommunity Learning. *Journal of Environmental Education*, **34**, 12-21.
- Vaughan P. & Rogers E. (2000) A Staged Model of Communication Effects: Evidence from an Entertainment-Education Radio Soap Opera in Tanzania. *Journal of Health Communication*, **5**, 203-227.
- Vongkhamheng C. (2002) *Participatory wildlife diversity monitoring with different ethnic groups, in Nam Et - Pou Loey National Biodiversity Conservation Areas, Northern Lao People's Democratic Republic*. M.Sc. thesis. Mahidol University, Bangkok.
- Walston J., Robinson J. G., Bennett E. L., Breitenmoser U., da Fonseca, G. A. B., Goodrich J., Gumal M., Hunter L., Johnson A., Karanth K. U., Leader-Williams N., MacKinnon K., Miquelle D., Pattanavibool A., Poole C., Rabinowitz A., Smith J. L. D., Stokes E. J., Stuart S. N., Vongkhamheng C., Wibisono H. & Mace G. M. (2010). Bringing the tiger back from the brink – the six percent solution. *PLoS Biology* **8**, e1000485.