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Effective implementation of payments for environmental services in Lao PDR

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From the University of Western Australia: Dr Michael Renton, A/Prof Michael Burton and Dr Marit Kragt

From the Ministry of Natural Resources and Environment: Mr Saysamone Phothisat

From the Ministry of Agriculture and Forestry: Mr Khamphay Manivong (who sadly passed away during the course of the project.)

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Last but not least, we want to acknowledge the much appreciated ongoing support of ACIAR Programme Managers, Dr Ejaz Qureshi and Tony Bartlett.

2 Executive summary

The project goal was to develop PES policy options for the Government of Lao PDR. This was addressed through the investigation and implementation of a Payment for Environmental Services (PES) scheme in Lao PDR so as to provide an input into the policy making processes of the national and provincial governments. In addition, the project aimed to increase awareness of PES schemes in concept and the complexities of their implementation through the development of an environmental and resource economics skills base.

Initially, a 'virtual' PES scheme was designed as a 'proof of concept'. Subsequently, two 'pilot' case study applications – focused on wildlife protection through local people conducting ant-poaching patrols and whole villages engaging in conservation activities – were put into practice as proof of concept and to provide practical experience in implementation.

Key features of the scheme recommended to the Lao PDR Government include the 'mimicking' of market principles through the estimation of demand for environmental services (using non-market valuation techniques) and the costs of supplying environmental services (using competitive reverse auctions), with bio-physical models being used to link supply with demand (in which outputs are estimated given inputs supplier effort). The design ensures that PES schemes will generate net benefits to the wider community through the setting of prices for services that equate supply with demand. It was also stressed that no two schemes will necessarily involve the same monetary parameters given that all contexts for application will vary.

The project had impact through its capacity development strategy with staff and students at the National University of Laos, Government of Lao PDR (GoL) officials and the staff of NGOs being exposed to new concepts both in theory and practice. 'Learning-by-doing' played a key role in expanding skill sets.

Policy recommendations made under the project are also being acted upon in the GoL: The GOL's Environmental Protection Fund has worked in parallel with the research team to set up two PES trial schemes so that they implemented the following recommended general principles:

- Are based on the willingness to pay of society, as estimated using choice modelling;
- Reflect the costs of supply, as estimated using conservation auctions;
- Use a single price for delivery of services that equates marginal supply costs with marginal benefits;
- Are competitive in supply, as achieved through competitive auctions;
- Are transparent in operation for all parties through consistent community consultation;
- Are flexible to be able to adapt to changing circumstances, particularly to changes in opportunity costs of suppliers; and,
- Engage actively with the local community to ensure consistency with social norms.

On the ground, the two pilot PES schemes commenced operation between August and November 2017 and are expected to achieve reduced risks of species extinction and improvements in the livelihoods of the local people. The schemes involve the participation of 16 villages in total, with over 60 patrol teams (each comprising between 4 to 6 people) being engaged under contract.

The financial parameters of the schemes were informed by a Choice Modelling application in which tourists to Lao PDR and residents of urban Vientiane City were questioned regarding the strength of their preferences for biodiversity protection. Villagers living adjacent to the Protected Area case studies were selected as suppliers of anti-poaching patrols on the basis of their responses to a conservation auction bidding scheme. Two biophysical models that simulated the population dynamics of species threatened by poaching were created for the two protected areas under consideration. These models allowed the inputs of village patrollers (which were costed in the conservation auctions) to be converted into biodiversity protection outcomes (that were valued in the choice modelling application). Prices paid to patrol teams varied between the two case study sites but also according to season. The latter variation gave recognition to the differing opportunity costs between the 'busy' season when the rice crop was the focus of farmer attention and the 'quiet' season. An additional feature of the PES scheme was the introduction of a set of payments made to villages as entities, to be used for village development projects. These payments were designed to provide communal incentives for wildlife protection, in support of the individual incentives made to those engaged in the patrol schemes directly.

Buyer and seller net benefits are anticipated from the two case studies. Specifically, the scheme implemented in the Phou Phou Chomvoy Provincial Protected Area is estimated to produce total benefits of \$5,331,865 with total costs of \$337,594. This yields total net benefits (total surplus) of \$4,994,271 comprising a consumer surplus of \$4,940,010 and a producer surplus \$54,261. For the Phou Khao Khouay National Protected Area case study predicted economic outcomes are total benefits \$197,320, total costs \$69,210, total net benefits (total surplus) \$128,111, consumer surplus \$145,457 and producer surplus \$17,346. Funding for both schemes was provided by a World Bank grant to the GoL Environmental Protection Fund.

On the basis of the Choice Modelling study it was recommended that the GoL implement a \$50 surcharge on the cost of tourist visas and a small additional charge for electricity for Vientiane urban residents. This would provide a sustainable source of funding for a wider programme of PES schemes across the nation's protected area network once the initial World Bank funds are exhausted.

In terms of future actions monitoring the on-going operation of the pilot PES schemes would be useful as an input into the future refinement of their conceptual design and practical implementation. Further education in environmental and resource economics for policy officials at senior levels of the GoL would facilitate the introduction of policy reforms associated with PES scheme introduction on a broader scale across Lao PDR. Additional research to provide a broader range of data regarding demand for and supply of environmental services would enable the application of the PES model designed in this project to a wider array of contexts within Lao PDR.

3 Background

The Government of Lao PDR (GoL) has a clearly identified goal of improving the condition of the environment. This has been expressed in domestic policy edicts as well as through its entering into international environmental agreements and treaties. The environment has been viewed as an important component of national well-being through its capacity to deliver valuable services including biodiversity, water and soil protection. Yet many of the people with the capacity to harm or help the environment are some of the poorest people in Lao PDR. So the idea of achieving environmental improvement goals alongside providing livelihoods for poor people has been attractive to the GoL. Payment for Environmental Services (PES) schemes offer this potential and the GoL had indicated an interest in applying such schemes. Implementation practicalities however presented an obstacle.

The interest in PES schemes and the barriers to their introduction in Lao PDR were identified in a scoping study carried out at ACIARs' behest by Salwood Asia Pacific Pty Ltd in 2011 (see Midgley et al 2012). The scoping study pointed to the significance of the environmental resources of Lao PDR and the pressures being placed on them by development activities including mining, hydro-electricity and unsustainable forest management. It also outlined the GoL's support for PES along with the complexity of organisational structures that would need to be confronted if PES schemes were to be introduced. Specifically, the GoL set out a number of key goals in the Lao PDR Ministry of Agriculture and Forestry 'Agricultural Master Plan 2011-2015'. In exploring forestry issues confronting the nation, the Master Plan stated that 'the biodiversity of Lao forests is severely threatened' and that the 'environmental services provided by forests have so far been largely neglected' (p33). To address these issues, the Master Plan sets out targets in the forest sector to 'improve forest cover (up to 65%) through the implementation of collaborative management plans for biodiversity and watershed services' and to 'develop legislation for valuing ecosystem services (biodiversity and water)' (p36). Those targets were aspired to be achieved through a number of actions, in particular the 'introduction of payments for environmental services' (p35).

The work under this project was formulated in response to that scoping study and the Lao PDR MAF Agricultural Master Plan 2011-2015. It aimed to investigate the practicalities of PES development and implementation to enable the GoL to make better informed decisions regarding the introduction of PES schemes in the Lao PDR context. The aim was to fill the policy gap that existed between the collection of funds for environmental management and the payment of those funds to rural small holders who can supply environmental improvements. The resultant increase in the livelihoods of rural small holders was also seen to be consistent with GoL goals: The Master Plan specified that 'the participation of local people will be the main approach of sustainable forest management' (p35). This suggests that the GoL was convinced of the merits of PES schemes but was seeking assistance in developing practical applications in the Lao PDR context that achieve the joint goals of more environmental services and improved livelihoods for poor farming households.

The project aimed to assist the GoL in designing and implementing PES schemes that provide a linkage between the already evident demand for environmental

services and the yet to be developed capacity of poor farming households to supply those services for financial gain. The project aimed to develop PES schemes that efficiently and effectively distribute funds collected by the Environmental Protection Fund (EPF) from potential environmental service buyers such resource development interests and international tourists. It was expected that such schemes would support the EPF in its efforts to make socially worthwhile investments in improving the environment and limit the prospect of those funds being used inappropriately through the implementation of transparent investment decision processes.

The project built on acquired experience from the ACIAR project (ADP/2007/055) on land use change in western provinces China. In this project, an auction-based PES was developed and introduced in collaboration with the Provincial Forestry Department to facilitate environmental conservation inspired tree planting initiatives. While it was expected that valuable lessons could be learnt from other PES applications, the specific circumstances of the Lao PDR meant that the simple 'parachuting' of research findings from other countries was unlikely to be fruitful. Instead, it was expected that the PES design and implementation had to be customised to the Lao PDR context.

The following key research issues (policy and operational) identified by the scoping study (p45-46) formed the focal points of this research project:

- Definition of environmental services to be investigated
- Development of environmental service measurement techniques suited for practical monitoring
- Modelling the relationships between environmental management actions and their outcomes
- Estimation of values associated with environmental services
- Formulation of methods to evaluate the economic, environmental and social impacts of PES
- Determination of the amount of funds to be devoted to PES
- Development of low transaction cost institutional and policy frameworks for PES schemes
- Risk assessment of alternative policies

4 Objectives

The overall aim of the project was to develop policy options for the implementation of Payments for Environmental Services in Lao PDR as a means of increasing smallholder livelihoods and improving environmental conditions through changed land management practices. This included a comprehensive analysis and understanding of policy and institutional frameworks to deliver outcomes which can achieve maximum economic, social and environmental benefits net of costs. This overall aim was addressed through five research objectives:

Objective 1: To introduce the concept and practice of PES to Lao PDR policy makers and their advisers

Objective 2: To analyse and develop evidence based policy options for the implementation of PES schemes appropriate to the Lao PDR context, covering the introduction of market based instruments in comparison to alternative payment systems

Objective 3: To increase the capacity of authorities within the Government of Lao PDR to design and implement PES schemes

Objective 4: To promote community participation in policy making and resource management to enable implementation of land use programs and raise awareness of the importance of environmental improvements.

Objective 5: To facilitate the sharing of experience in use of PES more widely in Lao PDR and across the Mekong region.

5 Methodology

A case study based methodology was used to achieve the project's objectives.

Objective 1: To introduce the concept and practice of PES to Lao PDR policy makers and their advisers

Activity 1.1 Inception meeting

A meeting with the UWA and ANU team members held in Perth was used to specify in detail the roles and responsibilities of individual team members as well as to develop further the project research plan. Australian team members then travelled to Vientiane to meet with Lao PDR project partners. NUoL team members assisted in facilitating individual meetings in Vientiane and also provided logistical support for an inception meeting that involved research partners, and other stakeholders. The meeting was used for Australian team members to outline PES concepts, developments and potentials, for Lao PDR partners to set out the contexts pertaining to PES formation and for refinement of the project research plan. The inception meeting explored the options for a preliminary 'virtual' case study site for the application of a PES scheme.

Activity 1.2 Catalogue Environmental services

NUoL, UWA, and ANU team members catalogued and used the environmental services provided within the preliminary case study site to develop a conceptual bio-physical model. This model established the relationship between changes in management actions and provision of environmental services. This involved a literature review, field studies at the site and interviews with stakeholders.

Activity 1.3 Estimate values

NUoL and ANU team members developed approaches (stated and revealed preference techniques as well as benefit transfer) to estimate values of improved environmental services in the preliminary case study site. The planned approach to estimating the benefits of the 'virtual' scheme through the benefit transfer method proved to be impractical when the focus of the proposed pilot PES schemes shifted from catchment condition to biodiversity. Without a set of previously estimated values for the biodiversity under threat in Lao PDR, transfers of estimates could not take place. The alternative method of estimating the use and non-use values of biodiversity protection, using Choice Modelling, is what was implemented in the core of the project.

Activity 1.4 Develop 'virtual' PES scheme

NUoL, ANU and UWA team members, in consultation with GoL officials, developed a 'virtual' PES scheme using the information generated in Activities 1.2 and 1.3. The literature on PES schemes internationally was used as a foundation. Weaknesses identified in existing schemes were detailed and strategies to avoid them formulated. For instance, few other PES schemes are based on information relating to the community demand for environmental services. The virtual scheme involved demand estimation techniques to fill that gap. Likewise, other schemes that use reverse auctions have suffered from a lack of incentive for suppliers to participate through the use of discriminatory pricing. The virtual scheme proposed reverse auctions with a uniform price resulting in producer and consumer

surpluses being generated. Incentives for all to participate were thus established. The end product of the virtual scheme development was a set of steps required for the development, implementation and assessment of an effective and efficient PES scheme. The 'virtual' PES scheme was presented to a range of relevant GoL officials and other interested parties. This increased their familiarity with the PES concept and application.

Activity 1.5 Sichuan field trip

A field trip to the Sichuan PES auction site was conducted by NUoL and ANU team members. This site was used as a case study in a previous ACIAR project. The field trip was used to enhance GoL officials' familiarity and understanding with and confidence in the PES concept and application. Briefing sessions were provided by Australian project leader as well as by staff from the State Forestry Administration in Beijing and the Sichuan Province Forestry Department who were involved in the development and implementation of the Sichuan trial.

Activity 1.6 Briefing sessions and short courses

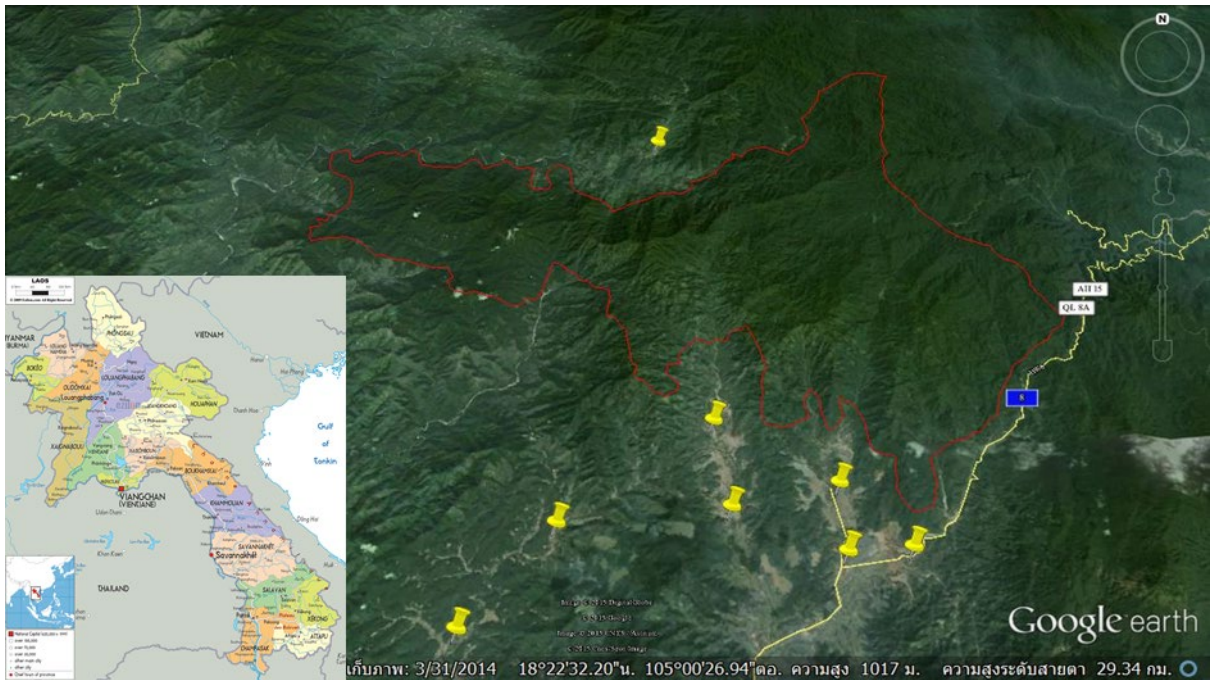
Briefing sessions and short courses were provided by NUoL, ANU and UWA team members in Vientiane throughout the carriage of the preliminary cases study when Australian team members were in country. Invitations were distributed widely to GoL officials, NGO representatives, international agency staff and industry representatives. ANU team members conducted a field trip to Australia. This involved visits of GoL officials to Sydney and Canberra for discussions with state and commonwealth government agency officials as well as researchers who are engaged in PES design and implementation. Both, the short courses and the field trip established the profile of the project as well as raised the levels of understanding of the concepts and practicalities of PES schemes.

Objective 2: To analyse and develop evidence based options for the implementation of PES schemes appropriate to the Lao PDR context, covering the introduction of market based instruments in comparison to alternative payment systems

Activity 2.1 Establish two case study sites

The initial project strategy was to establish PES case studies in the context of hydro and mining developments. Catchment protection/rehabilitation was the proposed focus for environmental services. Initial discussions with those responsible for the management of the NT2 hydro scheme catchment reached MoU stage but failed to go further because of the suspension of funding. Negotiations with the operators of the Sepon mine site and the Pou biah mine site progressed but did not produce an agreement given falling metals prices and the view on the part of the mining companies that they were already paying the GoL fees for their use of the environmental assets disturbed by their mines and should not be required to pay more. Selection of case studies switched to the consideration of biodiversity protection following interest expressed by World Bank officials in Vientiane, given the commissioning of the Bank's Protected Areas and Wildlife Program (PAWP). This programme provided a potential source of funds to implement the trial schemes. In close consultation with the GoL's Environmental Protection Fund (EPF) and other GoL agencies at national and provincial levels, two case study sites were selected: one in the Bolikhamxay Province (Phou Chomvoy Provincial Protected Area), and one in the Vientiane Capital Province

(Green Peafowl Conservation Zone of the Phou Khao Khouay National Protected Area). The selection of the two case study sites was based on specific environmental characteristics and local community features (social and economic). Wildlife protection was selected as a focal point given the long standing and on-going threats posed to biodiversity from illegal poaching of wildlife, principally for commercial sale. The sites were formally instigated through MoUs between the project and Bolikhamxay Province PONRE and Vientiane Capital Province PONRE, respectively. World Bank funding was secured through the EPF in an agreement with the NUoL following a lengthy and rigorous application process.



Phou Chomvoy case study area (participating villages pinned)



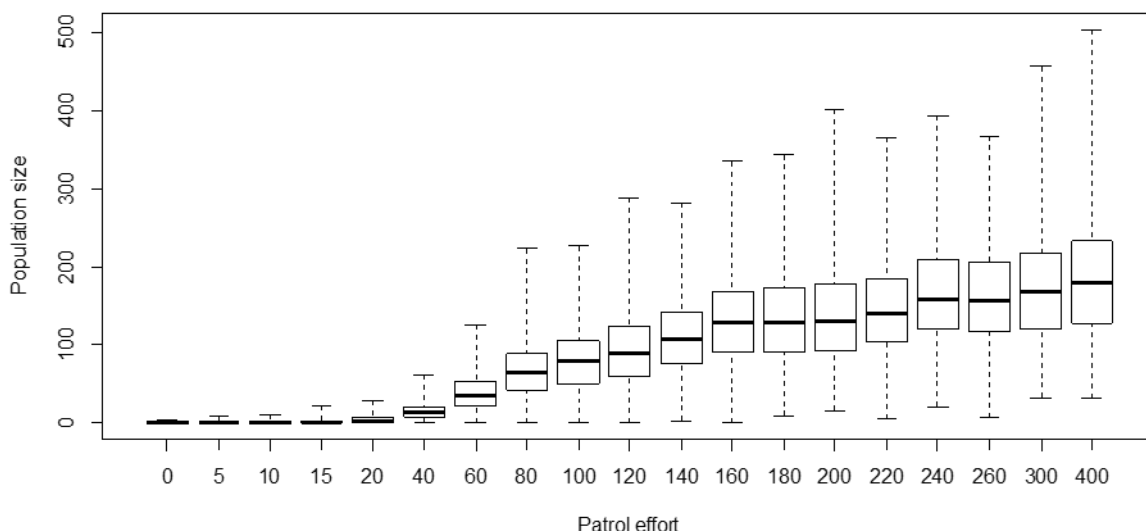
Phou Khao Khouay case study site (participating villages pinned)

Activity 2.2 Biophysical modelling

In a first step, UWA team members, in collaboration with ANU team members, developed conceptual bio-physical models. Two research reports outlining the bio-physical and socio-economic conditions in each case study site provided the foundation of these models. The models are based on geographical representations of the protected areas, with variables such as species reproductive rates, mortality rates, effectiveness of poaching activities and frequency and extent of anti-poaching patrols being used to model populations of species through time. This allowed the prediction of species outcomes given the levels of inputs such as patrol effort. In a second step, bio-physical models were developed, populated and tested, using data collected through wildlife baseline surveys. Data relating to some of the variables were available in the literature (such as reproductive and mortality rates). Other data were estimated using the expert opinion of researchers, particularly Dr Chantavy Vongkhamheng of WCA. The bio-physical models were used to establish a ‘cause-effect’ or ‘production function’ relationship between proposed management actions (wildlife protection) performed by villagers participating in the PES scheme as suppliers and the generated biodiversity benefits. The models were tailored to each case study given differences in ecological systems, management strategies and environmental outcomes involved. Stochastic simulation models were used to predict the production functions. Stochastic simulation models are based on probabilities of possible outcomes. In data-poor contexts like that of the Lao PDR, expert judgement needs to be combined with conceptual understandings and existing empirical findings to construct such predictive models. Importantly, the research highlighted the areas of data limitations where the largest return on additional research effort will be likely achieved (sensitivity analysis).

For example, in the PKK case study the simulation model runs on a monthly time step. It is an age-structured population model; it tracks the number of female peafowl in different age classes in each month. It does not explicitly represent

male birds, but the total number of birds is assumed to be twice the number of females. The model uses 20 age classes, representing birds from one to 20 years old. Reproduction and aging (moving from one age class to the next) occurs once per year. The number of eggs produced by each sexually mature female bird at the end of the year is drawn from a Poisson distribution, with the specified mean number of eggs. Population sizes of the Green Peafowl are predicted according to patrol effort as shown in the graph below.



For the PCV case study, the simulation model runs on a monthly time step. For each month the following processes are simulated:

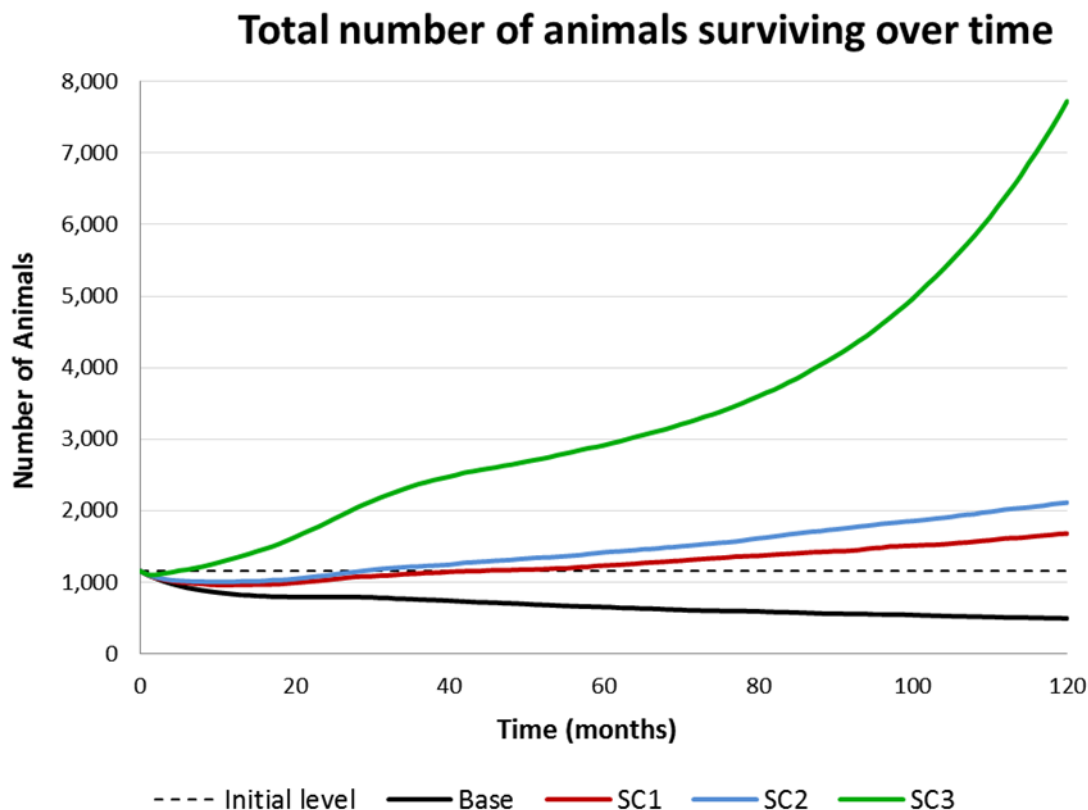
- Wildlife death from illegal snares
- Wildlife death from illegal direct hunting (shooting, collection, etc.)
- Wildlife maturation and reproduction
- Reductions in number of poachers and/or snares as a result of anti-poaching patrols
- Possible introduction of new poachers and possible movement of poachers and anti-poaching patrols

The model is informed using data specific to the PCV PPA. The generic population model captures the following ‘environmental production function’:

$$P_{t,i} = f(Q, A, P_{0i}, RR_i, Gen_i, Range_i, P_{sn}, P_{sh}, Grp, PE)$$

where the current population $P_{t,i}$ of species i is a function of information about the PCV PPA area, species-specific information, and patrolling effort and effectiveness [PE].

The following graph shows model predictions of animal numbers over time at differing level of patrol effort.



(Full details of the models and their results are available in Research Report Nos. 11 and 12)

Activity 2.3 Economic Valuation

The demand for non-market environmental services was estimated by means of choice modelling. This method facilitates the estimation of both use and non-use values provided by environmental assets in monetary terms. Choice modelling applications involve respondents to a survey being asked to make trade-offs between a range of characteristics, called attributes, which jointly describe a particular good or service. The attributes can take several levels and are bundled in choice options that are presented to respondents in choice questions. By making trade-offs in the choice questions, respondents reveal their preferences associated with each of these attributes. Choice Modelling is widely used to estimate benefits associated with non-market environmental services.

For this application a sequence of choice models was used to estimate the demand for reducing biodiversity loss. The monetary values of biodiversity benefits predicted to be generated as a result of the two pilot schemes by the biophysical models were estimated. Attributes in the Choice Modelling (CM) questionnaire used to reflect the elements of biodiversity protection benefit were number of species and impact on populations from poaching.

The CM surveys targeted two identified ES buyer groups: international tourists visiting Lao PDR and the urban population of Vientiane City. The project team developed four surveys customised to the two case study sites and the two buyer groups (one for each buyer group for each case study site). The surveys were conducted by about 100 Faculty of Economics and Business Management (NUoL) students, interviewing over 413 Vientiane City residents on a house to house

basis, and over 680 tourists at the departures area of Vientiane airport. The student interviewers received extensive training from project team members using training manuals that were developed by the project for that purpose (surveying, data entry and management, survey management). Particular features of the implementation of the CM technique developed to meet the context of Lao application included the use of separate booklets for the choice set answers so as to maintain confidentiality of results and the extensive use of graphics and show cards to cope with language difficulties.

Implicit prices for the attributes used in the PCV survey are reported below

Tourists

Attribute	Implicit prices	95% Confidence Interval
Species diversity	\$1.67/ Species	\$1.00 - \$2.35
Poaching	\$1.14/ % Poaching reduction	\$0.40 - \$1.80
Tourist access	\$9.22/ Access	\$4.27 - \$14.44
Benefitting households	\$0.017/ Household	\$0.012 - \$0.021

Residents

Attribute	Implicit prices	95% Confidence Interval
Species diversity	₭386/ Species	₭221 - ₭935
Poaching	₭913/ % Poaching reduction	₭156 - ₭1612
Tourist access	₭5,182/ Access	₭1,504 - ₭8,739
Benefitting households	₭7/ Household	₭1 - ₭13

*\$US1 = ₭8,177.68 (27.01.2017 Oanda.com)

For the PKK case, the implicit prices are reported in the following table.

Tourists

Attribute	Implicit prices	95% Confidence Interval
Green Peafowls	\$0.05/ Bird	\$0.01 - \$0.09
Tourist access	\$1.46/ Access	\$-2.63- \$4.94
Benefitting households	\$0.015/ Household	\$0.010 - \$0.022

Residents

Attribute	Implicit prices	95% Confidence Interval
Green Peafowls	₭41/ Bird	₭6 - ₭87
Tourist access	₭4,914/ Access	₭1,422 - ₭8,593
Benefitting households	₭6/ Household	₭-2 - ₭13

*\$US1 = ₭8,177.68 (27.01.2017 Oanda.com)

(Full details of the CM application and results are available in Research Report 13).

Activity 2.4 Estimate aggregate payments

ANU team members integrated information generated in the bio-physical modelling stage with the economic valuation data to estimate the aggregate willingness-to-pay for wildlife protection. Information on the value of the marginal benefits (estimated in monetary terms through the application of Choice Modelling) and on the value of the marginal costs (estimated in monetary terms through the conduct of the conservation auctions) were used to determine the efficient 'market' price to be paid per unit of wildlife protection achieved. This price determination process ensured that buyers and suppliers are made better off as a result of their participation in the PES scheme. The determination of an efficient price and

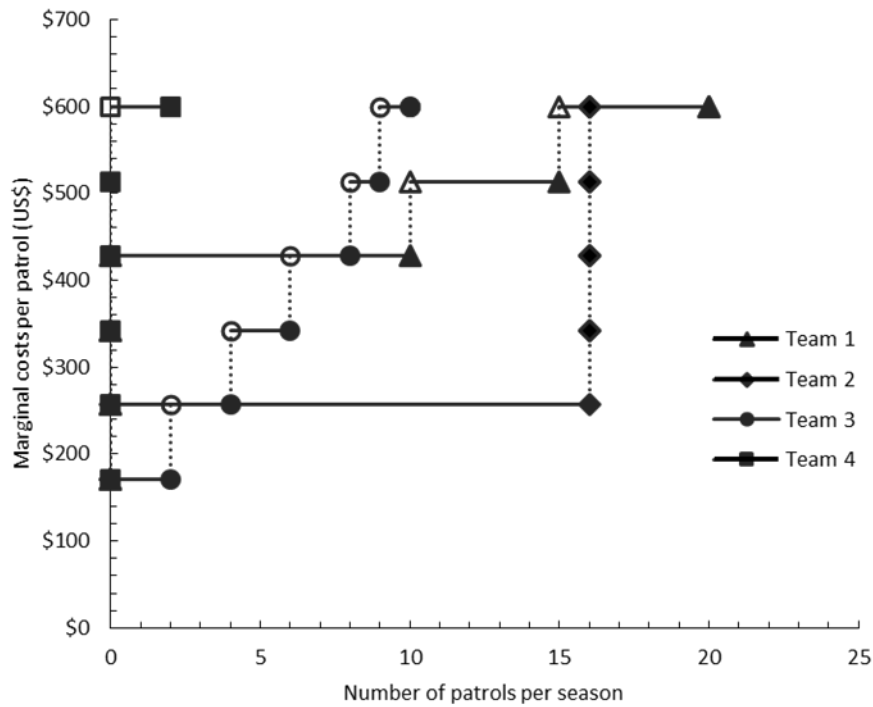
quantity allowed the determination of the aggregate value of payments to be made and the distribution of payments across alternative suppliers of the environmental services.

Activity 2.5 Design auction-based PES for case study 1 (PCV)

Activity 2.6 Design auction-based PES for case study 2 (PKK)

The same auction based scheme for estimating the costs of supply for each case study site was developed by the project team members using the 'virtual' PES scheme as a template. A literature review as well as the results of a household survey of potential anti-poaching patrol suppliers provided essential baseline information. Practical experience derived from previous Australian and Chinese applications were reviewed while taking into account the special institutional features of the Lao PDR context. Other regional applications, particularly the Vietnam Government's PES experimentation in Lam Dong Province, were reviewed and their findings integrated. Features of the auction process developed for the context of the project were the extensive consultation and training phases that were conducted prior to the auctions and the use of a price sequence as the basis for the request for supply. The latter point marked a significant departure from existing conservation auction practice. Rather than requesting bids of both price and quantity supplied, the project scheme provided bidders with a sequence of prices against which bidders could state the amount of patrols they wished to supply. This was not only an improvement in terms of ease of completing the task but also provided better incentives for honest revelation of true costs, given that price was announced to be a single price where demand was sufficient to match supply. The conservation auctions were used, in conjunction with the information on demand for biodiversity protection, to determine the efficient price per patrol, the efficient quantity of patrols, as well as the number of patrols offered to each bidding team.

The following graph is an example of the marginal cost curves for four patrol teams sourced from the auction data.



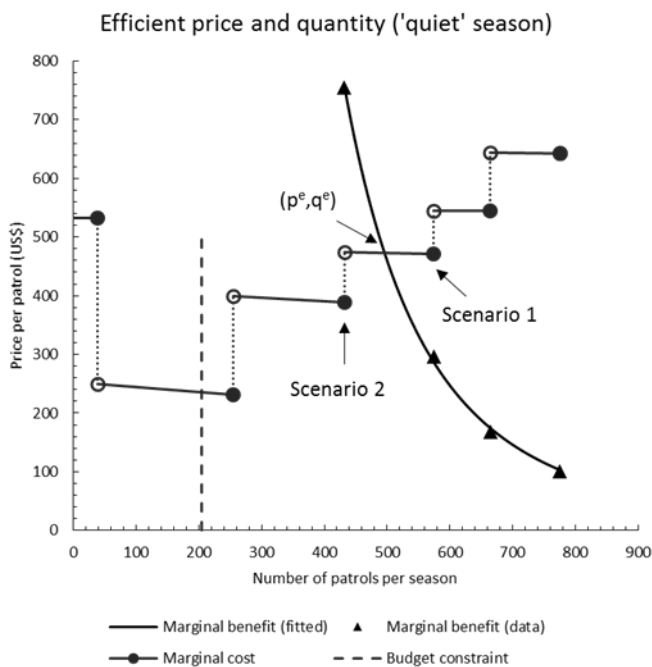
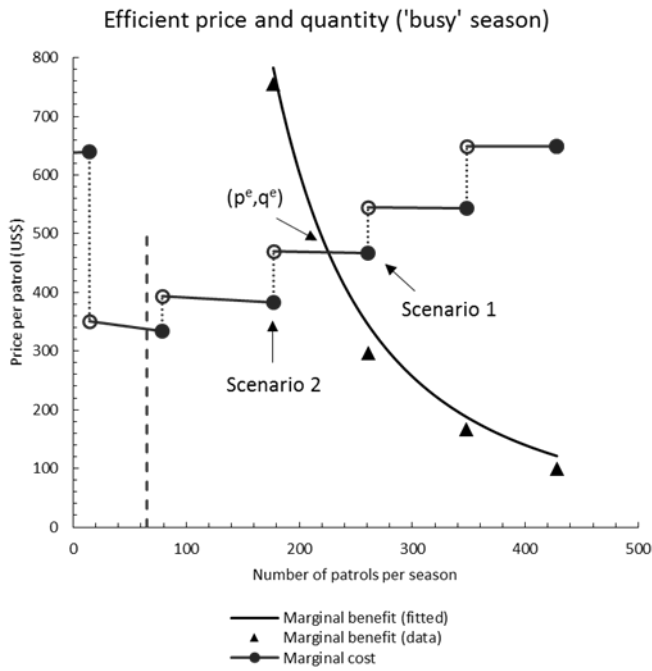
(See Research Report No 16 for full details or methods and results.)

Activity 2.7 Implement and assess case study 1 PES scheme (PCV)

Activity 2.8 Implement and assess case study 2 PES scheme (PKK)

The implementation of the two schemes involved close collaboration with the provincial, district and local GoL authorities. The Lao PDR research team members were heavily involved in the coordination of this activity. Familiarisation, consultation and training sessions were held for all levels of GoL staff, village facilitators, and the households in the villages engaged in the schemes. Households were introduced to the notion of being ‘suppliers’ of environmental services and the concept of competitive tendering. Once the auction process was completed, the bids were assessed and offers were made to the successful bidders. Contracts were signed in July 2017 for PKK and September 2017 for PCV (Patrol contracts with patrol teams and Community Conservation Agreements with villages). These contracts set out roles and responsibilities, the benefits to the suppliers (including payments), the monitoring system, the penalties for non-compliance, and pathways to lodge a complaint. The 3-year contracts are being administered by a PES Scheme manager, appointed to the Faculty of Economics and Business Management (FEBM) at NUoL, with the funds for payments coming from the World Bank PAWP scheme via the GoL EPF which acts to monitor the spending processes. Each of the patrol schemes is being administered by a patrol team manager, also appointed to FEBM.\

The following diagram illustrates the determination of the efficient price – that equates marginal benefits and marginal costs. At this price, surpluses available to both buyers and sellers in the PES ‘market’ are maximised (see research Report 17 for full details).



Activity 2.9 Completion workshop

A workshop was held to mark the completion of the project. Senior GoL officials at the national, provincial and district level, international agency representatives, NGO staff and other key stakeholders were invited to hear the key findings of the project and the recommendations flowing from those findings. NUoL and ANU team members coordinated the list of key decision makers/advisers to be invited. The team additionally arranged individual briefings with key GoL officials and other interested parties.

Activity 2.10 Summarising research findings and policy recommendations

A policy report along with a policy brief was prepared by ANU and NUoL team members to briefly mention the research issue, the approach adopted and the

steps taken in completing the analysis and the key findings and policy recommendations.

Objective 3: To increase the capacity of authorities within GoL to design and implement PES schemes

Activity 3.1 Training courses for GoL officials

Engagement with Lao PDR government officials was continual through the project life. To facilitate this type of engagement, ANU, NUoL and UWA team members offered a sequence of short courses to GoL officials. This increased the skills evident in the policy circle and increased the confidence of the officials in taking on the responsibilities of establishing PES schemes. Courses were designed to increase the level of complexity over time in accord with the growth in competence and confidence. Attendees were from GoL ministries, NGOs, staff and students from NUoL and from university departments, government agencies and NGOs from other South East Asian countries. Average attendance at each short course was around 50 with approximately equal numbers of men and women in attendance. (See section 10.2.9 below for details of the topics covered in each of the short courses, all of which except the one presented in Thailand for ECO-BEST, were conducted at the NUoL.)

Activity 3.2 In-depth on-the-job training

Three research assistants were recruited through the NUoL in the project life to provide specific assistance to the Australian and NUoL researchers. In-depth on-the-job training prepared these researchers for future roles as academics, trainers and policy advisers.

Activity 3.3 Attendance at AARES conference

NUoL, ANU and UWA team members attended and presented at Australian Agricultural and Resource Economics Society (AARES) conferences to present research results. Papers were presented on the principles of the PES scheme, the CM application and the reverse auction scheme at conferences in Port Macquarie, Canberra and Brisbane. This provided NUoL team member, A/Prof Kyaphilavong with the opportunity to gain exposure to the wider regional research community as well as to hear papers presented and to receive feedback on the project findings. (See section 10.2.5 below for full details of conference presentations)

Activity 3.4 Compile a PES policy handbook

To consolidate the input of the project into the Lao PES policy development and implementation process, a handbook was developed and presented at the final workshop that sets out the design and application stages of a PES scheme in readily understood language.

Objective 4: To promote community participation in policy making and resource management to enable implementation of land use programs and raise awareness of environmental improvements

Activity 4.1 Environmental valuation survey

The processes involved in the economic valuation studies for both case studies was based on community participation. The valuation exercises involved surveys of community preferences for environmental improvements. The survey material

was customized to the two target populations (tourists and residents). The survey material differed between the split-samples in terms of the language of delivery, filter questions, questions regarding socio-demographic characteristics, the payment vehicle and the levels of the cost attribute. The resident questionnaires were presented in Lao, whereas the tourist questionnaires were in English. The use of additional languages to account for the diversity of international tourists was not possible due to language limitations of the Lao interviewers. Those exercises and their concurrent publicity in local media, were expected to raise public awareness of environmental issues. (See section on Activity 2.3 above and Research Report 13 for more details)

Activity 4.2 PES bidding schemes

The PES applications in both cases engaged residents of the villages involved in the two PES schemes in conservation auctions. Sealed bid, single round conservation auctions were used to elicit the marginal costs of supply. Potential supplier teams were invited to bid for three-year Patrol Contracts. The auctions were open to any team that met a set of basic eligibility criteria. These included a specified team size and composition as well as the ability of each team member to perform anti-poaching patrols. At least two members of each team had to be able to read and write.

The marginal costs of supply were estimated through an auction format based on that used in the Regional Greenhouse Gas Initiative and the California Carbon Auctions. In these auctions, each bidder is required to submit a sequence of price-quantity pairs stating the amount of pollution permits they are willing to buy over a self-selected range of prices per permit

This auction format was adjusted such that participants only had to state quantities, against a set of prices pre-specified by the auctioneer. Each team was requested to submit a bid that stated the number of patrols they would be willing to perform per year (for three years) against a sequence of six pre-specified prices per patrol. This allowed bidders to make clear uncomplicated choices of quantity only, as opposed to the price and quantity choices required in conservation auction formats used to date.

The obtained sequences of price-quantity pairs represent the marginal costs of patrolling at the team level. While the price range was the same for all teams, the number of patrols for each price was expected to differ across bids given teams' opportunity cost heterogeneity. Information gained through the consultation process suggested that the opportunity costs of potential suppliers would differ across the year. The opportunity costs were expected to be higher during the rice planting and harvesting seasons (four months) than during the rest of the year (eight months). This paper refers to the former as 'busy' season and to the latter as 'quiet' season. To account for potential differences, each team was asked to submit one bid for each season. This approach generated two marginal cost curves per team representing the marginal costs of patrol team employment. The format of these curves was well suited to the process of aggregating quantities offered across suppliers at the given price points to estimate market supply.

The auction process increased community awareness of wildlife management options both directly in the impacted areas and through publicity, in other regions.

The impacts on communities and households were predicted for the duration of the PES contract period. (See section on Activities 2.5 and 2.6 above as well as Research Report 16 for more details on the auction scheme's methods and results)

Objective 5: To facilitate the sharing of experience in use of PES more widely in Lao PDR and across the Mekong region

Activity 5.1 Short courses

To help relieve the human capital capacity constraints that currently limit the application of PES in Lao PDR and elsewhere in the greater Mekong region countries, short courses were provided by ANU, NUoL and UWA team members. Some of the short courses were facilitated through the Environmental Economics Program for South East Asia (EEPSEA). Cost effectiveness was ensured through the opening of the courses run for GoL officials to selected international delegates (See Activity 3.1 above for details). The short course titles were:

1. Introduction to PES
2. Mechanism design
3. Bio-physical modelling
4. Non-market valuation
5. Conservation Auctions
6. Experience of PES in Lao PDR

Activity 5.2 Establish a 'virtual' community of practice

ANU team members developed a project web page (<http://ipesl.crawford.anu.edu.au/>). A web based communication facility, 'Virtual Community of Practice' (VCoP), was integrated into the project web page. VCoP was designed as an on-going communication/ discussion forum to develop and apply PES schemes and exchange ideas. Material developed within the project was uploaded onto the project web page. The VCoP was launched and promoted during the delivery of the short courses and on any other relevant occasion.

6 Achievements against activities and outputs/milestones

Objective 1: To introduce the concept and practice of PES to Lao PDR policy makers and their advisers.

no.	activity	outputs/ milestones	completion date	comments
1.1	Inception meeting to establish preliminary case study site	Inception meeting	12/2012	The inception meeting was conducted in December 2012. It was used to brief Lao PDR policy makers and their advisors about the concept and use of PES schemes, to develop working relations with project partners, and to commence the establishment of the preliminary case study site.
1.2	Catalogue environmental services	Briefing session + Policy brief	5/2013	<p>The selection of the preliminary case study site, the Nam Num River Basin, was completed in May 2013. Environmental services within the preliminary case study site were catalogued and were used to develop a conceptual bio-physical model that establishes the relationship between changes in management actions and provision of environmental services. The presentation of the 'virtual' PES scheme during the first project workshop in November 2013 was used to brief a range of relevant GoL officials and other interested parties. Policy briefs were distributed to relevant GoL officials and other interested parties.</p> <ul style="list-style-type: none"> ➤ Policy Brief 1 'Concept of PES schemes and project overview' (10/2013). ➤ Policy brief 2: 'How to build a PES scheme' (10/2014).
1.3	Estimate values of improved environmental services	Briefing session + policy brief	7/2013	<p>Approaches of how to estimate values of improved environmental services in the preliminary case study site were developed. The planned approach to estimating the benefits of the 'virtual' scheme (benefit transfer) proved to be impractical when the focus of the proposed scheme shifted from catchment condition to biodiversity. Without a set of previously estimated values for the biodiversity under threat in Lao PDR, transfers of estimates could not take place. The alternative method of estimating values, using choice experiments, is what was implemented in the core of the project. The presentation of the 'virtual' PES scheme during the first project workshop in November 2013 was used to brief a range of relevant GoL officials and other interested parties.</p>

				<p>Policy briefs were distributed to relevant GoL officials and other interested parties.</p> <ul style="list-style-type: none"> ➤ Policy Brief 1 'Concept of PES schemes and project overview' (10/2013). ➤ Policy brief 2: 'How to build a PES scheme' (10/2014).
1.4	Develop 'virtual' PES schemes	Briefing session + policy brief	11/2013	<p>A 'virtual' PES scheme for the Nam Ngum River Basin was designed as a 'proof of concept'. It sets out the steps required for the development, implementation and assessment of an effective and efficient PES scheme. The 'virtual' PES scheme was presented during the first project workshop in November 2013 to a range of relevant GoL officials and other interested parties.</p> <p>Policy briefs were distributed to relevant GoL officials and other interested parties.</p> <ul style="list-style-type: none"> ➤ Policy Brief 1 'Concept of PES schemes and project overview' (10/2013). ➤ Policy brief 2: 'How to build a PES scheme' (10/2014). <p>Relevant Research Reports:</p> <ul style="list-style-type: none"> ➤ Research Report 1 'Payments for environmental services: concepts and applications'. ➤ Research Report 2 'The environmental, economic and social condition of the Nam Ngum River Basin'. ➤ Research Report 3 'Development of a 'virtual' PES scheme for the Nam Ngum River Basin'. ➤ Research Report 4 'The legal foundations of payments for environmental services in the Lao PDR'.
1.5	Field trip to Sichuan PES auction scheme	Field trip	4/2013	<p>A field trip for Lao PDR officials to observe the implementation of a PES initiative in Sichuan Province, China, was conducted successfully in April 2013.</p>

1.6	Briefing sessions and short courses including Australian field trip	Short courses	3/2013 11/2013 4/2014 11/2014 11/2015 8/2016 8/2017	<p>Briefing sessions for Lao PDR Government officials were conducted in December 2012, March 2013 and November 2013.</p> <p>The Australian field trip was successfully conducted in November 2014. The trip included meetings with officials from NSW Department of Planning, the NSW Department of Environment, the Commonwealth Department of Environment, the Commonwealth Department of Agriculture and Forestry, the Victorian Department of Environment and Primary Industries as well as with representatives from Rio Tinto's Warkworth Mining operation in the Hunter Valley.</p> <p>The completed short courses are listed under Activity 3.1.</p> <ul style="list-style-type: none"> ➤ Policy Brief 1 'Concept of PES schemes and project overview' (10/2013). ➤ Policy brief 2: 'How to build a PES scheme' (10/2014).
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PC = partner country, A = Australia

Objective 2: To analyse and develop evidence based policy options for the implementation of PES schemes appropriate to the Lao PDR context, covering the introduction of market based instruments in comparison to alternative payment systems.

no.	activity	outputs/ milestones	completion date	comments
2.1	Establish two case study sites	Sites agreed with GoL	8/2014 2/2015	<p>A discussion about the establishment of two case study sites (NT2 catchment area; Sepon Mine catchment area) had been initiated in December 2013. A MoU had been signed between the project and WMPA. In April 2014, the NT2 Power Company and the World Bank stopped payments due to structural and operational shortcomings of the WMPA. This development has rendered the case study site infeasible. Cooperation with the MMG Limited – Sepon could not be established due to a lack of interest on part of MMG. Cooperation with Phou Bia Mining (Panaust) as an alternative to MMG Limited – Sepon could not be established due to a lack of interest on the part of Panaust.</p> <p>Two alternative case study sites have been established in collaboration with MONRE and MAF: one in the Bolikhamxay Province (Phou Chomvoy Provincial Protected Area within the upper catchment of the THE hydro-electricity dam - PCV), and one in the Vientiane Capital Province (Green Peafowl Conservation Zone within the Phou Khao Khouay National Protected Area - PKK).</p>

				<p>A MoU between the project and the Bolikhamxay Province PONRE (the responsible management agency for the THE area) was signed in August 2014. A MoU between the project and the Vientiane Capital Province PONRE was signed in February 2015. Funding for the payments to be made to villages under the PES schemes was secured through the Protected Area and Wildlife Project (PAW) funded by the World Bank after passing a demanding scrutiny process. The sub-project proposal (US\$ 800,000) was approved by the World Bank and the Government of Lao PDR (EPF) in 2016 after significant delays.</p>
2.2	Biophysical modelling	Models, research report	<p>11/2014 5/2015 10/2015 1/2017 5/2017</p>	<p>Conceptual bio-physical models have been developed. Research Report 5 and 6 outline the foundation of these models for the two case study sites. Bio-physical models for both case study sites were developed, tested, and used to predict production functions. Expert surveys and baseline surveys for both case study sites were completed. The collected data were used to refine and populate the bio-physical models. Bio-physical models were used to establish 'cause-effect' relationships between proposed management actions (wildlife protection) performed by villagers participating in the two PES schemes as suppliers and the generated biodiversity benefits.</p> <p>Relevant Research Reports:</p> <ul style="list-style-type: none"> ➤ Research Report 7 'Phou Khao Khouay National Protected Area: a field survey of Green Peafowl (<i>Pavo muticus</i>)'. ➤ Research Report 8 'Phou Chomvoy Provincial Protected Area: a biodiversity baseline assessment'. ➤ Research Report 11 'Modelling the effects of anti-poaching patrols on wildlife diversity in the Phou Chomvoy Provincial Protected Area'. ➤ Research Report 12' Modelling the effects of anti-poaching patrols on Green Peafowl populations in the Phou Khao Kouay National Protected Area'. <p>Other material:</p> <ul style="list-style-type: none"> ➤ Expert survey – data input for stochastic simulation models ➤ R-code for PCV model ➤ R-code for PKK model

2.3	Economic valuation	Models, research report	6/2017	<p>Choice Modelling was used to estimate monetary values of biodiversity benefits predicted to be generated as a result of the scheme. These benefits were predicted using the bio-physical models that relate proposed management actions with their biodiversity outcomes.</p> <p>Relevant Research Reports:</p> <ul style="list-style-type: none"> ➤ Research Report 13 'Valuing biodiversity protection: Payments for Environmental Services schemes in Lao PDR'. <p>Other material:</p> <ul style="list-style-type: none"> ➤ Choice modelling survey training manual – coordinators ➤ Choice modelling survey training manual –interviewers ➤ Choice modelling survey training manual –data entry experts ➤ Choice modelling urban population - survey protocol ➤ Choice modelling tourists - survey protocol ➤ Choice modelling – coordinator protocol ➤ Choice modelling survey – international tourists (PCV) ➤ Choice modelling survey – urban population of VTE city (PCV) ➤ Choice modelling survey – international tourists (PKK) ➤ Choice modelling survey – urban population of VTE city (PKK)
2.4	Estimate aggregate payments	Research report	6/2017 6/2017	<p>Information generated in the bio-physical modelling stage was integrated with the economic valuation data to estimate the aggregate willingness-to-pay for wildlife protection. Information on the value of the marginal benefits (estimated in monetary terms through the application of Choice Modelling) and on the value of the marginal costs (estimated in monetary terms through the conduct of the conservation auctions) were used to determine the efficient 'market' price to be paid per unit of environmental outcomes achieved. This price determination process ensured that buyers and suppliers are made better off as a result of their participation in the PES scheme. The determination of an efficient price and quantity allowed the determination of the aggregate value of payments to be made and the distribution of payments across alternative suppliers of the environmental services.</p>

				<p>Relevant Research Reports:</p> <ul style="list-style-type: none"> ➤ Research Report 16 'Costing biodiversity protection: Payments for Environmental Services schemes in Lao PDR'. ➤ Research Report 17 'Pricing biodiversity protection: Payments for Environmental Services schemes in Lao PDR'.
2.5	Design auction based PES for case study 1 (PCV)	Research report	10/2014 8/2016	<p>An auction based PES scheme for PCV was developed using the 'virtual' PES scheme as a template.</p> <p>A literature review as well as the results of a household survey provided essential baseline information.</p> <p>Relevant Research Reports:</p> <ul style="list-style-type: none"> ➤ Research Report 5 'The environmental, economic and social conditions of the Nam Mouane – Nam Gnouang catchment'. ➤ Research Report 9 'Providing incentives for biodiversity protection: anti-poaching patrolling in the Phou Chomvoy Provincial Protected Area'.
2.6	Design auction based PES for case study 2 (PKK)	Research report	12/2014 8/2016	<p>An auction based PES scheme for PKK was developed using the 'virtual' PES scheme as a template.</p> <p>A literature review as well as the results of a household survey provided essential baseline information.</p> <p>Relevant Research Reports:</p> <ul style="list-style-type: none"> ➤ Research Report 6 'The environmental, economic and social conditions of the Phou Khao Khouay National Protected Area's Green Peafowl Species Conservation Zone'. ➤ Research Report 10 'Providing incentives for biodiversity protection: anti-poaching patrolling the Green Peafowl Species Conservation Zone of the Phou Khao Khouay National Protected Area'.
2.7	Implement and assess case study 1 PES scheme (PCV)	Agreements with landholders; Research report	6/2017 6/2017	<p>Community Conservation Agreements with villages and Patrol Contracts with village teams have been signed September 2017.</p> <ul style="list-style-type: none"> ➤ Policy Brief 3 'Project update'. <p>Relevant Research Report:</p> <ul style="list-style-type: none"> ➤ Research Report 14 'Engaging the community in a Payments for Environmental Services scheme for the Phou Chomvoy Provincial Protected Area'.

				<p>Other material:</p> <ul style="list-style-type: none"> ➤ PES Information booklet for villagers (PCV) ➤ Training manual (including presentation) for facilitators: community consultations in Bolikhamxay Province' (PCV) ➤ Wildlife laws and regulations: discussion inputs for the Community Consultations in Bolikhamxay Province' (PCV) ➤ Expression of interest form – community (PCV) ➤ Expression of interest form – patrol teams (PCV) ➤ Community feedback form (PCV) ➤ Development of community actions plans and community conservation agreements in Bolikhamxay Province: manual for facilitators (including presentations) (PCV) ➤ Presentation 'Community feedback' (PCV) ➤ Presentation 'Legal restrictions' (PCV) ➤ Presentation 'PES recap' (PCV) ➤ Presentations 'Community resource profile' based on results of household survey (PCV) ➤ Template 'Community Action Plan' (PCV) ➤ Template 'Community Conservation Agreement' (PCV) ➤ Bidding for Patrol Contracts in Bolikhamxay Province: Manual for Facilitators (including presentation) (PCV) ➤ Presentation 'Bidding' ➤ Bidding sheets (PCV)
2.8	Implement and assess case study 2 PES scheme (PKK)	Agreements with landholders; Research report	6/2017 6/2017	<p>Community Conservation Agreements with villages and Patrol Contracts with village teams have been signed in July 2017.</p> <ul style="list-style-type: none"> ➤ Policy Brief 3 'Project update'. <p>Relevant Research Report:</p> <ul style="list-style-type: none"> ➤ Research Report 15 'Engaging the community in a Payments for Environmental Services scheme for the Green Peafowl Species Conservation Zone'.

				<p>Other material:</p> <ul style="list-style-type: none"> ➤ PES Information booklet for villagers (PKK) ➤ Training manual (including presentation) for facilitators: community consultations in Vientiane Capital Province' (PKK) ➤ Wildlife laws and regulations: discussion inputs for the Community Consultations in Vientiane Capital Province' (PKK) ➤ Expression of interest form – community (PKK) ➤ Expression of interest form – patrol teams (PKK) ➤ Community feedback form (PKK) ➤ Development of community actions plans and community conservation agreements in Vientiane Capital Province: manual for facilitators (including presentations) (PKK) ➤ Presentation 'Community feedback' (PKK) ➤ Presentation 'Legal restrictions' (PKK) ➤ Presentation 'PES recap' (PKK) ➤ Presentations 'Community resource profile' based on results of household survey (PKK) ➤ Template 'Community Action Plan' (PKK) ➤ Template 'Community Conservation Agreement' (PKK) ➤ Bidding for Patrol Contracts in Vientiane Capital Province: Manual for Facilitators (including presentation) (PKK) ➤ Presentation 'Bidding' ➤ Bidding sheets (PKK)
2.9	Completion workshop	Workshop in Vientiane	7/2017	The completion workshop was held 1 August 2017.
2.10	Summarise key project findings, experiences, lessons learnt and policy recommendations	Research Report; Policy brief	7/2017 7/2017	<p>Key project findings, experiences, lessons learnt and policy recommendations were summarized and will be communicated during the completion workshop and a sequence of briefing sessions with key stakeholders.</p> <p>Relevant Research Report:</p> <ul style="list-style-type: none"> ➤ Research Report 18 'Key findings and policy recommendations on Payments for Environmental Services schemes in Lao PDR'. ➤ Policy Brief 4 'Project achievements and policy recommendations' (July 2017).

PC = partner country, A = Australia

Objective 3: To increase the capacity of authorities within the GoL to design and implement PES schemes.

no.	activity	outputs/ milestones	completion date	comments
3.1	Training courses for GoL officers	Completed courses	3/2013 11/2013 11/2014 11/2015 8/2016 8/2017 (4/2014)	<p>Short course 1 'Introduction to PES schemes'</p> <p>Short course 2 'PES schemes: Mechanism design'</p> <p>Short course 3 'PES schemes: Bio-physical modelling'</p> <p>Short course 4 'Non-market environmental valuation'</p> <p>Short course 5 'Payments for Environmental Services (PES) Schemes: Designing and Implementing Conservation Auctions'</p> <p>Short course 6 'Short course: Designing and Implementing Payments for Environmental Services (PES) Schemes - Experience from Lao PDR' (An additional short course on PES delivered in Thailand in cooperation with ECO-BEST.)</p> <ul style="list-style-type: none"> ➤ Teaching material was provided to the participants in all seven short courses.
3.2	In-depth on-the-job training	Specific tasks at the direction of project leaders	Throughout the project duration.	<p>The project employed two full-time NUoL research assistants and one part-time NUoL research assistant.</p> <p>Opportunities to experience in-depth on-the-job training were provided to (1) FEBM/NUoL students through their engagement in the survey to establish a baseline for the PES scheme assessment and the choice modelling survey; and (2) to GoL staff members through their engagement in the community consultations, training sessions and conservation auctions.</p>
3.3	Attendance at AARES conference to present findings	Contributed paper presented	2/2014 2/2016 2/2017	<p>Project members attended the AARES conference in 2014, 2016, and 2017.</p> <p>Presentations:</p> <ul style="list-style-type: none"> ➤ Can PES schemes mimic markets? [Paper published in Ecosystem Services 23, 2017] ➤ Using Choice Modelling to estimate PES scheme benefits in Lao PDR. ➤ Environmental services auctions for PES schemes. ➤ Estimating marginal costs of producing the environmental service 'biodiversity'.

				<p>Papers submitted for publication:</p> <ul style="list-style-type: none"> ➤ Valuing biodiversity protection: Payments for Environmental Services schemes in Lao PDR. ➤ Predicting biodiversity protection: Payments for Environmental Services schemes in Lao PDR [to be submitted]. ➤ Costing biodiversity protection: Payments for Environmental Services schemes in Lao PDR [to be submitted]. ➤ Pricing biodiversity protection: Payments for Environmental Services schemes in Lao PDR [to be submitted].
3.4	Compile a PES Policy Handbook	Handbook (including key lessons learnt)	7/2017	<p>The PES policy handbook will be presented in Short Course 6 'Designing and Implementing Payments for Environmental Services (PES) Schemes - Experience from Lao PDR', which will be delivered in August 2017.</p> <ul style="list-style-type: none"> ➤ PES policy handbook ➤ Research Report 18 'Key findings and policy recommendations on PES schemes in Lao PDR'.

Objective 4: To promote community participation in policy making and resource management to enable implementation of land use programs and raise awareness of the importance of environmental improvements.

no.	activity	outputs/ milestones	completion date	comments
4.1	Environmental Valuation survey	Case study choice modelling surveys	11/2015	<p>Training manuals for FEBM students was developed (surveying, data entry and management, survey management).</p> <p>About 100 FEBM students were trained.</p> <p>A sequence of Choice Modelling surveys was developed and applied.</p> <ul style="list-style-type: none"> ➤ Training manual – coordinators ➤ Training manual – interviewers ➤ Training manual – data entry experts ➤ Choice modelling survey protocol – urban population VTE city ➤ Choice modelling survey protocol – international tourists ➤ Choice modelling survey – international tourists (PCV) ➤ Choice modelling survey – urban population of VTE city (PCV) ➤ Choice modelling survey – international tourists (PKK) ➤ Choice modelling survey – urban population of VTE city (PKK)
4.2	PES bidding schemes	Case study PES application	9/2016 1/2017	<p>A novel bidding format to estimate the marginal costs of producing the ES was developed and applied in both PES scheme sites.</p> <p>See activities 2.7 and 2.8.</p>

Objective 5: To facilitate the sharing of experience in use of PES more widely in Lao PDR and across the Mekong region.

no.	activity	outputs/ milestones	completion date	comments
5.1	Short courses	See activity 3.1	See activity 3.1	See activity 3.1
5.2	Establish a 'virtual' community of practice	Web based communication facility	3/2013	<p>The development of a project web page has been completed (http://ipesl.crawford.anu.edu.au/).</p> <p>A web based communication facility, VCoP, was integrated into the project web page.</p> <p>VCoP is designed as an on-going communication/ discussion forum to develop and apply PES schemes and exchange ideas. Material developed within the project was uploaded onto the project web page.</p> <p>The VCoP has been launched and promoted during the delivery of the short courses and on any other relevant occasion.</p>

7 Key results and discussion

7.1 Key results

7.1.1 Key achievements

In the context of two pilot PES schemes the project

- designed a conceptually sound and practical model for a PES scheme in a developing country context, firstly in a 'virtual context' to establish a 'proof of concept' and then in the setting of two protected areas where illegal poaching of wildlife is threatening endangered species survival;
- built stochastic simulation models to predict the impacts of anti-poaching patrols on wildlife;
- surveyed residents of Vientiane (about 413) and international tourists to Lao PDR (about 680) to estimate their willingness to pay for wildlife protection with about 100 National University of Laos students doing the personal interviews and supporting the data collection management (the students were trained through the project);
- surveyed households in the fourteen villages that are located in our case study areas to describe their current situation before the PES schemes are started;
- surveyed the wildlife in our case study areas to find out which species are present and to estimate their populations;
- consulted with the people living in our two case study areas to set up the terms of community conservation agreements and contracts for anti-poaching patrol teams;
- sought advice on the schemes from national, provincial and district officials;
- coordinated our activities with the Lao Wildlife Conservation Association, Worldwide Fund for Nature, Luxembourg Agency for Development Cooperation and Wildlife Conservation Society;
- received expressions of interest from local people of all fourteen target villages to form anti-poaching patrol teams in both case study areas;
- run environmental auctions for the supply of anti-poaching patrols in the fourteen villages involved;
- calculated the number of patrols to be offered and the price to be paid to the anti-poaching patrol teams in both PES schemes and assessed their costs, benefits and surpluses;
- negotiated with patrol teams in preparation for contract signing;
- successfully negotiated the financing of the two PES case studies through World Bank/EPF funding over three years;
- appointed two patrol managers, one scheme accountant and one scheme coordinator financed through the World Bank/EPF funding;
- coordinated with the EPF to arrange the logistical operations of the schemes;

- taught seven short courses on aspects of PES scheme design and establishment;
- trained Lao people in the design and use of PES schemes through ‘learning by doing’;
- provided advice to EPF officials on the operation of PES schemes at a broader level in Lao PDR;
- published eighteen research reports, four policy briefs, and continuous updates on the dedicated project web page;
- submitted and published four papers in international journals and published one book chapter reporting the project’s findings; and
- enrolled a Laotian PhD student in PhD studies at ANU to continue the scheme assessment process after the completion of the ACIAR project.

7.1.2 Key findings

The major findings of the Project included:

A PES scheme must be designed so that it is both conceptually sound and practically feasible in the context of Lao PDR. The ‘model’ PES scheme should be:

- based on sound economic principles
- voluntary for the suppliers involved
- transparent in its operation
- rewarding action
- producing additional wildlife protection cost-effectively
- enhancing the livelihoods of the people engaged in the scheme
- producing a net-benefit to the people of Lao PDR.

(see Research Report 3 ‘Development of a ‘virtual’ PES scheme for Nam Ngum Basin’)

Two ‘pilot’ PES schemes that were designed to integrate the above principles were implemented to protect wildlife in the Phou Chomvoy Provincial Protected Area and the Green Peafowl Species Conservation Zone of the Phou Khao Khouay National Protected Area. The schemes will improve environmental protection and enhance the livelihoods of local people engaged in the PES schemes.

The schemes involved the contracting of teams to patrol the protected areas against poaching of endangered wildlife. The price paid to patrol teams for each patrol was determined through the interaction of supply and demand, with a production function being used to convert patrol inputs to predicted wildlife outputs (see Research Report 17). Contracts with patrols differed between the ‘busy’ season (where higher opportunity costs prevailed given rice growing activities) and the quiet season and between the case study sites. Differences were in both price and quantity terms. Patrols were equipped with GPS units to ensure patrols were carried out, with returning patrols being required to download their GPS record of the patrol for the Patrol Scheme manager. Bonus payments were made to teams for dismantling snare lines and poacher camps. Perverse incentives (to manufacture snares) were avoided by setting the bonus payment rate below the

costs of manufacturing snares along with GPS/photographic proof requirements. A further element of the scheme involved payments made to village development funds to encourage those in engaged villages who were not in patrol teams to be active in wildlife protection. Community conservation agreements were entered into in order to receive the village payments. Payments comprised of fixed lump-sum payments and a component that varied according to the extent of patrol team payments. The variable payments were designed to ensure the broader village community encouraged the patrol teams to do their jobs. Further incentives for compliance were provided through social pressures derived from ceremonies upon inception and on-going social recognition for success.

(see Research Reports 9 & 10)

The training of staff and students of the National University of Laos, staff of the Government of Lao PDR and staff of NGOs in the principles and techniques of environmental and resource economics, particularly as they apply to PES scheme design and implementation was important in ensuring better analysis of environmental and resource management issues with subsequent improvements in policy making capacity.

Important data have been collected and analysed over the duration of the Project.

The choice modelling method was used to estimate wildlife protection benefits experienced by residents of Vientiane and foreign tourists visiting Lao PDR. These were found to be significant and demonstrated the potential for securing sustainable sources of PES scheme funding. A number of innovative strategies were introduced in the choice modelling applications and constitute key findings for the project as they represent methodological advances that are expected to be widely adopted in future applications of the method. These were designed to deal with the complexities of cross-cultural/language exchanges between interviewer and respondent. They included the extensive use of show cards, visual stimuli in choice sets and provision of a separate booklet of choice sets, which when completed was returned to the interviewer in a sealed envelope. Intensive briefing of the NUoL students engaged as interviewers for the CM application was also critical to the exercise's success. The CM application also provided the foundation for estimating the extent to which ES buyer groups could be charged for ES provision. The CM analysis yielded estimates of willingness to pay of around USD50 per tourist and USD3 per month per Vientiane household for biodiversity protection Lao wide.

(see Research Report 13)

Estimates of the costs of carrying-out anti-poaching patrols to protect wildlife were generated using Reverse Auctions. It was found that local villagers were capable of engaging in these auctions despite their limited education and exposure to commercial business exchange. The auction data yielded supply curve estimates that proved to be consistent with the predictions of economic theory. The importance of consultation and training in the lead up to the auction must be stressed. The use of familiar examples to explain the auction process was important in the briefing sessions.

(see Research Reports 14, 15 & 16)

Estimates of the impacts on wildlife populations caused by anti-poaching patrols were made using bio-physical models. Despite the lack of data, useful models were created and have been designed to be readily amended as more data are collected through the anti-poaching patrols. The patrols have been designed to incorporate collection of wildlife sighting data. These data, over time, would become a valuable addition to the bio-physical modelling process.

(see Research Reports 11 & 12)

Integrating the demand, supply and bio-physical relationship data into the two case study contexts allowed the estimation of specific prices for services provided:

1. For the PKK case study Village Development Fund fixed payments of LAK 120,000 per household per annum (across 907 households) were negotiated (outside of the auction process). The Village Development Funds are also being paid a sequence of variable payments amounting to 10% of patrol payments made to villages' patrol teams. The Patrol teams entered into contracts paying LAK 450,000 per patrol per team (ie LAK 50,000 per person per day (with 3 members in a team for patrols of 3 days).
2. In the PCV case study the fixed payments to the Village Development Funds are set at LAK 120,000 per household per annum (across 1021 households) with the variable payments at 5% of payments made to villages' patrol teams. The patrol teams of 5 people who are on patrol for 7 days receive LAK 2,100,000 per patrol per team. Flexibility was needed in the schemes to engage Nam Pan village patrols. A remoteness supplement of LAK 700,000 per patrol per team was negotiated.

All of these data will provide a useful base for the development of further PES schemes across Lao PDR. It is important to recognise that over time and over different application contexts, modifications to the PES pilot scheme's key parameters will be necessary. Flexibility in application was found to be a key ingredient to successful implementation. Such flexibilities need to relate to the social, economic and environmental conditions prevailing. For instance, in the period between negotiating agreements with villages and patrol teams, additional employment opportunities arose that changed the opportunity costs of participants. With marginal cost shifts, alterations in the terms of the contracts needed to be negotiated.

The PES scheme 'model' was designed to ensure that net benefits are generated from applications. If negative net benefits are apparent in any context, the model would ensure that a scheme would not be introduced. However, the project also found that transaction costs must be taken into account when contemplating applications. PES schemes require the actions of 'brokers' external to the buyers and sellers who act to structure the 'deal' between the two sides of the pseudo market. The costs of these brokers – including government, NGOs, research agencies, etc - need to be recognised.

7.2 Policy recommendations

Policy recommendations for the GoL, for the development and implementation of Payments for Environmental Services schemes, based on the experience gained over the 5 years of the Project include:

- Market principles should be used as the basis of PES schemes to ensure the efficient use of scarce resources. These include:
 - Competition between suppliers who voluntarily agree to participate.
 - The price paid for services should be based on the interaction between supply and demand.
 - Contractual agreement between parties with penalties for non-compliance.
- In each case, a single price should be paid to all PES suppliers for each unit of service they provide to ensure the equitable treatment of all those involved. Different cases will usually involve different prices given differing demand supply and environmental conditions.
- The price set for each new PES scheme warrants specific analysis as the demand supply and environmental conditions may be different: 'one-size does not necessarily fit all'.
- Flexibility in PES scheme design must be maintained to ensure that local customs and practice are integrated but the core conceptual base of the PES model should be maintained to ensure efficiency and equity. Continued interaction with communities will be necessary to identify changing circumstances. Renegotiation of agreements will be necessary periodically to account for changes. The time frame for contracts needs to recognise the likelihood of future change.
- Reward specific activities in a PES scheme to ensure that the scheme produces environmental services beyond those that would otherwise be produced.
- Involve the broader community in environmental protection activities as part of PES schemes by rewarding conservation activities with payments and recognitions as well as making payments for specific tasks performed by individuals.
- Be aware of potential 'perverse incentives' that can be created by PES schemes so that payments made under the scheme do not stimulate activities that are detrimental to the schemes goals (such as snare manufacturing).
- Community consultation and training are essential components of the implementation of PES schemes to ensure activities are consistent with cultural mores and that those engaged are aware of their rights and responsibilities under the scheme. Training at a technical level – regarding the participation in reverse auctions and the conduct of patrols – is key.
- The 'model' PES scheme can be readily modified to suit a wide range of environmental services in the context of Lao PDR including catchment protection, given that the basics of the scheme have been established.

Further information would need to be collected regarding supply demand and environmental interactions to define new schemes.

- Continued improvements in the enforcement of the rule of law should form the backdrop to PES scheme implementation. This relates to the recognition of rights and responsibilities under contracts for both buyers and sellers as well as the understanding of the law with regard to wildlife hunting by local people.
- A visa 'surcharge' to be paid by all tourists visiting Lao PDR would provide a sustainable source of funding for PES schemes to protect wildlife Lao-wide. The surcharge should be:
 - In the range of USD50 per tourist
 - Explained and 'marketed' to tourists as their specific contribution to wildlife protection in Lao PDR to ensure a favourable response to its implementation.
- A levy on electricity supplied (in the order of USD3 per month per household) to fund wildlife protection PES schemes would be acceptable to Vientiane residents.
- Payments collected under these proposals should be made to a specific purpose account within the EPF that is regularly and independently audited to ensure transparency and to ensure public trust is maintained.
- Government agencies and their staff involved in the implementation and operation should ensure that they abide by the conditions of the agreements underpinning the PES scheme to ensure trust and a reciprocity of commitment amongst suppliers. Payments should be made according to contracts promptly and accurately.

8 Impacts

8.1 Scientific impacts – now and in 5 years

Advances in the development and application of non-market valuation techniques, biophysical modelling, community consultation, the implementation of conservation auctions and the integration of economic data into the formation of PES prices were made under the project's auspices. These cutting edge scientific developments are and will be the subject of journal articles that are expected to have strong citations (see Section 10.2.4 below). The integration of economic and bio-physical inputs into the design of the PES schemes is likely to be taken as a precedent in the on-going development of other PES schemes but also has wider implications in the development of environmental and resource policy. A key element in the advances made was the investigation of the steps required between conceptual foundation and practical implementation in the context of a developing country where skills, data and institutional frameworks are lacking. This is likely to have impacts especially across the Mekong River Basin countries, particularly given the involvement of scholars and practitioners from across that region in the projects' short courses and via VCOP. The wider disciplinary impacts of these advances are yet to be determined. However, on an immediate practical level the project's engagement with the World Wildlife Fund, the Wildlife Conservation Association (a Lao environmental organisation) and the Wildlife Conservation Society has initiated a discussion in these agencies concerning the way they think about PES schemes and incentives structures in environmental protection projects.

8.2 Capacity impacts – now and in 5 years

The capacity of project partners used for other non-project activities has been strengthened. NUoL staff and students have used the new skills learned through their engagement in project activities (short courses, learning-by-doing through research opportunities, conference participation, and project management activities) to (1) establish a research career path (e.g. by conducting estimating environmental benefits through choice experiments for their Master theses – three theses successfully submitted and examined) (two project research assistants have gone on to enrol in scholarship supported PhD programmes – one in Japan and one at ANU); (2) increase their research capacity and reputation, and (3) negotiate successfully with an external funding agency (World Bank).

The exposure to the PES concept achieved through short courses and the experience of engagement ('learning-by-doing') with the project assisted in the development of the project Lao PDR partners' skills in environmental and resource economics and policy design. Lao PDR partners gained knowledge of the ecological and economic tools needed to implement PES schemes and organisational and institutional structures that allow the successful operation of PES schemes.

Specifically, staff and students from NUoL improved their research skills by applying core research principles such as scientific rigour, transparency and research ethics. They gained experience in sampling, survey design, data collection and data analysis through their involvement in conducting choice experiments in Vientiane City and household surveys in the target villages in both

case study sites. Seventy percent of about 100 students who participated in the choice experiments were women. Forty percent of about 60 students who participated in the household surveys were women. Additionally, project partners from NUoL, MONRE and MAF gained experience in negotiating with an external funding agency (World Bank) through their involvement in the development and submission of a project proposal that will ensure the operationalisation of the two pilot PES schemes and further capacity building of NUoL staff and students in Environmental and Natural Resource Economics. Additionally, project partners gained experience in the design and implementation of community consultation processes and environmental auctions. They gained knowledge in applying safeguard documents of an international funding agency (World Bank) to a pilot PES scheme context through the development of a Mechanism for Grievance, Conflict Resolution and Redress; an Environmental and Social Management Plan, Community Action Plans and Community Conservation Agreements.

The impacts of these skills acquisitions are likely to be broad ranging. Because all of the skills gained are readily transferable to other policy areas it will not only be in the field of PES scheme design that they will prove valuable. The quality of environmental and resource economic research, policy advice and policy making in the key GoL organisations is expected to improve both in the short and long term. Long term impacts will come through the improved performance of NUoL academics disseminating their knowledge to future cohorts of students.

Selected villagers from the PES target communities have been trained as village facilitators to assist in the community consultation process and in conducting the environmental auctions. Through their subsequent involvement in the community consultations and bidding training sessions they gained experience as trainers and mediators. These skills are readily transferable to other village contexts.

Villagers from the PES target communities through their engagement in household surveys and the community consultation process learned about (1) the current status of wildlife diversity in the protected areas neighbouring their villages (and build an awareness that many species are threatened with extinction), (2) the importance of wildlife conservation for themselves as well as for wider society, and (3) the Lao PDR wildlife laws. Through their participation in bidding training sessions they gained familiarity with the principles of environmental auctions including basic business principles. It is expected that a better understanding of basic business principles will assist villagers in future commercial operations.

A randomly selected sample of the urban population of Vientiane City, through their involvement as respondents in the choice experiment survey to estimate PES benefits, gained knowledge of (1) the current status of wildlife diversity in the protected areas of Lao PDR (including that some species are threatened with extinction), and (2) the living conditions of communities in rural areas of Lao PDR.

8.3 Community impacts – now and in 5 years

8.3.1 Economic impacts

Part of the project's results involve the estimation of the economic impacts of the introduction of the two pilot PES schemes. These estimates take the form of consumer and producer surplus estimates. These are the benefits enjoyed by the 'buyers' and 'sellers' in the PES 'market' net of their costs. The producers gain through payments being made to them for the PES scheme activities. These are,

essentially, livelihood improvements (payments for carrying out wildlife patrols as well as village development fund payments) net of the opportunity costs associated with changes in local people's income earning activities. The consumer surpluses involve benefits being enjoyed by Vientiane residents and foreign tourists as a result of the improved wildlife status produced through the PES scheme initiatives. The table below sets out the magnitudes of these measures of economic impact arising directly from the project. If the PES scheme design formulated under this project is adopted beyond the two pilot schemes implemented, then a portion of the so-generated consumer and producer surpluses could be attributed to this project's research effort. That portion would amount to the improved efficiency in resource use that results from using the project's design rather than the default design that does not follow market principles. Details on the quantitative estimates of the environmental impacts are found in Research Report 17.

Table 2 of Research Report 17 provides predicted economic outcomes per year for the PCV case study:

Total benefits \$5,331,865
Total costs \$337,594
Total net benefits (total surplus) \$4,994,271
Consumer surplus \$4,940,010
Producer surplus \$54,261

Table 5 of Research Report 17 provides predicted economic outcomes per year for the PKK case study:

Total benefits \$197,320
Total costs \$69,210
Total net benefits (total surplus) \$128,111
Consumer surplus \$145,457
Producer surplus \$17,346

These results demonstrate that both producers and consumers of environmental services under the schemes are made better off. For PCV, the benefit cost ratio is in the order of 15:1 and for PKK, 3:1.

8.3.2 Social impacts

The extensive, transparent and confidential consultation process in Bolikhamxay Province and Vientiane Capital Province has built trust between the project team, GoL officials and the villagers of the 16 target communities. Villagers had the opportunity to provide anonymous and confidential feedback during the household surveys and during and after the consultation process. The provision of anonymous and confidential feedback is still a novel concept in Lao PDR.

The GoL has shown an appreciation of a bottom-up policy approach to policy making that takes into account (and measures) community inputs and has recognised the advantages of novel concepts and evidence-based policy-making on several occasions:

- The project team has been asked by and has delivered to the GoL advice on a PES Ministerial Decree.

- The GoL has used the Community Engagement Framework developed by the project for the Bolihkamxay pilot PES scheme as an input to design a manual for projects funded through the EPF.
- The GoL through the EPF has approved a World Bank loan to be used to operationalise the two pilot PES schemes developed under the project and to strengthen the teaching and research capacity of the NUoL in Environmental and Natural Resource Economics.

For the PCV case study, aggregate revenue earned by PES scheme suppliers is predicted to be \$391,855 per annum. The comparable figure for the PKK site is \$51,864 per annum.

8.3.3 Environmental impacts

The two pilot PES schemes are predicted to have an impact on the status of species that are currently listed as rare or endangered by the IUCN. The predictions are drawn from the bio-physical models created to predict the species status outcomes that result from the PES scheme initiated anti-poaching patrols. While the models were designed to provide the 'linkage' between supply and demand in the pseudo market provided under the PES scheme, they are also useful in the predicting the environmental outcomes likely from the research investment. Example predictions for the PCV case study under different scenarios of patrol management effort are set out in the table below.

Number of different species protected and percentage of total animal numbers poached under different patrol management strategies (over various time frames)

Attribute	Time frame	Scenario			
		Base	SC1	SC2	SC3
Number of different species protected by patrols, compared to base case scenario	1 yr		1.4	1.7	2.9
	3 yrs		2.9	3.7	7.6
	6 yrs		3.0	4.1	9.3
	10 yrs		3.4	5.0	10.4
Percentage of animals poached (lost), compared to population levels at $t = 0$	1 yr	28%	17%	13%	-15%
	3 yrs	34%	3%	-6%	-106%
	6 yrs	48%	-14%	-32%	-184%
	10 yrs	57%	-45%	-83%	-569%

8.4 Communication and dissemination activities

8.4.1 Strategic level:

- The project web page (<http://ipesl.crawford.anu.edu.au>) was used as a vehicle for dissemination of research reports, short course notes, policy briefs as well as of active communication with practitioners, policy makers and the general public (e.g., announcing events and updating interested parties on the ongoing activities of the project). [Contribution to Objective 5]
- Project staff presented the project concepts, aims and progress in a range of events. Examples include: (1) Annual Forestry Sector Working Group meeting at the Department of Forestry in Vientiane, Lao PDR; (2) Regional Workshop on Payments for Environmental Services in Hanoi, Vietnam (organized by the Centre for International Forestry Research in association with the Vietnam Academy of Forest Sciences); (3) AARES ACT Branch Seminars in Canberra, Australia. [Contribution to Objective 3 & 5]
- The project conducted briefings of high ranking GoL officials at the national, provincial and district levels (including the Chair of the Finance Committee of the National Assembly and the Technical Committee of Environmental Protection Fund) on a regular basis, which contributed to the project's capacity building effort and strengthened political support. [Contribution to Objective 3 & 5]
- The project conducted briefings of the Luxembourg Agency for Development Cooperation, World Wildlife Fund, Wildlife Conservation Association, and Wildlife Conservation Society on a regular basis, which contributed to the project's success in collaborating with these organisations. [Contribution to Objective 3 & 5]
- The project conducted joint field trips of project staff, high ranking GoL officials and representatives of the World Bank to both case study sites, which contributed to the project's capacity building effort and facilitated project progress. [Contribution to Objective 3 & 5]
- Project team members presented at conferences to communicate the research results to an international audience of academics, government staff and practitioners. [Contribution to Objective 3]
- The project conducted a sequence of short courses for government officials, academics of the NUoL, and other interested parties covering all components of designing and implementing PES schemes. [Contribution to Objective 1,3 & 5]

8.4.2 Operational level:

- The project engaged all relevant stakeholders at national, provincial, district and local levels in an inclusive information, consultation and training process. [Contribution to Objective 4]
- The project conducted weekly project coordination skype meetings ('Management Team/Lao-Australia') to maintain/improve the effectiveness and efficiency of the project at the strategic and management level.

- The project conducted weekly project coordination skype meeting ('Technical Team/Lao-Australia') to maintain/improve the effectiveness and efficiency of the project at the operational level.

9 Conclusions and recommendations

9.1 Conclusions

The project has demonstrated that a conceptually sound PES scheme can be implemented successfully in the context of wildlife protection in Lao PDR so as to create economic, environmental and social net benefits. It can be concluded from this key finding that PES schemes offer the GoL a viable policy instrument to pursue its goals associated with improvising the environment as well as advancing the livelihoods of poor rural communities. The project has provided a series of policy recommendations to substantiate this finding and conclusion. Put simply, the project has achieved its goal of providing policy advice on PES schemes through the practical experience gained in implementing two case study examples of effective and efficient PES scheme in Lao PDR.

Some caveats are worth noting.

A danger arising from the project's success is that the GoL will take its results, particularly as they relate to the price to be paid for the provision of environmental services, and apply them in circumstances that are quite different from those experienced in the pilot scheme contexts. Indiscriminate extrapolation of the results may not give rise to efficient resource use. Careful attention needs to be paid to contextual differences across applications and adjustments made accordingly. While the 'model' PES scheme has the capacity to be extrapolated to different contexts, the empirics of each application will need careful adaptation and potentially, additional data collection. This applies to the demand for different typed of environmental services, the costs of supply in different regions for different activities and the relationship existing between the services contracted and the environmental outcomes predicted to be achieved.

It is also important to note in conclusion that the PES scheme devised and applied came with significant 'transaction costs'. While these costs have largely been borne by the ACIAR research budget, it must be recognised that further extrapolation of the PES scheme model will also bear transaction costs. While they will not be as high as those experienced in this project – the costs associated with development of the concepts and the processes involved in application will not be borne again – it will be important to limit any additional transaction costs through the use of the data collected in the completed project. For instance, benefit transfer is now a potential given the choice modelling application. Similarly, costs of supply may not be too different across a range of contexts where wildlife protection is the PES goal. However, care will be required in judging how far the transfer process can be extended.

9.2 Recommendations

The policy recommendations arising from this project are set out above in section 7.2. Here are set out some recommendations relating to ACIAR project commissioning and management as well as future opportunities arising from the research conducted.

The research project successfully combined cutting edge economic analysis with practical implementation challenges. An important research lesson was that

conceptual analysis requires much deeper effort when exposed to the realities of implementation, something that is frequently ignored in the literature. It also takes a lot more time, with frequent frustrations. Budgets in time and money need to incorporate these elements. The outcomes are, however, far richer than the norm.

Funding for this project from ACIAR was sufficient to cover the costs of the research effort but it did not fund the implementation costs. A lot of time was consumed securing that implementation funding, ultimately from the World Bank but with numerous foiled attempts with hydro power and mining companies. The funding uncertainty created a large risk for the success of the project.

A consequence of the funding arrangements with the World Bank was that the focus of the project was on biodiversity as the core environmental service. The original project envisaged a study involving the provision of an environmental service that would offset the consequences of a development project such as a mine or a hydro-electricity dam. The GoL is therefore still without guidance on the parameters (particularly the magnitude of the associated offsetting benefits) relating to PES schemes that could be associated with development approvals. A potential short term extension to the current project would be a valuation study that would estimate the value of the environmental benefits lost due to large scale development projects that involve the loss of forest ecosystems. Further longer term research projects could involve the investigation of actual PES schemes in the context of forest management using funds generated from development approvals processes as guided by the proposed benefits estimation extension.

There remains a considerable deficit of environmental and resource economics skills in the GoL agencies. The training effort made in this project was significant and successful but relatively insignificant when matched against what would be required to see effective policy making the norm. This deficit provides a threat to the future operation of the pilot PES schemes specifically and the longer term successful spread of the PES 'model' developed under the project. With an inadequate understanding of the importance of resource use efficiency, the prospect is that 'standard' PES schemes which can best be described as 'helicopter money' will prevail because of their relative ease of operation and flexibility in terms of meeting political rather than economic goals.

Future research projects that link strong Australian economic analysts with NUoL economists and GoL agencies would also be able to further the training efforts made under this project. The 'learning by doing' strategy was highly successful and could be further pursued in such an extension.

Communication persistence is a critical element to a successful ACIAR project. It is vital that the Australian project leader and the host country project leader are in regular voice contact. Email communication is not enough. Fortunately, technology has progressed the opportunities for cheap internet based voice communication (VOIP). Technology is no longer a barrier. The only impediment is a lack of commitment to a weekly conversation that is structured around an agenda and ends with a task list to be reported on as the first item on the next week's agenda.

Finding a 'champion' for the project in policy circles is important but difficult. Political connections help but the process of finding a champion also requires persistence and the development of effective communication instruments such as Policy Briefs to gain initial interest.

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Kragt, M., G. Scheufele, E. Hay, and M. Renton (to be submitted). Predicting Biodiversity Protection: Payments for Environmental Services schemes in Lao PDR.

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Scheufele, G. and J. Bennett (to be submitted). Pricing Biodiversity Protection: Payments for Environmental Services schemes in Lao PDR.

10.2.5 Conference Presentations

Scheufele G. and J. Bennett. 'Estimating marginal costs of producing the environmental service 'biodiversity''. Presented at the annual conference of the Australian Agricultural and Resource Economics Society, Brisbane. February 7-10, 2017

Scheufele G., X. Tsechalicha, J. Bennett, P. Kyophilavong, M. Burton, Y. Pangxang and S. Phoyduangsy. 'Environmental services auctions for PES schemes'. Presented at the annual conference of the Australian Agricultural and Resource Economics Society, Canberra. February 2-5, 2016

Scheufele G., M. Kragt, P. Kyophilavong, M. Burton and J. Bennett. 'Using Choice Modelling to estimate PES scheme benefits in Lao PDR'. Presented at the annual conference of the Australian Agricultural and Resource Economics Society, Canberra. February 2-5, 2016

Scheufele G. & J. Bennett. 'Can PES schemes mimic markets?' Presented at the annual conference of the Australian Agricultural and Resource Economics Society, Port Macquarie. February 4-7, 2014

10.2.6 Briefing Presentations

- Development of a 'virtual' PES scheme (2013)
- Estimating PES benefits – Bolikhamxay case study (2014)
- PES scheme design – Bolikhamxay case study (2014)
- Making PES schemes in Lao PDR for wildlife protection (2016)
- Project Overview – Final workshop (2017)
- PES schemes in Lao PDR - Ministerial Briefing (2017)

10.2.7 Policy Briefs

- Policy Brief 1 'Concept of PES schemes and project overview' (2013)
- Policy brief 2: 'How to build a PES scheme' (2014)
- Policy Brief 3 'Project update' (2016)
- Policy Brief 4 'Project achievements and policy recommendations' (2017)

10.2.8 Stochastic Simulation Models

- R-code for PCV model (2016)
- R-code for PKK model (2016)

10.2.9 Short Course Notes

- Short course 1: Introduction to Payments for Environmental Services (PES) Schemes (2013)
- Short course 2: Payments for Environmental Services (PES) Schemes: Mechanism Design (2013)
- Short course 3: Payments for Environmental Services (PES) Schemes: Biophysical Modelling (2014)
- Short course 4: Payments for Environmental Services (PES) Schemes: Non-Market Environmental Valuation (2015)
- Short course 5: Payments for Environmental Services (PES) Schemes: Designing and Implementing Conservation Auctions (2016)
- Short course 6: Designing and Implementing Payments for Environmental Services (PES) Schemes - Experience from Lao PDR (2017)
- Payment for Environmental Services: A short course for ECO-BEST in Thailand (2014)

10.2.10 Expert Survey

- Expert survey – data input for stochastic simulation models

10.2.11 Household Surveys

- Household surveys – interviewer instructions (PCV)
- Household survey (PCV)
- Household surveys – interviewer instructions (PKK)
- Household survey – (PKK)

10.2.12 Choice Modelling Surveys

- Choice modelling survey - training manual coordinators
- Choice modelling survey - training manual interviewers
- Choice modelling survey - training manual data entry experts

- Choice modelling - urban population survey protocol
- Choice modelling - tourists survey protocol
- Choice modelling – coordinator protocol
- Choice modelling survey – international tourists (PCV)
- Choice modelling survey – urban population of VTE city (PCV)
- Choice modelling survey – international tourists (PKK)
- Choice modelling survey – urban population of VTE city (PKK)

10.2.13 Community Consultations

- PES Information booklet for villagers (PCV)
- Training manual (including presentation) for facilitators: community consultations in Bolikhamxay Province' (PCV)
- Wildlife laws and regulations: discussion inputs for the Community Consultations in Bolikhamxay Province' (PCV)
- Expression of interest form – community (PCV)
- Expression of interest form – patrol teams (PCV)
- Community feedback form (PCV)
- PES Information booklet for villagers (PKK)
- Training manual (including presentation) for facilitators: community consultations in Vientiane Capital Province' (PKK)
- Wildlife laws and regulations: discussion inputs for the Community Consultations in Vientiane Capital Province' (PKK)
- Expression of interest form – community (PKK)
- Expression of interest form – patrol teams (PKK)
- Community feedback form (PKK)

10.2.14 Development of Community Conservation Agreements

- Development of community actions plans and community conservation agreements in Bolikhamxay Province: manual for facilitators (including presentations) (PCV)
- Presentation 'Community feedback' (PCV)
- Presentation 'Legal restrictions' (PCV)
- Presentation 'PES recap' (PCV)
- Presentation 'Next steps' (PCV)

- Presentations 'Community resource profile' based on results of household survey (PCV)
- Template 'Community Action Plan' (PCV)
- Template 'Community Conservation Agreement' (PCV)
- Development of community actions plans and community conservation agreements in Vientiane Capital Province: manual for facilitators (including presentations) (PKK)
- Presentation 'Community feedback' (PKK)
- Presentation 'Legal restrictions' (PKK)
- Presentation 'PES recap' (PKK)
- Presentation 'Next steps' (PKK)
- Presentations 'Community resource profile' based on results of household survey (PKK)
- Template 'Community Action Plan' (PKK)
- Template 'Community Conservation Agreement' (PKK)

10.2.15 Conservation Auctions

- Bidding for Patrol Contracts in Bolikhamxay Province: Manual for Facilitators (including presentation) (PCV)
- Bidding sheets (PCV)
- Template 'Patrol contract' (PCV)
- Bidding for Patrol Contracts in Vientiane Capital Province: Manual for Facilitators (including presentation) (PKK)
- Bidding sheets (PKK)
- Template 'Patrol contract' (PKK)

11 Appendixes

11.1 Appendix 1:

All listed documents are available electronically.