SUSTAINABLE DEVELOPMENT — EAST ASIA AND PACIFIC REGION

DISCUSSION PAPERS

What's Driving the Wildlife Trade?

A Review of Expert Opinion on Economic and Social Drivers of the Wildlife Trade and Trade Control Efforts in Cambodia, Indonesia, Lao PDR, and Vietnam

October 2008

THE WORLD BANK

TRAFFIC
the wildlife trade monitoring network

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Foreword

The trade in wildlife living in the forests and other natural habitats in East and Southeast Asia is of great importance and concern. While we continue to prepare and implement many conservation-related projects across the region, we are aware that unsustainable wildlife trade, much of it illegal, undermines the best attempts by governments and NGOs to secure viable populations of many species. The abundance of many wild species in the forests and other ecosystems is now just a shadow of what it was - and could be - to the detriment of those who have relied on those species in a sustainable manner for livelihoods, including in times of food insecurity.

In 2005, we launched the report *Going, Going, Gone? The Illegal Trade in Wildlife in East and Southeast Asia*, which described the nature and scale of the trade, including through case studies. It described the markets, including illegal markets, for wildlife. However, in our discussions on how to move forward in tackling the problems identified in the report, we became aware that there was limited understanding of the economic and social drivers of these markets. This information is needed to determine the actions most likely to succeed given the wide range of market contexts within which the illegal wildlife trade operates in the region.

This report is intended to help address this information gap. It was supported financially by the World Bank-Netherlands Partnership Program and prepared by TRAFFIC, in collaboration with staff from the IUCN Asia Ecosystems and Livelihoods Group and Species Programme and The World Bank. We believe this to be an important contribution to the effort to generate information about the economic and social factors influencing illegal and unsustainable wildlife trade in Southeast Asia. It is our sincere hope that this information will result in more effective policies, programs and projects aimed to address the illegal and unsustainable trade in wildlife in the region.

I would like, in particular, to acknowledge the continuing dedication and commitment of TRAFFIC in addressing this critical issue and our pleasure in working with them in the preparation of this report.

Rahul Raturi
Manager
Rural Development, Natural Resources and Environment Sector Unit
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Key definitions and terminology used in this report

Intervention	Any action taken in order to modify a result or course of events with respect to the harvest and trade of wild species. This includes both direct and indirect interventions: i.e. those direct actions which aim to work directly on harvesting, production or trade/markets (e.g. price controls or bans), and those indirect interventions that attempt to influence the underlying factors or conditions that motivate people to engage in wildlife trade (e.g. diversifying livelihoods or raising awareness).
Livelihoods	A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base. (DFID, 1999)
Market-based instruments	Market-based instruments are designed to affect the demand and supply conditions facing individuals and enterprises. Instruments that alter market conditions directly include imposition or removal of taxes or subsidies that change cost or demand conditions, or product designations (such as labelling or certification) that change demand conditions. Market-mimicking instruments include tradable permit systems, or other methods that establish tradable property rights or remove barriers for trading. (Farber and Tietenberg, 2006)
Non-legally binding agreements	Arrangements that are not subject to legislative approval to bring them into force, which may be voluntary or required. These often involve organised groups of, for example, villagers, harvesters, traders, private sector companies or industry representatives.
Non-wild sources	Non-wild harvest is considered to include production on farms or nurseries (once the species is fenced in, or grown on a household's land) both through propagation in those facilities (including captive breeding), and through the rearing of specimens that may have originally been harvested or sourced from the wild as eggs or juveniles (often referred to as 'ranched').
Economic and social drivers	Drivers are understood as the forces, conditions or factors that lead people to behave in a particular way. In this report, economic and social drivers are considered in the context of the economic and social conditions that lead people to harvest, trade or consume wildlife in an illegal and/or unsustainable manner
Wildlife trade	Wildlife trade is any sale or exchange by people of wild animal and plant resources. This can involve live animals and plants for the pet and horticultural trades, or the trade in a diverse range of wild animal and plant products needed or prized by humans – including skins, medicinal ingredients, tourist curios, timber, fish and other food products (TRAFFIC, 2007). Timber and fisheries products have been excluded from consideration in this report.

Acknowledgements

This report reflects the combined efforts of a very large number of people who have provided their knowledge and time to considering the wildlife trade in south-east Asia, both what drives it and the effectiveness of efforts to address issues of legality and sustainability. It was made possible through the generous financial support of the World Bank-Netherlands Partnership Program, and programmatic support from the World Bank's East Asia and Pacific Region's Rural Development, Natural Resources and Environment Unit. We are particularly grateful to Tony Whitten, the Unit's Senior Biodiversity Specialist, for his keen interest in this work and strong support throughout the project.

The study was led by a project Steering Group composed of: James Compton (previously with TRAFFIC Southeast Asia, now TRAFFIC International), Lucy Emerton (previously with the IUCN Asia Ecosystems and Livelihoods Group), R. Craig Kirkpatrick (previously with TRAFFIC East Asia), Teresa Mulliken (TRAFFIC International), Thomasina Oldfield (previously with the IUCN Species Programme, now TRAFFIC International), Chris Shepherd (TRAFFIC Southeast Asia) and Sulma Warne (TRAFFIC Southeast Asia). The project benefitted greatly from the contributions of Elaine Marshall, project research co-ordinator, Adrian Newton (Bournemouth University), who led the statistical analysis, and Emily Hicks (TRAFFIC Southeast Asia), who co-ordinated research activities in south-east Asia. The resulting report was prepared through the combined contributions of the above, with additional inputs from Mark Auliya (TRAFFIC Southeast Asia) and Ani Mardiastuti (previously with TRAFFIC Southeast Asia).

The study benefited from the learning provided through previous analytical work by the Centre for International Forestry Research (CIFOR) on non-timber forest product commercialisation. We are grateful to Brian Belcher of CIFOR for his advice with regard to research methodologies and approaches. It similarly benefitted from the work of the "Sustainable Use Project" of the IUCN/SSC Sustainable Use Specialist Group, IUCN Asia and South American Regional Offices, University of Cambridge, Durrell Institute of Conservation Ecology, and TRAFFIC. Lessons learned from the CEPFOR project on commercialisation of non-timber forest products in Mexico and Bolivia were also very valuable, and we are grateful to Elaine Marshall and Adrian Newton for bringing this experience into the project.

The study would not have been possible without the contribution of the 82 individuals who took the time to complete the detailed questionnaires that formed the backbone of the project research. These individuals are not named here, as the questionnaires were completed under conditions of confidentiality. In addition, Doug Hendrie (Wildlife Conservation Society), provided significant inputs into the case study on tortoises and freshwater turtles. We are extremely grateful to each of these individuals for contributing so generously of their knowledge, insights and time.

The study also benefitted from the experience and insights provided by participants in the project workshops, who, in addition to TRAFFIC and IUCN staff, included: Rosamunde Almond (consultant, IUCN Sustainable Use Project), Ramesh Boonratana, Phil Brylski (previously with the World Bank), Gordon Claridge, Chris Dickinson (WWF), Chantal Elkin (Conservation International), Troy Hansel (Wildlife Conservation Society), Mark Infield (Flora and Fauna International), Stephen Ling (World Bank), Bryony Morgan (previously with the World Bank), Rob Primmer (FRR), Nguyen Xuan Dang (Head of Zoology, IEBR), Scott Roberton (Wildlife Conservation Society), Samedi (CITES Management Authority, Indonesia), Renae Stenhouse (previously with the Wildlife Conservation Society). We are very grateful for their contributions to this project.

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International), Martin Jenkins, Stephen Ling (World Bank), Kathy MacKinnon (World Bank), Simon Milledge (TRAFFIC East/Southern Africa), Scott Roberton (Wildlife Conservation Society), and Tony Whitten (World Bank). Additional comments on the study's overall findings were provided by participants in meetings convened for this purpose in Jakarta, Indonesia and Hanoi, Vietnam, by Bouaphanh Phanthavong, Acting Director, Division of Forest Resource Conservation in the Department of Forestry, Lao PDR, and by Suon Phalla, CITES Management Authority, Cambodia.

The following TRAFFIC Southeast Asia staff also provided invaluable support to the project: Dang Linh Huong, Nguyen Dao Ngoc Van, Kate Purcell, and Julie Thomson. Very many thanks are also due to Julie Gray and Richard Thomas (TRAFFIC International) for editorial and publications support, and to Ed Parnell for readying the report for publication. We also wish to thank the Rufford Maurice Laing Foundation for their ongoing and generous support to TRAFFIC's editorial and publications processes.

Executive Summary

Worldwide there is a high – and in many cases growing – demand for wild plants and animals and products made from them. Wild species are used as the source of a wide variety of goods, including foods, medicines, pets, display, fashion and cultural items, industrial resins and extracts, and household items. Use may be local to the resource itself, e.g. hunting for meat for direct consumption, or take place many thousands of miles away, the wildlife products passing along a complex processing and trade chain from harvester to end-consumer.

South-east Asia is both a centre for the consumption of wildlife products, and also a key supplier of wildlife products to the world. Cambodia, Indonesia, Lao PDR and Vietnam are among the south-east Asian countries that act as major sources of wildlife in trade, the trade involving a wide variety of native species, which, in many cases, are declining as a result of unsustainable, and often illegal, harvest. In 2005, with funding support from the World Bank-Netherlands Partnership Program, TRAFFIC initiated a study to better understand the economic and social drivers of the wildlife trade in these four countries, and to assess the effectiveness of interventions that have been employed to halt illegal and unsustainable trade in their native flora and fauna.

Since empirical data are sparse and incomplete, the primary data sources for the study were a survey of expert opinion and a review of relevant literature. A detailed questionnaire was completed by 89 experts on the wildlife trade, drawn from government departments, conservation organisations, universities, scientific bodies, and independent researchers across Cambodia, Indonesia, Lao PDR, Vietnam and elsewhere. The responses covered around 30 plant and animal taxa that are traded in and from the four countries under a variety of market, policy and regulatory contexts. The questionnaire data were analysed at an aggregate level, to give a picture of the wildlife trade overall, and detailed case studies were produced for three species groups: Tiger *Panthera tigris*, agarwood *Aquilaria* spp. and *Gyrinops* spp., and tortoises and freshwater turtles (various species). Workshops and meetings with wildlife trade experts in the region were also organised to guide the project's research and consider and further elaborate on the project findings.

The study aimed to generate findings and recommendations that would be useful to governments, non-governmental organisations, donors and others in considering how interventions to reduce illegal and unsustainable wildlife trade might be applied more effectively in future.

Why illegal and unsustainable wildlife trade in south-east Asia matters

There is increasing recognition that the wildlife trade in south-east Asia has far-reaching effects. Not only does it supply markets and consumers both locally and across the globe, but it also has significant implications for conservation and development at local, national and regional levels, as well as internationally.

The wildlife trade is of significant economic importance in south-east Asia. It involves wide and complex networks for both sourcing and marketing. It engages a diverse range of actors, including rural harvesters, professional hunters, a wide variety of intermediate traders, wholesalers and retailers, up to the final consumers of wildlife – many of whom live thousands of miles away from the product source. Participants derive from across the social spectrum, ranging from poor rural villagers and small-scale traders to large businesses, affluent city-dwellers and politically-powerful interests. The scale of economic benefits received through participating in the wildlife trade are similarly varied, trade in some cases a regular source of income, in others an occasional income source, and in some cases a "safety net" in times

of hardship. For some, selling wildlife can be a lucrative business, attracting large amounts of money and generating very large profits.

The conservation impacts of the wildlife trade in south-east Asia are immense. Unsustainable, and often illegal, exploitation of wild plants and animals is having devastating effects on the region's biodiversity. There has been a drastic decline in the populations of many wildlife species with high commercial value, many of which are now rare, endangered or locally extinct – such as the Tiger, Sumatran Rhinoceros *Dicerorhinus sumatrensis,* Javan Rhinoceros *Rhinoceros sondaicus,* Asian Elephant *Elephas maximus*, pangolins *Manis* spp., freshwater turtles and tortoises, agarwood and numerous wild orchid species.

Where it continues at unsustainable levels, the wildlife trade may also undermine efforts to achieve sustainable development and poverty alleviation in the region, because it is depleting valuable natural assets upon which millions of people depend at least in part. Many of those surviving below the national poverty line in Cambodia, Indonesia, Lao PDR and Vietnam depend to a significant extent on biological resources for their wellbeing and survival, and are less able to access or afford alternative sources of livelihoods when biodiversity is depleted. The loss of wild animal and plant species thus undermines a basic means of production for a large part of the human population in the region, and erodes vital coping mechanisms.

The need to factor economic and social considerations into efforts to halt the illegal and unsustainable wildlife trade

A wide range of interventions has been employed to date in efforts to halt the illegal and unsustainable wildlife trade in south-east Asia. These range from more conventional "command and control" measures (which tighten the laws, regulations, enforcement and penalties restricting wildlife harvesting and trade), through attempts to secure more sustainable sources of wildlife products (such as through the domestication of key species, or the introduction of more sustainable resource management and harvesting techniques), to more innovative mechanisms that aim to tackle the broader conditions that encourage people to participate in the wildlife trade (such as supporting development of alternative livelihood options).

Economic and social factors drive both demand and supply sides of the wildlife trade equation, and any effort to improve either biodiversity conservation or development returns in the region as these relate to the use and trade of wild resources needs to be cognisant of these drivers and to design actions in a way that takes them into account. Yet there remains little common understanding about the trade's underlying economic and social drivers, or about the effectiveness and impacts of wildlife trade-related interventions in economic and social terms.

This gap in knowledge represents a serious constraint to designing comprehensive measures that will not only reduce illegal and unsustainable wildlife trade but also simultaneously result in tangible improvements in livelihoods, poverty reduction and the achievement of sustainable development goals. **This study is believed to be the first broad spectrum effort to generate and synthesize information about economic and social dimensions of illegal and unsustainable wildlife trade in south-east Asia with the specific aim of improving the effectiveness and outcomes of policies, programmes and projects aiming to address this trade.**

Identifying the assumptions that guide wildlife trade interventions

The study was designed to inform two questions, namely: *what drives the wildlife trade?*; and *which interventions are most effective in reducing illegal and unsustainable wildlife trade?*

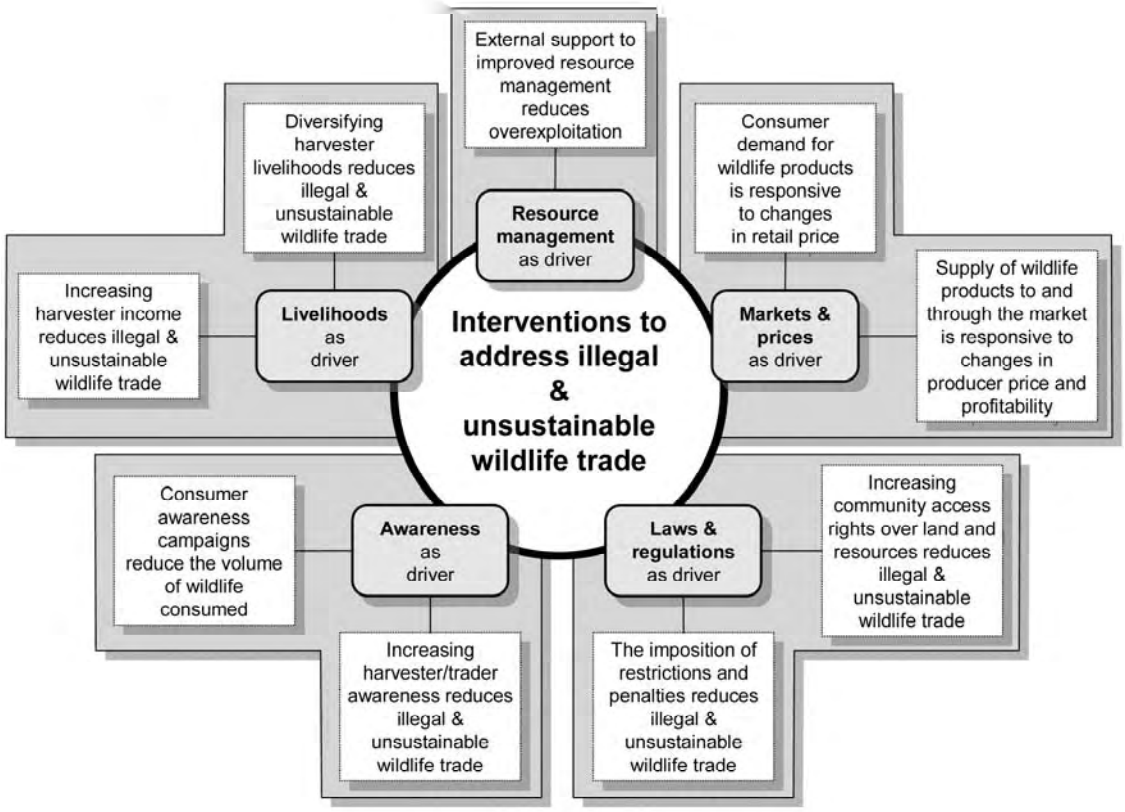
The design of interventions is shaped by a series of assumptions made by governments, non-governmental organisations, and others of what drives illegal and unsustainable wildlife trade, and which conditions therefore need to change in order to reduce it. The interventions that are then set in place employ a series of measures to manipulate, influence and change these key conditions.

While many of the assumptions that guide the design of wildlife trade interventions are based on common-sense thinking, and most are informed by long experience and lessons learned by practitioners in the field, they are rarely made explicit, or investigated thoroughly prior to or during the course of project design. To improve the effectiveness of interventions, there is therefore a need to ascertain whether the assumed economic and social drivers of wildlife trade, and related chains of causalities, linkages and outcomes that are being acted upon, are actually borne out by evidence.

The study investigated whether expert opinion and available literature supported or refuted the assumptions that are made when designing wildlife trade interventions, and to ascertain whether survey respondents believed that associated interventions had been effective in reducing illegal and unsustainable wildlife trade in Cambodia, Indonesia, Lao PDR and Vietnam.

Research focused on five broad categories of interventions that are commonly employed, individually or in combination, to reduce unsustainable and/or illegal wildlife trade. Each of these intervention types is, at least implicitly, founded on assumptions about a different set of economic and social drivers, as illustrated in the diagram below: those concerning people's livelihoods, the markets and prices for wildlife products, the laws and regulations that are in place to govern people's actions, awareness and knowledge of regulations and conservation concerns, and the practices and techniques used to manage wild animal and plant resources.

Figure I: Assumptions underlying wildlife trade interventions



Issues emerging from the study

Gaps in information about the wildlife trade

Beliefs regarding the importance of different drivers and the effectiveness of different intervention types vary among wildlife trade experts. While this may reflect the spectrum of experiences concerning species, product type, harvest site, and other factors, it may also point to a wider lack of clear evidence of generalised traits. This is reflected in the literature, with published work often focusing on trade in particular species or locations, rather than across the trade chain, and lacking data sufficient to assess the impact or effectiveness of different interventions over time and space.

The impacts of illegal and unsustainable wildlife trade

There was a high level of consensus among experts that the abundance of traded species in the wild had declined over the past decade, confirming the findings of the large body of data and literature that draws attention to alarming rates of loss of commercially valuable biodiversity in the region as a result of over-exploitation and trade. Many of the species that are declining are used to support subsistence needs, e.g. for food and medicine, as well as providing a source of income. Further declines will not only affect the status of traded species and the ecosystems in which they occur, undermining achievement of Millennium Development Goal 7 (environmental sustainability), but will also hamper efforts to achieve the Goals related to poverty, hunger and health.

The effectiveness of interventions to control illegal and unsustainable wildlife trade

Many of the interventions that have been employed to control illegal and unsustainable wildlife trade in Cambodia, Indonesia, Lao PDR and Vietnam are believed to have been at least partially successful, although beliefs on the level of effectiveness varied among experts. However, based on survey responses and information from the literature, assumptions made about economic and social drivers in the design of intervention approaches may in some cases be misplaced.

The study illuminated the fact that wildlife trade chains are typically highly variable and complex, with an extremely wide reach involving diverse participants whose actions are shaped by different conditions and drivers from the point of harvest to the end-consumer. It is therefore perhaps not surprising that interventions, which tend to focus on particular parts of the trade chain, may not be successful in reducing illegal and unsustainable trade overall.

Livelihoods as drivers

Efforts to reduce poverty, increase income and diversify livelihoods among rural communities were believed by experts surveyed to have relatively low impact on participation in harvesting wildlife for trade. The links between wealth, poverty and engagement in the wildlife trade are complex: people involved in the trade are not necessarily poor, and the poor who are involved usually do not drive the trade. Further, they do not capture the majority of the trade's monetary value. Expert opinions suggested that improving the income or livelihood status of harvester communities often did not reduce their participation in the wildlife trade.

Markets and prices as drivers

Both experts and literature consulted for this study considered rising affluence and increasing disposable income in consumer countries was a major driver of demand for wildlife in the region. Unsurprisingly, harvesters and suppliers are highly responsive to the market opportunities presented by the wildlife trade, displaying mobility between products, locations and markets in order to meet demand. At the same time, it was noted that a variety of factors associated with economic growth, trade expansion and the

development of infrastructure had facilitated an increased supply of wildlife to markets in the region. Improved communications and connectivity, road development, and the opening up of wild animal and plant habitat via illegal logging and other new activities, thereby facilitating extraction and trade of wildlife products, were believed to be the primary factors influencing the market availability of wildlife. Although it is only relatively recently that price- and market-based instruments (such as product certification, buying agreements, tax incentives and price controls) have started to be used to control the wildlife trade, they were generally perceived to be effective.

Laws and regulations as drivers

The study found that the number of laws and regulations governing the wildlife trade in Cambodia, Indonesia, Lao PDR and Vietnam had increased over recent years, and that these often provided an effective mechanism for controlling illegal and unsustainable trade. However, law enforcement and broader governance conditions were considered to be the critical factors in determining their ultimate success and impact. Although the experts consulted in the study also pointed to tenure arrangements, customary norms, traditional practices, and voluntary agreements as being highly effective where they had been applied, they suggested that relatively little attention had been paid to these measures in wildlife trade interventions.

Awareness as a driver

Experts consulted in this study underlined that interventions had showed relatively high degrees of success in raising awareness about the illegality and negative conservation impacts of the wildlife trade among harvesters, traders and consumers. However, improved awareness was not thought to have resulted in an equal reduction in the amount of wildlife harvested, traded and consumed illegally and unsustainably. Significant gaps in understanding remain about the links between awareness-raising and changes in the attitudes and behaviour of participants in the wildlife trade.

Resource management practices as drivers

A range of resource management practices were reviewed in the survey of expert opinion (including species management plans, harvest controls, such as closed seasons and limits on technology, harvesting size and age of the species). For the most part these interventions were considered to have been at least somewhat successful in controlling illegal and unsustainable wildlife exploitation. Experts however noted that a weak information base about the multiple and complex factors influencing the sustainability of harvesting regimes, and about what levels and types of exploitation were sustainable in a given case, continued to act as a constraint to the effectiveness of these types of interventions.

Conclusions and recommendations

Despite the evidence that, thus far, those seeking to stop illegal and unsustainable trade are, for the lack of better terminology, "losing the war", there are also numerous examples demonstrating that individual battles are being won. The key motivation for this study was the desire to increase the number of battles being won, and, ultimately, to win the war, by improving the targeting and design of efforts to reduce illegal and unsustainable wildlife trade, bearing in mind both conservation and development priorities. This was based further on the recognition that resources to address illegal and unsustainable trade are limited, and therefore it is critical to consider how and where best to invest those resources to achieve the conservation and development aims of the people and countries concerned.

This study is not unique in posing questions concerning the relative effectiveness of different conservation approaches, questions that are increasingly being asked within conservation more generally. However, it is believed to be the first effort to address such questions focusing on wildlife trade drivers

and interventions across multiple countries and products in south-east Asia. This research highlighted the diversity of the trade and pointed to the need for a greater effort to understand more fully this diversity and how best to respond to it to achieve conservation and development aims.

Eight preliminary conclusions relevant to improving the effectiveness of interventions to reduce the illegal and unsustainable wildlife trade in south-east Asia made on the basis of this review are provided below. These are by no means definitive. They may not, for example, be universally applicable to individual products, or to the situation within different countries, the latter point highlighted by government staff considering the research findings. They are therefore proposed as a starting point for further investigation and refinement, including through collecting more detailed data on wildlife harvest, trade, consumption and the application and impact of associated interventions. Recommendations based on these preliminary conclusions are also provided, in the belief that increased action is required alongside increased research in order to reduce illegal and unsustainable trade.

The evidence base for wildlife trade interventions needs to be strengthened – there are needs both to improve available data and knowledge about the wildlife trade, and to make this information more practical, policy relevant and easily accessible to planners and decision-makers. In particular, investments are required to further develop the evidence base for wildlife trade interventions, including research on specific species, products, locations and stakeholder groups where data are currently lacking. Research on the specifics of wildlife trade dynamics on a national basis should also be undertaken, as suggested by government staff during this study. The use of models and tools such as Bayesian Belief Networks in predicting the likely outcome of different interventions should also be explored further.

Wealth appears to be a stronger driver of illegal and unsustainable wildlife trade in south-east Asia than poverty - interventions to reduce poverty alone are unlikely to be effective in reducing illegal and unsustainable wildlife trade. There is a critical need to ensure that interventions are better targeted to, and more cognisant of, the dynamics of increasing affluence and wealth, rising aspirations and demands, and wider processes of economic growth in the region. Particular efforts need to be made to target interventions to urban consumers, and to richer and more powerful groups.

The design of wildlife trade interventions needs to take into account the broader conditions and trends that act to drive illegal and unsustainable wildlife trade – as well as considering the impacts of changing wealth status, efforts are needed to ensure that wildlife trade concerns and safeguards are integrated into trade and infrastructure expansion in the region.

Laws and regulations stand little chance of success unless they are effectively implemented and enforced, and wider issues of governance are also tackled – a greater emphasis needs to be placed on enforcing the wide array of harvest and trade controls already in place. This includes integrating policy on management of wildlife harvest and trade with implementation and enforcement of that policy; ensuring that policies and controls are targeted at those points in the trade chain likely to have the greatest impact; strengthening the judicial sector's understanding of the significance of illegal and unsustainable wildlife trade, and focusing on the building of multi-agency law enforcement capacity. Efforts are also required to ensure the good governance that is required to ensure the equitable and effective application of harvest and trade controls.

Non-regulatory approaches to controlling illegal and unsustainable trade, e.g. market-based interventions and support for improvements in resource management, are under-used – support needs to be given to efforts to manage wildlife harvest and trade sustainably and to help channel legally and sustainably produced goods to appropriate markets. This includes encouraging greater investigation of, and where appropriate, investment in measures such as buying agreements and product certification,

support for traditional management systems, and for research to develop more sustainable management practices.

Awareness efforts to reduce illegal and unsustainable trade need to be targeted to specific audiences and their effectiveness evaluated over time – greater understanding is required regarding how best to communicate to the various stakeholder groups involved in the wildlife trade to shift their behaviour away from illegal and unsustainable activities. Additional efforts to improve the knowledge base regarding the shaping of stakeholder attitudes toward the harvest, trade, purchase and consumption of wildlife products are needed. Awareness campaigns should also incorporate a monitoring and evaluation component.

Co-ordinated packages of mutually reinforcing interventions are required to address illegal and unsustainable wildlife trade in a more comprehensive manner – there is a need to better co-ordinate the design and application of different trade interventions along the trade chain. This includes ensuring that interventions present a balanced mix of enabling and positive incentives together with more restrictive and punitive measures; ensuring that interventions are inter-linked and targeted across the different species, products, countries, locations, actors and stages in the trade chain; and actively fostering better co-ordination, data-sharing and joint efforts between different government agencies, sectors and countries, and between governments and non-governmental organisations, according to their specific mandates, agendas, interests and capacities.

Increased policy attention and action is required if wildlife trade is to be brought within sustainable levels and conducted according to national and international trade controls – meaning that there is a need to shift the way in which wildlife trade is perceived, and to raise the priority that is accorded to the policies, interventions and resources that are targeted towards addressing it. This includes securing high-level political support to ensure that measures to address illegal and unsustainable trade are accorded a high priority, and mainstreaming wildlife trade issues not only within conservation policies, programmes and budgets, but also within policies, programmes and budgets targeted towards meeting development and poverty reduction goals.

1 BACKGROUND AND INTRODUCTION: why economic and social drivers of the wildlife trade matter, and what the study aimed to achieve

This chapter describes the context and sets the scene for the study. It summarises the study rationale (Section 1.4) and explains why the economic and social drivers of the wildlife trade are topics requiring scrutiny from both conservation and development viewpoints (Sections 1.1, 1.2 and 1.3). A brief description of the countries included in the study is provided (Section 1.6). The goals of the study are also described (Section 1.5), as well as the structure and layout of this report (Section 1.7).

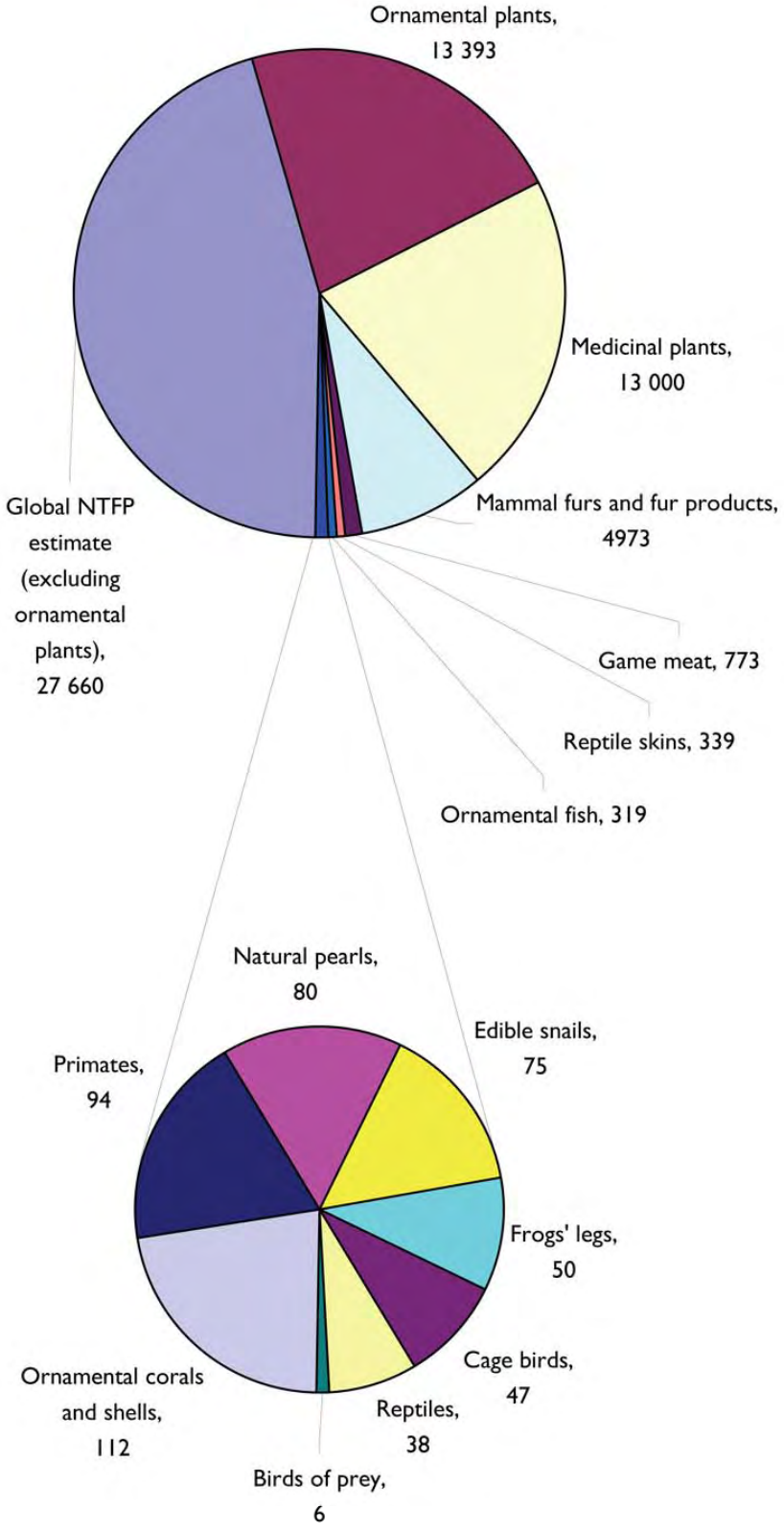
1.1 The wildlife trade – an overview

Worldwide there is a high – and in many cases growing – demand for wild plants and animals and products made from them. Wild species are used as the source of a wide variety of goods, including foods, medicines, pets, display, fashion and cultural items, industrial resins and extracts, and household items. Use may be local to the resource itself, e.g. hunting for meat for direct consumption, or take place many thousands of miles away, the wildlife products passing along a complex processing and trade chain from harvester to end-consumer.

The true scale and value of the wildlife trade are unknown, as much of the trade is carried out through informal networks, and not documented or captured in government statistics (Broad *et al.*, 2003), and/or illegal, and similarly not recorded (Roe, 2008). In their review of 54 studies of forest environmental income (defined as "rent (or value added) captured through consumption, barter, or sale of natural capital within the first link in a market chain, starting from the point at which the natural capital is extracted or appropriated") and the rural poor, Vedeld *et al.* (2004) estimated that the mean forest environmental income was equivalent to approximately 22% of household income. Cash income constituted approximately half of total forest environmental income. While advising that these results not be extrapolated to large populations, Bojo (2004) considers that they do illustrate how important forest-related income can be for poor people.

Reviews of reported international trade in wildlife products demonstrate that it is a major industry, with an estimated value of over USD300 billion in 2005, based on declared import values (Engler, in prep.). The bulk of this value is represented by trade in fisheries and timber products; however, the international trade in other products was valued at USD21 billion in 2005 (Figure 1), exceeding the value of the global international trade in coffee, tea and spices for that year of USD17 billion (Engler and Parry-Jones, 2007). The total value of products reported in international trade has also increased significantly in the last decade, as has the value of a variety of commodity groups, including live animals and medicinal plants (Roe, 2008).

Figure 1: Declared import value of wildlife resources other than timber and fisheries products in 2005 (USD million).



Source: Engler, in prep.

1.2 The wildlife trade in south-east Asia

South-east Asia is both a centre for the consumption of wildlife products and also a key supplier to external markets, with demand being met by both legal and illegal trade. De Beer and McDermott (1996) believed that a minimum of 30 million people in south-east Asia were critically dependent on non-timber forest products (NTFPs), with a much larger number of people in the region benefitting from them. Many countries in the region, including, Cambodia, Indonesia, Lao People's Democratic Republic (Lao PDR) and Vietnam, act as major sources, and in Vietnam's case also a re-exporter, of wildlife that is traded and consumed. Indonesia and Vietnam are considered among the world's top traders of NTFPs, second only to China and India (Vantomme *et al.*, 2002). A wide array of plant and animal species are collected and traded in and from south-east Asia, with several hundred wild products having been identified as being regularly harvested from forests in the region for trade (Foppes, 1996; Sly, 2001; Belcher and Kusters, 2004). Bamboos and rattans, medicinal and aromatic plants, fruits and resins are considered particularly important in terms of the scale of production and trade (Vantomme *et al.*, 2002).

Shop selling medicinal plants and extracts, Sa Pa, Vietnam.
Credit: TRAFFIC/Emily Hicks.

There have been numerous studies of the wildlife trade, focusing variously on conservation aspects (particularly with regard to the trade in fauna), socio-economic aspects (more frequently addressed in the context of the trade in flora), and the application of trade controls (e.g. see Durst and Bishop, 1994; de Beer and McDermott, 1996; Compton *et al.*, 1999; Nooren and Claridge, 2001; Vantomme *et al.*, 2002; Kusters and Belcher, 2004; Shepherd *et al.*, 2004; Lee *et al.*, 2005; World Bank, 2005; Singh *et al.*, 2006a, 2006b).

Plant and animal products provide a variety of critical goods and services to the rural poor of south-east Asia, being used as a source of food (including fodder for livestock), energy (e.g. fuelwood), materials for housing, medicines, and income. Over a quarter of people in Cambodia, Indonesia, Lao PDR and Vietnam survive below the national poverty line (Asian Development Bank, 2005) and depend to a large extent on environmental goods and services for their wellbeing and survival.

The wildlife trade in south-east Asia involves wide and complex marketing networks and engages a diverse range of participants. A complex array of socio-economic factors shape people's participation in the wildlife trade as harvesters, traders, wholesalers and retailers (Rao and McGowan, 2002), including the nature and scope of livelihood resources open to them, their needs for cash, the normative and regulatory frameworks that govern their actions, market access, opportunities to harvest and trade in wildlife, and the availability of wildlife resources themselves. Wildlife consumption, in turn, is heavily influenced by socio-economic factors such as people's tastes, aspirations and perceived needs, as well as their relative affluence or poverty and purchasing power.

Wildlife products in international trade typically pass through a network of intermediaries from primary harvesters, through a series of middlemen and intermediaries, wholesalers and exporters, processors and retailers before reaching the end-consumer. Trade chains consist of flexible distribution lines that are often highly creative. For example, delivery vehicles and buses are regularly involved, and there are many reports where highly valuable, and often illegal, species are transported using specialised systems such as fake army and government number plates, funeral and wedding cars, and ambulances (SFNC, 2003). Trade networks are maintained by the services provided by market intermediaries, including storage, transporting and marketing of products, handling bureaucratic requirements (both official, e.g. permits and payments of fines, and unofficial, e.g. bribes), and the provision of loans against future delivery of wildlife (Neumann and Hirsch, 2000; Belcher and Kusters, 2004; Grieser Johns, 2004).

Many people are involved in the wildlife trade and draw benefit from it. In some cases, the trade can be a highly lucrative business, and generate substantial profits (Roe *et al.*, 2002). In most cases, the value added over the course of the wildlife marketing and processing chain is substantial. This value, however, tends to be unequally distributed between participants and over space, time and scale, with a progressively greater value being added as a product moves up the marketing chain from rural harvesters and producers, through intermediaries and middlemen, through often affluent traders and retailers of the final product, to end-consumers (Neumann and Hirsch, 2000; Roe *et al.*, 2002). The level of cash income received by those involved in wildlife harvests for trade is often very low, with harvesters particularly at risk of exploitation where traders have a monopoly on transport and/or information, add little value to the product, and/or the harvesters are in debt to them (Warner, 1995; Neumann and Hirsch, 2000). However, a low level of cash income relative to the product's final price does not necessarily mean that the value retained by harvesters is necessarily unimportant to their income (de Beer and McDermott, 1996; Belcher and Kusters, 2004).

In Lao PDR, for example, NTFPs play a central role in the rural economy. It is estimated that wild foods contribute between 61-79% of non-rice food consumption by weight, and provide an average of 4% of energy intake, 40% of calcium, 25% of iron and 40% of vitamins A and C (Clendon and Soydara, 2001). In addition to subsistence consumption, NTFPs also generate cash earnings. NTFPs were considered by Foppes and Ketphanh (2000) to be worth an average of approximately USD320 per year for rural households in Lao PDR, contributing about 44% of subsistence value, 55% of cash income for rural villagers, or 46% of the total household economy. Commercial NTFP exploitation is thought to generate gross revenues of more than USD46 million (Emerton *et al.,* 2002).

Wildlife makes an important contribution to village nutrition in parts of Vietnam; for example, over two thirds of households interviewed in the buffer zone of a protected area in Vietnam did not grow sufficient rice to feed themselves (Grieser Johns, 2004). Around Ba Be National Park and Na Hang Nature reserve in northern Vietnam, almost all households harvest NTFPs for home consumption. A high proportion – up to 80% – also rely on NTFPs as a source of income, with sales of NTFPs estimated to account for an average of between 4-8% of household cash income. Poorer households tend to collect a much greater range of products, including those with low market value, and the percentage contribution of NTFPs to household income is up to twice as high for poor as for rich households (IUCN, 2002).

In Cambodia, where most of the population lives in rural areas, forest products are considered to play a very important, but not adequately recognised, role in the nation's economy (Vantomme *et al.*, 2002). Rattan, considered the most important NTFP in Indonesia, which in turn supplies much of the world market, provides income both via harvest and manufacturing (Vantomme *et al.*, 2002); Indonesia was the largest exporter of rattan products in 2002, earning USD182 million in that year (INBAR, 2008).

However, much of the available research points to a decline in the populations of many species subject to commercial trade as a result of unsustainable and often illegal exploitation. Many animal species whose

products command a high commercial value are now rare, endangered or locally extinct. This includes high profile and highly threatened species such as the Tiger *Panthera tigris*, Sumatran Rhinoceros *Dicerorhinus sumatrensis,* Javan Rhinoceros *Rhinoceros sondaicus*, and Asian Elephant *Elephas maximus*, all hunting and trade of which is banned, and lesser known but similarly at-risk species, such as pangolins *Manis* spp., hunted for meat and also for their scales, which are used in traditional medicine, and various species of freshwater turtle and tortoise, used for food, medicines, display and as pets. In Vietnam, 12 species of large animals have become extinct or virtually extinct in the last 40 years, mainly as a result of hunting and wildlife trade (Wildlife Conservation Society, 2004). Many plant species are similarly declining as a result of commercial trade, including several tree species producing the aromatic agarwood, used in incense, medicine and perfumes (Barden *et al.*, 2000), and orchids, used both as ornamental plants and as ingredients in traditional medicine.

Black orchid from rainforest near Samarinda, East Kalimantan, Indonesia.
Credit: Edward Parker

The number of south-east Asian species being categorised as threatened on the IUCN Red List, and for which over-exploitation is cited as a threat, is large and growing. As well as the species mentioned above, the Red List includes numerous bird species popular in trade, e.g. various lories, cockatoos and pheasants, and mammal species such as Asiatic Black Bear *Ursus thibetanus* and Babirusa *Babyrousa babyrussa* (IUCN, 2007). There is concern that depletion owing to trade could result in what has been referred to as the "empty forest syndrome" by the Wildlife Conservation Society (2004), standing forest in which native animal populations have been severely reduced. As noted above, population declines are not limited to animals, however. Rattan, considered by the Food and Agricultural Organization of the United Nations (FAO) as the most important internationally traded non-wood forest product, and of critical importance in Asia as a primary, supplementary or emergency source of income in rural areas, is also at risk, rattan resources being depleted through over-exploitation and loss of forest habitat (Vantomme *et al.*, 2002).

For a growing number of people, therefore, engagement in the wildlife trade therefore constitutes an often largely unsustainable, and sometimes illegal, source of livelihood. As noted above, many species are declining in the wild, some to the point that they are threatened with extinction. Many national governments have responded by banning or severely limiting harvest and/or trade in species of concern, or wildlife more generally. Particularly where values accruing at the local level are low, short-term local gains in income from unsustainable and/or illegal harvest and trade may be outweighed by the longer-term losses and costs associated with engaging in illegal activity and/or the declining availability of the resource overall. This may be reflected by, for example, longer harvest times required to secure the same level of income from resource use. Of particular concern is the fact that the loss of wild animal and plant species harvested unsustainably for trade removes vital resources and products that are used locally for food, medicines and income-generation (see, for example, Bennet and Rao, 2002; Roe, 2008). When unsustainable, the wildlife trade thus undermines a basic means of production in rural communities, and therefore erodes vital coping mechanisms and

security nets. These effects are particularly intense for poorer and more vulnerable sectors of the population, who are less able to access or afford alternative sources of subsistence and income, and are less resilient to stresses and shocks. In short, illegal and unsustainable harvesting of wildlife for trade does not just threaten the region's rich and increasingly endangered biodiversity, it is also depleting valuable natural assets that form the very basis of survival for the human population.

1.3 Wildlife trade in an expanding regional economy

Demand for natural resources, including NTFPs, in East and south-east Asia has increased markedly in recent years in response to economic growth in the region, with rising incomes linked to increases in demand for wildlife (World Bank, 2005). The dynamics of economic growth and change in the region present particular challenges to efforts to address the wildlife trade. South-east Asia harbours a phenomenal diversity in economic and social conditions. In 2007, the economies of East Asia and the Pacific recorded a growth of 10.5%, the highest growth in over a decade. Growth in the gross domestic product (GDP) was considered strong in both Cambodia (9.6%) and Vietnam (8.5%); Indonesia showed a somewhat lower growth (6.3%) (World Bank, 2008a). Alongside this impressive growth and rising affluence, the region at the same time contains some of the poorest countries in the world in terms of rankings in the human development index (see Table 1), a high proportion of the population remains below the poverty line, and income and consumption inequality remains extremely high. As mentioned above, alongside rapid urbanisation, growth and market expansion, much of the human population remains vulnerable, and faces uncertain and insecure livelihoods.

Economic performance and social conditions in two countries, in particular, act as drivers of regional trade generally. India and China are playing a progressively influential role in production and consumption both within and outside the region. Significant annual growth in GDP in these two countries (8.7% in India and 11.9% in China in 2007; World Bank, 2008a,b) has been accompanied by their growing domination of regional (and even global) markets. These changes are manifested through the expansion of industry, trade and investment into surrounding countries (in particular Indonesia and the Lower Mekong sub-region), as well as by the changing demands, aspirations and purchasing power of increasingly affluent sectors of the population. All of these factors potentially have an impact on the wildlife trade.

Economic growth is being accompanied by a massive effort to expand infrastructure, and to "open up" the region so as to facilitate trade flows, communication and development within and between countries. Of particular importance is the Greater Mekong Subregion Economic Co-operation (involving Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and Yunnan Province in China), which incorporates numerous projects aiming to promote economic integration, growth and development between member countries, with a heavy emphasis on infrastructure development. It includes, for example, the development of North-South, East-West, and Southern Economic Corridors which are all-weather road networks linking the six Mekong riparian countries, and the Mekong River navigation development project.

The potential impacts of these and other developments on wildlife harvesting and trade are immense, arising not just from the opening up of previously inaccessible natural habitats, but also from the inflow of traders and easier and cheaper transport of goods out of wildlife production areas, less complicated movement between consumer and producer countries, as well as the short-term pressures on wildlife products and habitats caused by the sudden inflow of construction workers. Major concerns have already been raised about the potential for these road and river corridors to create increased access to, and facilitate illegal trade in, wildlife, timber and other forest products (AMRC, 2006; Fujimura 2006).

1.4 The rationale for the study

There is increasing recognition that the wildlife trade in south-east Asia has far-reaching effects. Not only does it supply markets and consumers both locally and across the globe, but it also has significant implications for conservation and development at local, national and regional levels, as well as internationally. The trade is causing the decline of many wildlife populations, with a growing number of species becoming threatened with extinction. These declines in turn reduce the availability of wildlife resources to those dependent upon them for subsistence and/or income. Economic and social factors drive both demand and supply sides of the wildlife trade equation, and any effort to improve either biodiversity conservation or sustainable development status in the region as these relate to the use and trade of wild resources needs to be cognisant of these drivers and to design actions in a way that takes them into account.

Meanwhile, there is a poor understanding of the economic and social drivers and impacts of the wildlife trade, including its interactions with changing livelihood, market and other socio-economic conditions. Furthermore, although considerable investments have been made by governments, inter-governmental organisations (IGOs) and non-governmental organisations (NGOs) to reduce illegal and unsustainable trade, there has as yet been no comprehensive effort to assess the effectiveness of different intervention approaches being used to achieve these ends. This knowledge gap is not unique to the wildlife trade, with the need for a stronger information and evidence base increasingly acknowledged with regard to conservation efforts more generally, as well as specifically in relation to the use of NTFPs (e.g. see Salafsky and Margoluis, 2003; Sutherland, 2003; Arnold, 2004; Ferraro, 2005).

1.5 Goals of the study

This study represents a preliminary step towards addressing these knowledge gaps for the the wildlife trade identified above. It focuses on products traded in and from four countries in south-east Asia: Cambodia, Indonesia, Lao PDR and Vietnam. The trade in each of these countries is of high importance from both a conservation and development perspective.

Carried out by TRAFFIC from 2005 to 2008, and funded through the World Bank-Netherlands Partnership Program, this study had the objectives to:

- Better understand the economic and social drivers of the wildlife trade in selected south-east Asian countries (Cambodia, Indonesia, Lao PDR and Vietnam);
- Assess the effectiveness of the regulatory and market-based approaches currently used to address unsustainable trade in wildlife products; and
- Identify mechanisms to increase the success of future interventions.

The study thus aimed to increase understanding of the socio-economic factors influencing wildlife trade in Cambodia, Indonesia, Lao PDR and Vietnam, and to identify how interventions might be better applied to reduce the illegal and unsustainable trade. In short, it was designed to inform two questions, namely: 1) what drives the wildlife trade? and 2) which interventions are most effective, under which circumstances, in reducing illegal and unsustainable wildlife trade?

It was recognised at the outset that such an analysis would face several challenges, including that posed by the complexity of the wildlife trade itself, and the nature of previous research action, which has focused on documenting trade in particular species or from particular sites rather than generating an overall synthesis. In response, this study was based on a broad-based synthesis of the knowledge and opinions of over 80 national and international experts on different aspects of the south-east Asian wildlife trade, and

endeavoured to be as inclusive as possible in terms of species, products, countries and stakeholder groups.

It is believed to be the first effort to assess comprehensively the economic and social drivers of the trade in relation to the effectiveness of interventions that aim to address them. It should be seen as a starting point for a more detailed investigation of these issues rather than as providing definitive answers, and highlights numerous areas requiring further exploration.

1.6 Profile of the study countries

Indonesia is ranked as one of the most biodiverse countries of the world, being home to the largest number of mammal and palm species of any one country, as well as large numbers of birds, reptiles and amphibians, and other flowering plant species. Cambodia, Lao PDR and Vietnam are also home to a large number and wide variety of animal and plant species (CBD, 2007). Despite measurable economic growth, there remains severe rural poverty throughout much of south-east Asia (Table 1) summarises statistics from The Human Development Index), which may become exacerbated in the context of increasing biodiversity loss. Summary information on country development, including poverty and population statistics, and biodiversity, is detailed below for each of the target countries.

Cambodia

Cambodia has a population of just over 16 million. Despite annual GDP growth of 10.5% in 2006 (World Bank, 2006), an estimated three quarters of the population live on less than USD2 a day, and one third (some five and a half million people) live on less than USD1 a day, and are considered undernourished (PRSP Cambodia, 2006). Over 90% of these particularly poor people are located in rural areas and agriculture and natural resources are crucial to improving their incomes (Sok, 2003).

Cambodia's recent violent history has resulted in many groups who are disadvantaged by inadequate food supplies, poor health, physical disabilities, lack of access to land, insecure land titles, lack of skills, inadequate information, and poor access to input and product markets (Sok, 2003).

According to FAO (2005), forested land accounts for 58% of the total area of Cambodia, and is reported to have declined by 14% since 1990. There are 29 protected areas in Cambodia (CBD, 2007), but knowledge of the conservation status of plants and animals remains very limited. Cambodia became a Party to the Convention on Biological Diversity (CBD) in 1995 and to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1997.

Indonesia

Comprising 17 500 islands, Indonesia is the world's largest archipelagic State, and with a population of over 225 million, it is the world's fourth-most populous country. Out of the four countries in this study, it has the highest GDP per capita, and the smallest proportion (7.5%) of people living on less than USD1/day (UNDP, 2005). Although national poverty levels declined steadily from the mid 1970s, they worsened after the economic crises in the mid 1990s, before recovering to pre-crisis levels in 2004 (INDOPOV, 2008). An estimated 75% of rural poor rely on agricultural activities for subsistence (PRSP, 2007). Research indicates that NTFPs form a central role in the economy and survival strategy of indigenous forest-dependent peoples in Kalimantan, providing a mechanism to meet basic subsistence needs and income generation (ProFound, 2007).

Indonesia is ranked as the second-most biodiverse country in the world, but this biodiversity is being rapidly degraded and increasingly under threat from rapid landscape change, pollution and over-harvesting (CBD, 2007). Indonesia has 43 terrestrial national parks and 527 nature reserves and game

reserves (CBD, 2007). Total forest area has declined by 15% between 1990 and 2005, and is currently estimated at 46% of total land area (FAO, 2005). Indonesia has been a Party to CITES since 1979, and signed and ratified the CBD in 1994.

Lao PDR

With a population of 5.9 million, Lao PDR is the smallest of the countries considered in this report. The economy of Lao PDR grew at 7.2% in 2006, the thirty-fifth fastest in the world (CIA, 2007). Despite this, government estimates indicate that GDP per capita in rural southeast Lao PDR may be as low as USD120, which is well below the national average (Rosales *et al.*, 2003).

Rural dwellers comprise 80% of the population, most of whom practise subsistence agriculture. Many communities have extreme difficulty meeting even basic subsistence needs, and are highly dependent on the harvest of wild animals and plants for seasonal and emergency food shortages (De Beer and McDermott, 1996; PRSP, 2007).

Lao PDR is endowed with rich biological diversity, some of which is protected under 20 protected areas referred to as National Biodiversity Conservation Areas (established in 1993), and these comprise 14% of the total land area (CBD, 2007). According to its Poverty Reduction Strategy Papers (PRSP, 2007), the government of Lao PDR recognises deforestation as the largest threat to biodiversity loss: however, current forest cover estimates are estimated at 68% of total land area, having only declined by 5% in the past 15 years (FAO, 2005). The Government of Lao PDR acceded to the CBD in 1996 and has been a Party to CITES since 2004. Lao PDR does not yet have CITES-enabling legislation in place.

Vietnam

Vietnam, with a population of over 85 million, is the thirteenth-most populous country in the world. According to Government figures, the rate of GDP growth (8.17% in 2006) is the fastest in south-east Asia (UNDP, 2005). Vietnam is ranked the highest of all four countries in this study on the Human Development Index, with the highest life expectancy. Despite this, almost two thirds of its population live on less than USD2 a day. As in other parts of the region, the poorest people tend to live in rural areas. Rural poverty, poorly developed agricultural systems and limited access to land, coupled with a regional tradition of using forest products, has led to a dependency on these goods for subsistence and income generation (Grieser Johns, 2004).

Despite designating 126 protected areas, and despite forest cover having increased by 11% between 1990 and 2005, Vietnam's biodiversity still faces threats from farmland expansion, over-exploitation, forest fire, infrastructure construction, illegal wildlife trade, environment pollution and alien invasive species (FAO, 2005; CBD, 2007). The government of Vietnam signed up to and ratified the CBD and became Party to CITES in 1994.

Table 1: Human development indicators for Vietnam, Indonesia, Lao PDR and Cambodia

	Countries			
	Vietnam	**Indonesia**	**Cambodia**	**Lao PDR**
GDP 2003 USD billion	52.4	287.2	6.2	2.9
GDP /capita PPP USD (purchasing power parity)	2,490	3,361	2,078	1,759
Annual population growth rate % (2003)	1.2	1.1	1.9	2.1
Life expectancy (2003)	70.4	66.5	53	54.5
% of Population living on <1USD/day	17.7	7.5	34.1	26.3
% of Population living on <2USD/day	63.7	52.4	77.7	73.2
% Share of income or consumption by poorest 20% population	7.5	8.4	6.9	7.6
% of total population under nourished	19	6	33	22
Health expenditure/capita PPP USD (2002)	148	110	192	49
Adult literacy % for 15 years and over (2003)	90.3	87.9	73.6	68.7

Source: UNDP (2005); World Resources Institute (2005).

1.7 Structure of this report

- This chapter (Background and introduction) describes the context and sets the scene for the study. It explains why the topic of the study (economic and social drivers of the wildlife trade) is an issue requiring scrutiny, and explains the rationale, goals and intended aims of the study.
- Chapter 2 (Methods) describes how and by whom the study was carried out, documents the methods used to collect and analyse data. It also explains some of the constraints and limitations to the study and data generated.
- Chapter 3 (Conceptual framework) describes the overarching conceptual framework for the study.
- Chapter 4 (Results from the survey of expert opinion) summarises the results of the survey of expert opinion that was carried out as part of the study. It reports on survey respondents' perceptions of the nature, dynamics and drivers of the wildlife trade in Cambodia, Indonesia, Lao PDR and Vietnam, and their opinions on the success of interventions to address illegal and unsustainable wildlife trade. The main text of the chapter is descriptive, and provides a narrative interpretation of the aggregate results of the survey of expert opinion, with references to findings for specific products, species, countries or trade conditions; detailed quantitative results are presented in tables and graphs, each expressing the number of questionnaires dealing with a particular issue or topic and the percentages of respondents who expressed a particular opinion.
- Chapter 5 (Results from the case studies) describes in more detail the regional trade in three key taxa: Tigers; agarwood; and tortoises and freshwater turtles. For each, an overview is provided of conservation status, market dynamics and the trade chain, analysis is made of the effectiveness of wildlife trade interventions, and a summary of key findings and results is presented.
- Chapter 6 (Discussion) analyses and discusses the findings of the survey of expert opinion and detailed case studies as presented in earlier chapters, and in the light of other research and studies that have been carried out in the region dealing with these topics. Specifically, it revisits the two basic questions being addressed by the study (what drives the wildlife trade? and which interventions are most effective, under which circumstances, in reducing illegal and unsustainable wildlife trade?) through investigating whether expert opinion and experience support the various assumptions about economic and social drivers that are made when wildlife trade interventions are designed and implemented.
- Following on from the data and analysis presented in earlier chapters of this report, Chapter 7 (Conclusions and recommendations) summarises the study's findings in relation to the nature of the economic and social drivers of the wildlife trade in south-east Asia, and the application of interventions to address them. It provides a series of recommendations, targeted at conservation and wildlife policy-makers, planners and managers, donor agencies and NGOs, identifying how interventions might be better considered and applied to reduce the illegal and unsustainable trade in the future.
- A full list of references is provided following Chapter 7.
- Annexes to this report include the questionnaire for the survey of expert opinion, as well as a detailed list of expert opinions of key actions required to reduce the illegal and unsustainable wildlife trade (summarised from workshop consultations as part of the project).

2 METHODS: how the study was carried out

This chapter describes how and by whom the study was carried out (Section 2.1), documents the methods used to collect and analyse data (Sections 2.2 and 2.3), and explains some of the constraints and limitations to the study and data generated (Section 2.4).

2.1 The study process

Knowledge of the wildlife trade is characterized by a high degree of uncertainty, in terms of the volume and dynamics of the trade, as well as its impacts on wildlife and human livelihoods. Rigorous, quantitative data on these issues are time-consuming and expensive to obtain, particularly for large numbers of case studies or over extensive geographic areas. Many of the research projects that have examined the wildlife trade have suffered from lack of general applicability, because they have examined only a small number of wildlife products over very restricted geographic areas and timescales. Data are particularly difficult to come by for products traded illegally – published value figures may be linked to speculation in relation to the retail value of the items if sold as finished products. It is therefore not possible to use these as a reliable indicator of, for example, changes in demand.

There are very few studies that examine wildlife trade for different products and the socio-economic factors associated with it at different points in the trade chain, particularly over extended periods of time. In considering the initial research approaches, TRAFFIC consulted with other institutions that had sought to answer related questions. The Centre for International Forestry Research (CIFOR), in their much larger study of the commercialization of NTFPs, chose to use experts to complete detailed case studies using a questionnaire-type format (e.g. see Ruiz-Perez *et al.,* 2004). In its initial phase, the IUCN/SSC Sustainable Use Specialist Group; IUCN's Species Programme, Asia and South America regional offices; TRAFFIC; the University of Kent and the University of Cambridge, used published and grey literature as the source of detailed information to underpin a multivariate analysis of factors influencing whether wildlife use was sustainable. Researchers found that there was not sufficient information contained within the literature to allow such an analysis, however. As a result, it was necessary to consult experts directly to complete data gaps. In Phase II of that project it was decided to approach the collection of data through a questionnaire provided to experts. The present project used lessons learned from both of these initiatives in considering the use of a questionnaire-based approach, supported by consultation of the related literature.

In November 2005, TRAFFIC convened a project inception workshop in Hanoi to discuss the project scope and approach. Participants included a range of experts on wildlife trade issues, drawn from participating countries as well as from international organisations. The workshop resulted in the sharing of information, the formulation of a plan for project activities, and the identification of key species, products and markets to be investigated. A broad conceptual framework to guide the study and articulate its specific research questions was also developed jointly by workshop participants. This was subsequently elaborated and refined by the study team, after consultation with additional experts and following a review of published and unpublished literature. The resulting framework provided a tool to organise the research and to link its various components towards meeting the overarching focus and objectives of the study. This framework and associated hypotheses are described in Chapter 3.

Information about the aims and focus of the study were shared with key government staff in the focal study countries, as well as various other organisations who are engaged in research and projects on biodiversity conservation and the wildlife trade, to solicit their advice and ideas, and to identify methodologies and lessons learned that have been generated elsewhere and have relevance for the current

study. The core staffing for project delivery was set in place, comprising a steering group (TRAFFIC and IUCN staff), a research co-ordinator, and a statistical analyst.

Following these consultations, it was agreed to focus on collection and analysis of expert knowledge and opinion in relation to the study questions, supplemented by reference to the relevant literature. This permitted consideration of trade in a much larger number of products and locations than would have been possible if the focus had instead been on collection of primary data. Such use of expert knowledge and opinion has a number of strengths and weaknesses, which are explored in Section 2.4 below.

The collection of data, research and analysis were carried out over the course of 2006 and the first half of 2007. In June 2007, a second regional workshop was held in Hanoi to explore and interpret the initial findings of the study and to identify gaps in the statistical analysis. Most participants had already been involved in the project during its inception and/or data-collection phases. A key output of the workshop was a set of groupings of questionnaire responses that could be used to explore relationships among different types of products and different types of intervention further.

A draft report was prepared by the research co-ordinator and statistical analyst, with advice from the steering group, based on the review of expert opinion and of relevant literature (see below). The report included detailed case studies on the Tiger, agarwood, and tortoises and freshwater turtles, taxa traded in significant quantities that are both commercially important and particularly threatened in conservation terms. Each of these case studies was collated by a TRAFFIC expert in consultation with others, based on questionnaire data and literature as well as personal knowledge and experience. Findings from the case studies are presented in Chapter 5 of this document.

A draft of this report was circulated to external reviewers, including World Bank staff members as well as technical experts on the wildlife trade in south-east Asia drawn from TRAFFIC, IUCN, WCS and Conservation International (CI). The findings were also shared with government staff in each of the four target countries. Comments and inputs received were used in the preparation of a revised draft of the report, which was reviewed and commented upon further by World Bank staff. The final report takes these comments into account.

2.2 Research methodologies

The study is based on a synthesis of the knowledge and opinions of national and international experts on the south-east Asian wildlife trade. Two main approaches were used to solicit information and collect data: a review of relevant literature; and a questionnaire designed to elicit expert knowledge and opinions relating to a wide range of species and products. These are described below. Additional information was collected through the project workshops and meetings described above (see Section 2.1).

Literature review

A literature review was undertaken including collection and synthesis of both published and unpublished literature on the wildlife trade in south-east Asia and elsewhere. It included books, journal articles and papers, as well as internal working papers, project documents and other unpublished material, much of which was provided by the experts and organisations consulted in the study. Findings from the literature review are integrated throughout this document.

This review confirmed the lack of systematic collection and/or analysis of time series information on the scale of wildlife trade, associated social and economic drivers, the application of various interventions aimed at influencing sustainability and/or levels of illegal trade, and/or the effectiveness of those interventions.

Questionnaire survey of expert knowledge and opinion

As noted above, given the lack of data necessary to address the questions posed in this project, it was decided to adopt a questionnaire approach, in which information was elicited from a wide range of experts familiar with a variety of products traded throughout the region. In coming to this decision and the resulting process of questionnaire preparation, insights were gained from examining similar research approaches used by CIFOR (e.g. see Ruiz-Perez *et al.,* 2004), IUCN (see Oldfield, 2005), and the UNEP-World Conservation Monitoring Centre and Overseas Development Institute (Marshall *et al.,* 2006).

The primary quantitative data for the study therefore comes from expert knowledge and opinion collected via detailed questionnaires that cover specific wildlife products or species that are traded across the four countries. These encompass around 30 plant and animal species or groups (Table 2), and represent wildlife trade at local, national, regional and global scales, carried out under differing market, policy, legal and regulatory contexts.

Frozen pangolins, *Manis* spp., were among the species investigated in this study (see Table 2).
Credit: TRAFFIC/Sulma Warne

The questionnaire was composed of 76 questions (some with sub-parts) designed to obtain information to "test" the validity of the hypotheses and assumptions underlying different categories of wildlife trade interventions (see Chapter 3). These elicited respondents' knowledge and opinions on socio-economic characteristics, market trends, and the scope, effectiveness and impact of interventions. Most of the questions were closed, offering multiple-choice answers, so as to facilitate comparison across different taxa and countries. In addition, respondents were asked to score their confidence in their response to each question. The full questionnaire is attached as Annex 1.

A total of 89 questionnaires were completed by 82 individual respondents, drawn from government departments, conservation organisations, universities, scientific authorities, independent researchers and the private sector across Cambodia, Indonesia, Lao PDR and Vietnam. Several respondents were also selected from key external consumer markets for wildlife from these countries. Survey respondents were individually selected as experts who had direct experience of the wildlife trade, including close familiarity with the taxa or product on which they responded. All respondents were assured of the confidentiality of their responses. Questionnaires were completed in hard copy or electronically, in some cases with the assistance of a facilitator who conducted an interview in order to solicit the responses. In Cambodia and Indonesia the questionnaire was translated into the local language. Completed questionnaires were checked for internal consistency and completeness by TRAFFIC staff, and where necessary further communication was carried out with respondents.

Findings from the questionnaire survey of expert knowledge and opinion are presented in Chapter 4 of this document.

Table 2: Products and species investigated in the study

Products:	**Species**	**Cambodia**	**Indonesia**	**Lao PDR**	**Vietnam**	**Others**
Plants						
Agarwood	*Aquilaria* spp., *Gyrinops* spp.		■	■	■	China
Cardamom fruits	*Amomum* spp.			■	■	
Damar resin	White Meranti *Shorea javanica*		■			
Dipterocarp resin	*Dipterocarpus* spp. mainly *D. alatus*	■				
Malva nuts	*Scaphium macropodium*			■	■	
Rattan	*Calamus* spp.		■	■	■	
Rosewood	*Dalbergia* spp. mainly *D. cochinchinensis*					
Wood carvings	*Paraserianthes falcataria*		■			
Yellow vine	*Coscinium* spp.	■				
Tree ferns	*Cyathea* spp.		■			
Paper Mulberry	*Broussonetia papyrifera*			■		
Orchids	Various species in the family Orchidaceae		■			
Animals:						
Bear bile	Asiatic Black Bear *Ursus thibetanus*, Sun Bear *U. malayanus*			■	■	
Bears (live)	Asiatic Black Bear *Ursus thibetanus*, Sun Bear *U. malayanus*	■				
Birds (live)	Various including lories *Eos* spp. and Tanimbar Cockatoo *Cacatua goffiniana* (Indonesia) song birds Order Passeriformes for Vietnam		■		■	
Bird nests	Edible-nest Swiftlet *Collocalia fuciphaga*		■			
Crocodile parts	Saltwater Crocodile *Crocodylus porosus*, New Guinea Crocodile *C. novaeguineae*		■			
Crocodiles (live)	Siamese Crocodile *Crocodylus siamensis*	■				
Deer meat	Mouse deer *Tragulus* spp.	■				
Elephant	Asian Elephant *Elephas maximus*			■		
Frog legs	Crab-eating Frog *Fejervarya cancrivora*		■			
Fruit bat meat	Flying fox *Pteropus* spp., Lesser Dawn Bat *Eonycteris spelaea*, Leschenault's Rousette *Rousettus leschenaulti*, Geoffroy's Rousette *R. amplexicaudatus*		■		■	
Butterflies	Various species		■		■	
Langur bones	Douc Langur *Pygathrix nemaeus*, Francois Langur *Trachypithecus francoisi*			■		
Macaques (live)	Long-tailed Macaque *Macaca fascicularis*		■			
Orang-utans (live)	Orang-utan *Pongo pygmaeus*		■			
Otter skins	Small-clawed Otter *Aonyx cinerea*, Eurasian Otter *Lutra lutra*, Hairy-nosed Otter *L. sumatrana* Smooth-coated Otter *Lutrogale perspicillata*,	■				
Pangolin parts	Malayan Pangolin *Manis javanica*, Chinese Pangolin *M. pentadactyla*		■	■		
Porcupine meat	Various including Asian Brush-tailed Porcupine *Atherurus macrourus, Hystrix* spp.				■	
Python parts	*Python* spp. family Pythonidae			■		
Python (parts & live)	Sumatran Short-tailed Python *Python curtus*		■			
Snake meat for animal feed	Primarily Rainbow Water Snake *Enhydris enhydris*	■				
Tiger parts	*Panthera tigris*		■	■	■	China
Turtle parts and meat	Various, including species within the family Geoemydidae, also Malaysian Box Turtle *Cuora amboinensis*, Asiatic Softshell Turtle *Amyda cartilaginea*	■	■		■	
Turtles (live)	Various, including Asian Giant Tortoise *Manouria emys*		■			Japan, China
Wild pig meat	Babirusa *Babyrousa babyrussa*		■			

2.3 Data analysis methods

Each of the individual questionnaire responses was treated as a separate sample unit (n = 89). Simple summary statistics were generated to describe these data after grouping the questions relevant to each hypothesis, and associated research questions. To identify whether distinct types or groups of wildlife trade scenarios could be differentiated, multivariate statistical techniques were applied to the information obtained through the questionnaire survey. To explore variation among the questionnaires taken as a whole and identify whether different groups or types of case study scenario might be differentiated, Principal Components Analysis (PCA) and cluster analysis methods were used. PCA was selected as it is a

relatively simple and objective ordination technique (Shaw, 2003). Cluster analysis was selected as it is explicitly designed to identify subsets of data with similar characteristics (Shaw, 2003). Both techniques were used by Ruiz Pérez and Byron (1999) in their development of a typology of NTFP case studies. Analyses were performed with PRIMER v.6 (Clarke and Gorley, 2006).

Prior to analysis the data were normalized as recommended by Shaw (2003), involving conversion to a standard format to facilitate their comparison. This form of data transformation is necessary when, as in case of the questionnaire data, the variables differ with respect to the scales on which the information was collected. In preparing the data for analysis, data for all questions relating to interventions or their impacts, and the assessments of confidence in questionnaire responses were also removed. The remaining 214 questionnaire variables were used in the analysis to describe each of the completed questionnaires as a single entity. A Euclidean distance measure, the most commonly used in cluster analysis, was used (Shaw, 2003).

Following the workshop held to explore and interpret the initial findings of the study and to identify gaps from the statistical analysis, a further statistical analysis was carried out on different sub-groups of questionnaires, to explore the relative success of different intervention types, through the development of a Bayesian Belief Network (BBN). BBNs are essentially analytical tools for combining and exploring different forms of evidence, and are particularly useful to situations where such evidence is characterized by a high degree of uncertainty, as in the case of the wildlife trade. BBNs represent the relationship between variables in the form of probabilities, enabling many different sources of data to be integrated and analysed according to a common framework. This method is increasingly being used in exploring management of environmental resources under uncertainty (Burn *et al.*, 2003). It has been applied in processes to understand changes in illegal hunting of elephants and trade in elephant products, in conjunction with the Monitoring Illegal Killing of Elephants (MIKE) programme and Elephant Trade Information System (ETIS) (Burn *et al.*, 2003), and in an analysis of NTFP commercialization (Newton *et al.*, 2006). While the BBN analysis for this project showed promise as an analytical approach, unfortunately, because of the relatively small sample size, it could not be used in a robust way to test the strength of intervention types used in combination or across the variables selected for testing. The BBN results were therefore not included in the main body of the report, but have been provided, along with additional information on the analytical approach, in Annex 3.

2.4 Constraints and data limitations

As noted above, the wildlife trade is characterized by a high degree of uncertainty. Rigorous, quantitative data on aspects such as trade volumes, values, contributions to livelihoods along the trade chain, and responses to interventions are time-consuming and expensive to obtain, particularly for large numbers of case studies or over extensive geographic areas. Many of the research projects that have examined the wildlife trade thus far have not been generally applicable because they have examined only a small number of wildlife products over very restricted geographic areas and timescales.

For these reasons this project adopted a questionnaire approach, as noted above, in which information was elicited from a wide range of experts familiar with a variety of products traded throughout the region. It is worth noting that this research may be constrained in its specific applicability due to the dynamic and changing nature of wildlife trade. Nevertheless, it is hoped that this report will help illuminate wildlife trade dynamics and trends which are prevalent at the time of research.

There are, however, a number of constraints and limitations that are inherent to drawing general results and conclusions from expert knowledge and opinion, and in the use of a single survey instrument (in this case a questionnaire) to gather such data. These are discussed below, and details are given of efforts made to minimise any resultant problems or inaccuracies.

Taxa and products covered

A strong emphasis was placed on ensuring that the study sample represented as wide a range of wildlife products and dynamics as possible, including with regard not only to the taxa and products covered, but also the types of markets and locations included. It should be noted that the questionnaires cover twice as many animal as plant species and products (24 animal species and 12 plant species; 58 animal products and 29 plant products). Thirty-five completed questionnaires dealt with three specific taxa: agarwood (12), tortoises and freshwater turtles (11), and the Tiger (12). This was deliberate, as these taxa were the focus of detailed case studies. The results should therefore be viewed with some caution, as the questionnaires neither represent the full variety of species groups found within the region, nor proportionately represent their relative importance in trade networks. Nevertheless, this study does represent one of the most comprehensive assessments of the wildlife trade undertaken in the region to date; the sample size is large enough to suggest that its results can be treated with a reasonably high degree of confidence, particularly where clear patterns have been detected.

The use of expert knowledge and opinion

Expert knowledge and opinion represents one of the richest sources of information on the wildlife trade in south-east Asia. This is especially the case given the obvious difficulties involved in collecting primary data on activities that may well take place outside the law, involve politically powerful individuals, and/or concern extremely sensitive topics and locations. A wide range of individuals both within and outside the region have a lengthy experience and in-depth knowledge on illegal and unsustainable wildlife trade, much of which remains undocumented and is not captured in the existing literature. Documentation of the information and views held by experts provides an important (and possibly the only) mechanism for capturing and recording this wealth of knowledge.

Nevertheless, when interpreting the results of the study it is also important to bear in mind that they represent the knowledge and opinions of the individuals concerned. Results are not necessarily based directly on first-hand research, primary data or scientifically validated observations and records. The possibility cannot be discounted that some responses may be incorrect, biased, or based on a misinterpretation of the on-ground situation. They may also reflect the bias or misinterpretation of the facilitator (in cases where questionnaires were administered verbally) or data analysts. A review of the stated sources of information upon which questionnaire responses were based, however, reveals that the majority of the information shared is based on primary research by the respondent themselves and on their direct experience of project implementation, with a high level of reference to published (and thus presumably credible) literature (Table 3). However, experts will almost certainly have had greater familiarity with certain aspects over others, and this should also be kept in mind in considering the survey results.

Table 3: Source of information upon which responses are based

Sources of information	% of sample
Primary research	61.8
Experience of project implementation	50.6
Published literature	50.6
Grey literature	42.7
Policy level research/implementation	34.8
Anecdotal information (e.g. opinions of others)	33.7
Direct involvement in wildlife trade	14.6

Efforts were made to ensure that the sample included as wide a range of experts as possible. However, the vast majority of respondents consider themselves to be active in conservation, with a minority engaged primarily in socio-economic development activities; a high proportion of the sample is researchers (Table 4). It should therefore be noted that the sample is heavily biased towards individuals who are engaged in

research, and who are involved in the "conservation intervention" side of wildlife trade issues. Although this is to some extent appropriate to the goals and focus of the study, there is weak representation from other key groups and stakeholders including government authorities, the private sector, and those participating directly in the wildlife trade as harvesters, traders and consumers. This study therefore largely represents the opinion of experts who are external to the industry itself.

Table 4: Profile of experts consulted

Involvement in wildlife trade issues	% of sample
Conservation	75.3
Research	65.2
Development	14.6
Regulatory enforcement	9.0
Independent consultant	6.7
Other	3.4
Private sector	2.2
Intermediary trader	1.1
Retailer	1.1
Wholesaler	0

Attempts were made to introduce a greater degree of certainty into responses by asking respondents to indicate their level of confidence when answering each question. A ranking is provided of each response of 1 (= very confident based on substantial data, both published and grey), 2 (= fairly confident based on incomplete data), or 3 (= limited confidence based on anecdotal data). These confidence scores help to indicate uncertainty, for example where the respondent might be more or less knowledgeable about particular aspects of the trade chain. Completed questionnaires show a fairly high level of respondent confidence. Confidence values for the entire data set ranged from 1.17 to 1.90, with a mean value of 1.53. One reason for the high levels of confidence may be that those selected as "experts" were carefully identified and were also allowed to choose to focus on species and products with which they were most familiar.

The use of a questionnaire

The use of questionnaires in any circumstance is subject to a number of limitations, including the lack of flexibility, the one-dimensional nature of information provided, and the risk of asking "leading questions" of respondents. These problems are exacerbated when there is a long and complex questionnaire (such as that used in this study), and by the fact that the majority (but not all) of questionnaires were filled in remotely without any direct interaction with an interviewer. Measures taken to minimise these potential problems included the careful design and pre-testing of the questionnaire itself, offers of facilitation and direct interaction (in person or via the telephone) while completing the survey, and extensive post-questionnaire follow-up with respondents.

It is also important to note that different data collection methods, personnel and the process of translation did allow for some differences to occur in the interpretation of the questionnaire. This was minimised by the project employing one person to oversee and coordinate the whole process, however some variance in interpretation is likely to remain, thereby affecting the robustness of results.

Assessing interventions versus their implementation

This study assessed the perceived success of different intervention approaches as they are currently applied. Some reviewers expressed the concern that this might mask the effectiveness of the intervention approach, i.e. the issue might not be one of the intervention not being successful, but rather that it was not being adequately implemented or enforced. This concern was considered particularly relevant in relation to regulatory approaches to addressing illegal and unsustainable trade, where there was a nearly universal belief that greater enforcement efforts were needed. This study did not assess whether certain intervention approaches were being implemented "better" than others, nor whether it was the level of implementation typical for certain intervention types, rather than the intervention itself, that was the key factor determining perceived success. This issue would seem to be similarly relevant to all of the intervention approaches covered in this report, and merits further exploration in future studies.

Aggregation

The main focus of this report is to present the aggregate results of the survey of expert knowledge and opinion so as to give an overall picture of views on the wildlife trade (and to respond to the current information gaps which exist at this level). Detailed case studies are provided for three key traded taxa: the Tiger, agarwood, and tortoises and freshwater turtles.

One possible critique of a large survey such as this, which cross-cuts many different taxa, products, countries and sets of socio-economic, harvesting, trade and consumption conditions, is that dealing with data analysis at an aggregated level of the whole sample provides a set of conclusions that are too general. In other words, they do not draw out the trends, patterns and commonalities within and between different species and/or categories of wildlife trade that share common characteristics (for example, plants as compared to animals, legal as compared to illegal trade, trade in particular countries, and so on).

In order to determine whether any trends existed according to different categories of wildlife trade, disaggregated analysis was carried out of the questionnaire responses, using PCA (see Section 2.3), according to a typology of categories identified by participants in the second project workshop (Table 5). As this analysis provided little evidence of the existence of distinct categories or "types" of traded products, no reporting is provided on this disaggregated data analysis. Rather, results refer to the data set as a whole. The results in aggregate should not be viewed as applicable to specific cases, e.g. to individual species, products or sites.

Table 5: Typology groups used in disaggregated data analysis

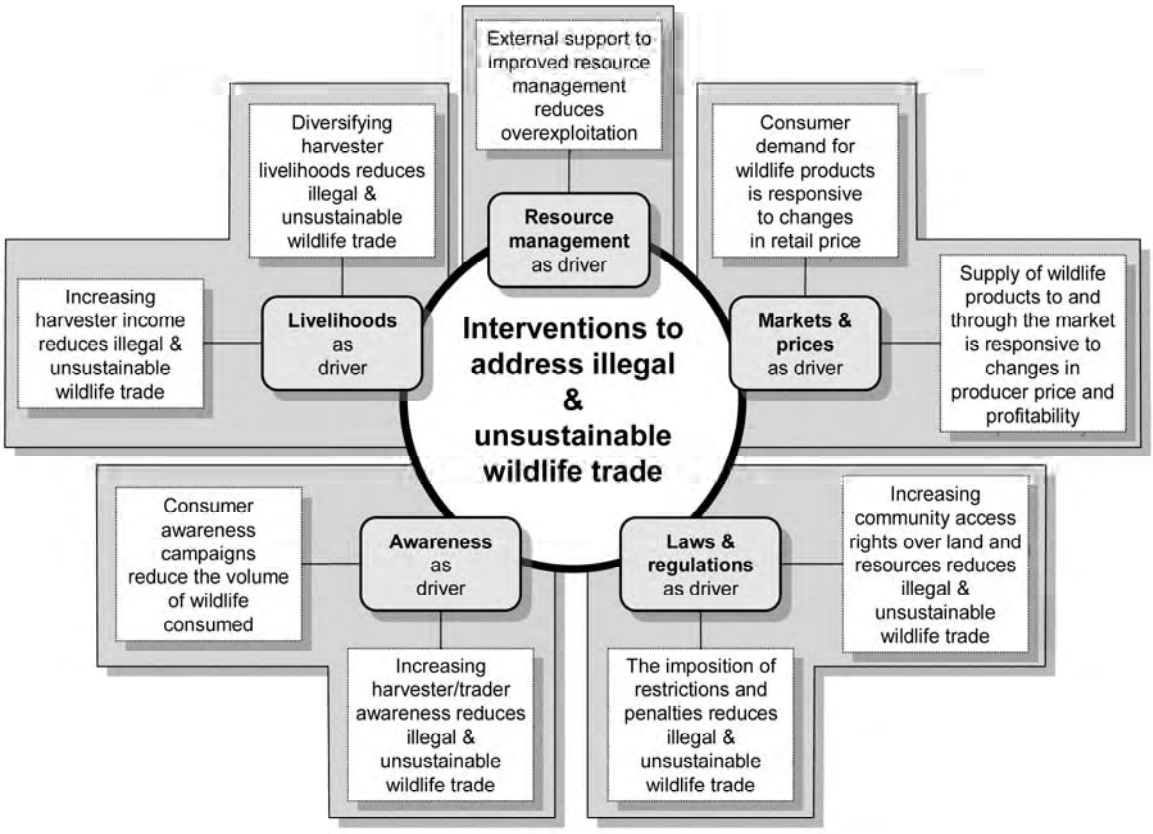
Typology groups
Country where harvested
Animal/plant
Legal vs. illegal according to: • international trade regulations • national trade regulations • CITES I/CITES II
End use
Reproductive rate
Selected focal product groups (Tiger, agarwood, tortoises/freshwater turtles)

3 CONCEPTUAL FRAMEWORK: linking economic and social drivers and interventions

In line with its goal and objectives, the study is designed to inform two questions, namely: what drives the wildlife trade?; and which interventions are most effective, under which circumstances, in reducing illegal and unsustainable wildlife trade? The conceptual framework for this study was therefore based around providing a mechanism to identify, understand and assess the validity of the various assumptions that are made about economic and social drivers when wildlife trade interventions are designed and implemented. Designing an overarching framework to organise and link research also aimed to ensure that the study remained targeted towards generating findings and recommendations that would provide advice to the decision-makers, planners and managers, donor agencies and NGOs who are actually engaged in efforts to address illegal and unsustainable wildlife trade.

The design of wildlife trade interventions is shaped by a series of assumptions made on the part of planners about which conditions need to change in order to curtail participation in illegal and unsustainable wildlife trade, what mechanisms can successfully achieve the desired changes, and what are the assumed social, economic and conservation outcomes of chosen interventions. While many of the assumptions which guide the design of wildlife trade interventions are based on common-sense thinking, and most are informed by long experience and lessons learned in the field, they are rarely made explicit, or investigated thoroughly prior to or during the course of project design. There is a need to ascertain whether assumptions of what the economic and social drivers of the wildlife trade are, and related chains of causalities, linkages and outcomes which are being acted upon, are actually borne out by evidence.

Figure 2: Assumptions underlying wildlife trade interventions



The study framework therefore analyses and tests the background thinking to interventions which essentially aim to influence, manipulate and change the various socio-economic conditions under which people harvest, trade in and consume wildlife products. It focuses on five broad categories of interventions that are commonly employed, individually or in combination, to reduce illegal and/or unsustainable wildlife trade. Each of these intervention types is founded on the hypothesis that a particular set of conditions acts to determine people's participation in the wildlife trade, and therefore needs to be influenced, manipulated and changed if illegal and unsustainable trade in wild species is to be reduced (Figure 2). For each category of intervention, the range of assumptions underlying these hypotheses were investigated by the study. The next section below describes in more detail the hypotheses and assumptions which were investigated by the study for each intervention category.

3.1 Hypotheses and assumptions upon which wildlife trade interventions are based

Livelihood-based interventions

This category of intervention primarily targets the harvesters of wildlife and wildlife products. It assumes that participation in wildlife trade is determined by the size and composition of people's livelihoods, and that these therefore need to be changed if the illegal and unsustainable trade in wild species is to be reduced. Specifically, interventions are commonly based on the hypothesis that investments which improve socio-economic status and diversify livelihood sources will reduce people's participation in illegal and/or unsustainable wildlife harvesting for trade. The study investigates whether these assumptions and hypotheses appear to be supported by the available evidence and experiences to date.

Livelihood-based interventions are fundamentally associated with changing the socio-economic conditions under which people operate on a day-to-day basis. They are often used to support and reinforce laws and regulations, providing the "carrot" which will balance the "stick" employed by command and control measures. A key element underlying their background thinking is that laws and regulations are not enough, by themselves, to ensure that local communities (and especially poorer people) will be both willing and able to reduce or modify their exploitation of wildlife. A range of direct incentives, improvements in living conditions, and provision of alternative options to generate subsistence and income, are seen as being required both to induce people to change their livelihood patterns as well as to empower them by allowing them to move out of the wildlife trade and into other more sustainable activities.

These types of interventions are now routinely incorporated into most field-based conservation projects. Development projects, even those that are not concerned explicitly with conservation goals, are also increasingly working on decreasing reliance on unsustainable natural resource use as a means of strengthening local livelihoods, improving income opportunities and reducing rural poverty.

Market-based interventions

This category of intervention targets the harvesters, traders and consumers of wildlife and wildlife products. It aims to change the economic and financial conditions that influence their behaviour, assuming that participation in wildlife trade is determined by the nature of prices and markets and their effects on demand and supply, and that these therefore need to be changed if the illegal and unsustainable trade in wild species is to be reduced. Specifically, interventions are commonly based on the hypothesis that consumer demand for wildlife products is responsive to changes in retail price (and thus cost), and the supply of wildlife products to and through the market is responsive to changes in harvester and trader price (and thus profitability). The study investigates whether these assumptions and hypotheses appear to be supported by the available evidence and experiences.

Market-based interventions are designed to affect the demand for and supply of wildlife products. They target both the markets and prices of wildlife and wildlife products themselves, as well as those of substitutes (including the price of and markets for sustainably harvested resources as well as of substitute goods and sources of income). Instruments range from attempts to raise the consumer price or reduce the producer profitability of wildlife products (such as through imposing taxes or other levies), make substitute products relatively more attractive (such as through subsidies or relatively lower tax rates), increase the profitability of sustainably-harvested production (such as through measures to promote cost-effectiveness, subsidies to production or mechanisms to add value, including through processing, certification and labelling).

Over recent years there has been a growing focus of attention on market-based mechanisms to promote conservation and modify the demand and supply of products which are leading to environmental degradation and species loss, although their use to address wildlife trade issues specifically is still relatively uncommon.

Legislative and regulatory interventions

This category of intervention targets the harvesters, traders and consumers of wildlife and wildlife products. It assumes that participation in wildlife trade is determined by the presence of laws and regulations, and that these therefore need to be changed if the illegal and unsustainable trade in wild species is to be reduced. Specifically, interventions are commonly based on the hypotheses that increasing the level and range of restrictions on wildlife exploitation, trade and purchase will reduce people's participation in illegal and/or unsustainable wildlife harvesting, trade and consumption; and that strengthening the access rights of local communities to wildlife and wildlife habitat will reduce their participation in illegal and/or unsustainable wildlife harvesting for trade. The study investigates whether these assumptions and hypotheses appear to be supported by the available evidence and experiences.

Legislation and regulations that are concerned directly with wildlife trade typically take one of two forms: either preventative (banning the harvest, sale or export of wildlife and wildlife products) or regulative (establishing controls or quotas on wildlife harvest and trade). In addition, a host of other norms, rules and codes of conduct (both customary and legislative, mandatory and voluntary) govern the conditions and procedures under which people are permitted to own, access, manage and use wildlife habitats and species. Interventions to strengthen these various rules and regulations are often applied in combination with a range of enabling measures and direct incentives including livelihood- and market-based interventions (to provide incentive structures which will both enable and encourage compliance), awareness interventions (to ensure that wildlife producers and consumers know what their legal rights and responsibilities are) and resource management interventions (to institutionalise the application of particular norms or regulations via changed harvesting and management practices).

These types of interventions have conventionally been a core focus of efforts to control the wildlife trade. Attempts to strengthen formal legislative and regulatory frameworks have had a strong focus on working with relevant government authorities to ensure that a comprehensive body of laws, rules and penalties are in place which cover wildlife trade concerns, and that compliance and enforcement are improved. More recently, there has been increasing attention paid to supporting (and often also enshrining in "modern" law) local norms and customs which act to regulate the illegal and unsustainable trade in wildlife, to helping to develop voluntary codes of conduct (particularly among private producers, traders and consumers, and among user or harvester associations), and to ensuring that the broader laws and policies which govern land and natural resource management are equitable with regard to local access and use rights, and engender participation and stake in wildlife use and management.

A travelling exhibition in Vietnam to promote awareness of the conservation aspects of wildlife trade, 2006-2007.
Credit: TRAFFIC

Awareness interventions

This category of intervention targets the harvesters, traders and consumers of wildlife and wildlife products. It assumes that participation in wildlife trade is determined by the degree of people's awareness, and that this therefore needs to be changed if the illegal and unsustainable trade in wild species is to be reduced. Specifically, interventions are commonly based on the hypotheses that making harvesters, traders and consumers more aware of any illegality and negative conservation impacts of wildlife trade will reduce their participation in it. The study investigates whether these assumptions and hypotheses appear to be supported by the available evidence and experiences.

Awareness interventions relating to the wildlife trade have been applied via a diverse range of mechanisms (for example media campaigns, school curricula, roadshows, documentaries and poster series), to a broad range of target audiences (including harvesters, traders, consumers, hoteliers, medical practitioners, Customs officials and the general public). They are based on the fundamental belief that improved knowledge of the illegality and impacts of wildlife harvesting, trade and consumption will in turn lead to a change in attitudes and practices among participants.

Resource management interventions

This category of intervention targets the harvesters of wildlife and wildlife products. It assumes that participation in illegal and unsustainable wildlife trade is determined by the relative availability of technical know-how and practices, and that these therefore need to be changed if the illegal and unsustainable trade in wild species is to be reduced. Specifically, interventions are commonly based on the hypotheses that the provision of technical, material and management support to better harvesting techniques and management, and/or more sustainable land and resource management will reduce people's participation in illegal and/or unsustainable wildlife harvesting for trade. The study investigates whether these assumptions and hypotheses appear to be supported by the available evidence and experiences.

Efforts to improve wildlife resource management have had a strong focus both on improving the sustainability of wild harvests and on promoting non-wild alternative supplies of traded plants and animals, such as through cultivation, domestication or captive breeding. For both, a key element of interventions has been to strengthen skills in applying new harvesting and management techniques and methods. Interventions aiming to improve sustainability in wild harvests have frequently been accompanied by work to build capacity to undertake resource inventory and monitoring, so that the impacts of harvesting on population size and structure can be evaluated, and the findings used to inform the amounts that should be harvested to ensure sustainability. Resource management interventions for both wild and cultivated harvests are often linked to efforts to strengthen local profit and value-added, including the provision of credit, support to business planning and marketing, the organisation of producer or harvester associations and co-operatives, and various market-based mechanisms, such as labelling or certification.

4 RESULTS FROM THE SURVEY OF EXPERT OPINION: perceptions of wildlife trade dynamics, drivers and intervention effectiveness

This chapter summarises the results of the survey of expert opinion that was carried out as part of the study. It reports on survey respondents' perceptions of the nature, dynamics and drivers of the wildlife trade in Cambodia, Indonesia, Lao PDR and Vietnam, and their opinions on the success of interventions to address illegal and unsustainable wildlife trade. The main text of the chapter is descriptive, and provides a narrative interpretation of the aggregate results of the survey of expert opinion. Detailed quantitative results are presented in tables and graphs, expressing the number of questionnaires dealing with a particular issue or topic and the percentages of respondents who expressed a particular opinion.

It is important to reiterate here that the study assessed the perceived effectiveness of different intervention approaches as they are currently applied, rather than the effectiveness of these same interventions if they were fully implemented/enforced. Both workshop participants and reviewers of an earlier draft of this report expressed concern that the results might be interpreted as implying that certain approaches did not work, or did not work well, when in actual fact the problem was that they were not being implemented fully. This was of particular concern in relation to regulatory approaches, where there was a nearly universal belief that greater efforts were needed to enforce the legislation and regulations currently in place.

This study did not assess whether certain intervention approaches were being implemented "better" than others, and whether it was the level of implementation typical for certain intervention types, rather than the intervention itself, that was the key factor determining perceived success. This issue would seem to be similarly relevant to all of the intervention approaches covered in this report, and merits further exploration in a future study.

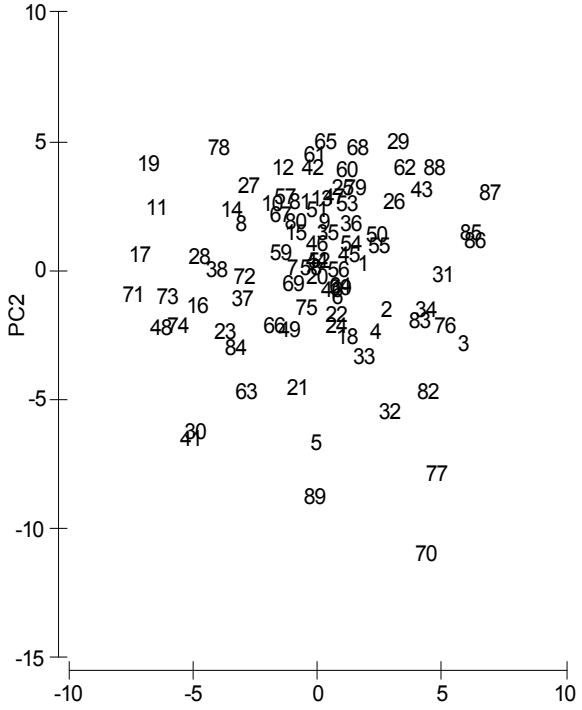
4.1 The variability of the wildlife trade

The study aimed to determine whether distinct types or groups of "cases" as represented by the questionnaires can be differentiated. If so, these different types might usefully provide a basis for developing generalisations applicable to wildlife products or geographical areas other than those studied here. The concept of developing a typology of case studies has been applied previously to NTFPs with some success (Ruiz Pérez and Byron, 1999).

One important element of analysis was therefore to investigate whether different questionnaire responses could be grouped into differentiated categories or "types", based on common characteristics, which could then be compared with each other (for example, plants as compared to animals, legal as compared to illegal trade, trade in particular countries, and so on). It was anticipated that such a disaggregated analysis could yield important information and lessons about trends, patterns and commonalities within and between these different types.

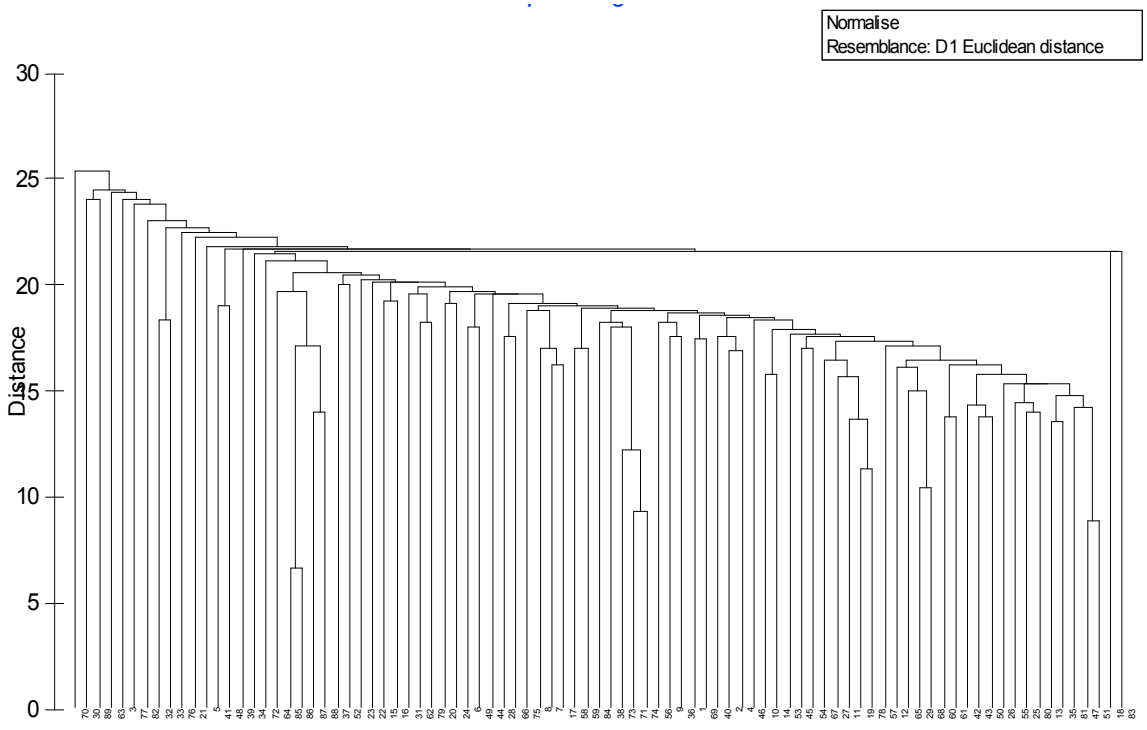
The PCA plot (Figure 3) illustrated a continuous pattern of variation, with little evidence of clustering among the cases represented by each questionnaire. It is important to note that the overall amount of variation explained by this analysis (10.2% of the variation for principal components 1 and 2 combined) is very low, further highlighting the lack of evidence for strong grouping or clustering of cases.

Figure 3: Principal Components Analysis plot of case studies using the questionnaire responses as descriptor variables



The results of the cluster analysis, using a Euclidean distance measure, again provided little evidence of major groups or "types" of cases (Figure 4). In general, the clusters were composed of small numbers of cases, with little evidence of large numbers of cases clustering together at high distance values.

Figure 4: Dendrogram produced by cluster analysis, illustrating grouping of cases



Both of these statistical analyses provide little support for the existence of distinct groups or "types" of cases, suggesting rather that there is continuous variation among them. The results should be interpreted with caution, however, as they will have been determined by the nature of the questionnaire data. Selection of a different set of descriptive variables would be likely to have yielded a different result.

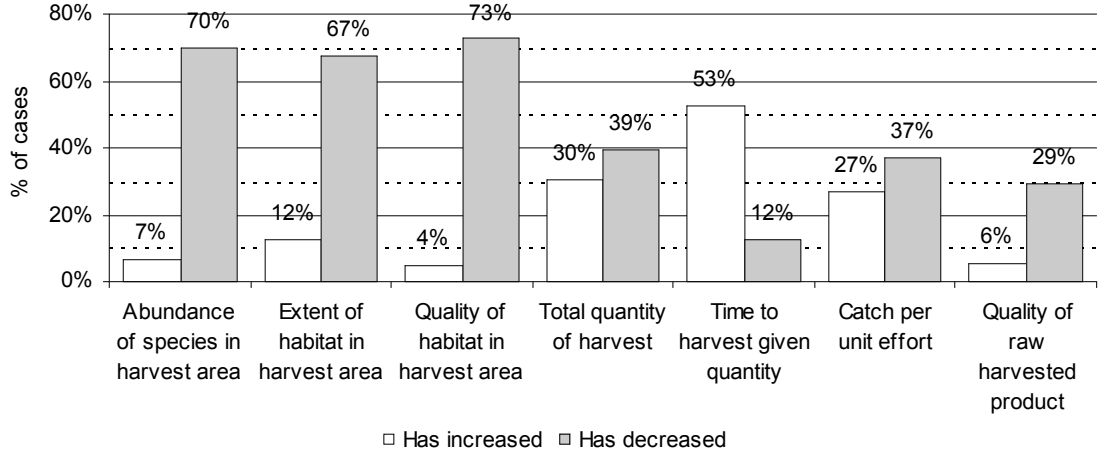
4.2 The sustainability of wildlife harvesting for trade

Echoing the findings of the large body of data and publications that draw attention to high rates of loss of commercially valuable biodiversity in the region, there was a high level of consensus among experts that the abundance of traded species in the wild has declined over the last decade. This trend was perceived by more than two thirds of survey respondents, across wildlife harvest areas under all types of tenure (see Section 4.11).

Based on survey responses, the decline in species abundance would appear to be manifested (and is also itself reflected) in a number of changes in the conditions under which wildlife is harvested and traded. Over a quarter of respondents indicated that they had observed that the quality of raw harvested products had declined, around a third noted a decrease in catch per unit effort (i.e. quantity of harvest and time taken to harvest) and in the total quantity of harvest, and over half registered an increase in the time taken to harvest a given quantity of plants or animals. However, it is important to note that at least as many respondents did not state that they had observed such changes in product quality or catch per unit effort (over a third stating that the latter had declined), even when they believed that the abundance of species in harvest areas had decreased over time. As more than two thirds of experts also stated that they believed that harvesting had moved to new areas over the last decade in response to over-exploitation, it seems likely that local stocks of harvestable resources have already been exhausted in some areas and for some species.

Other changes, such as the reduction in the extent and quality of habitat, are also cited as important factors leading to the decline of traded species, and were flagged as such by two thirds and almost three quarters of experts, respectively (Figure 5).

Figure 5: Perceptions of changes in habitat, availability, harvesting conditions and quality of traded wildlife products



Data expressed as a percentage of all responses (n=89)

4.3 Socio-economic profile of wildlife harvesters

Survey responses indicated that while the primary harvesters of wildlife operated under varying conditions, there were certain common trends and patterns as regards their socio-economic profile. In almost all cases, respondents stated that wildlife harvesting for trade was carried out by adult men; women were said to be involved in harvest in only 20% of the cases covered by the survey, and children in less than 10%. The majority of experts also described a local situation where wildlife harvesting was more frequently carried out as a planned (71%), rather than opportunistic (44%), activity, with 16% describing it as both. They indicated that, of the species and products covered by the survey, plants were generally gathered and animals hunted specifically to trade, rather than sales taking place when there was a surplus over home consumption needs.

As the survey of expert opinion considered only those products that were traded, it is not surprising to find that the majority of respondents cited needs for cash income as the main motivation for harvesting for virtually all of the cases represented by questionnaires, and that very few experts mentioned other reasons (such as enjoyment, culture and pest removal).

The majority of survey responses – two thirds – deal with species that are harvested all year round: only a third of questionnaires concern products that are thought to be gathered seasonally or occasionally. Harvesting of wildlife was said to be carried out when a need arose to meet unforeseen or emergency needs for cash income by a similar proportion, around a third, of cases.

Almost all respondents portrayed a situation where wildlife harvesters either worked on an informal "contract" basis for suppliers/middlemen or operated independently (each stated in around half of questionnaires). While cash on sale was considered the main mechanism for payment, a third of cases described cash being paid in advance to harvest a certain type of product, and a tenth involved various forms of non-cash barter. It is worth noting that very few cases were described of harvesters being paid a wage to hunt or gather plants on behalf of middlemen or traders.

In three quarters of cases experts stated that the trade-chain to which they were referring was well established, with just over a half reporting a fixed market location and the same actors involved in harvesting and trading from year to year. It was considered rare for harvesters to sell directly to the consumer (only 15% of cases): most experts (70%) described a situation involving a trader or middleman who came to the harvesting community to purchase products directly from harvesters, or where harvesters brought the product to the trader to sell (64%), with just over a third stating that both situations occurred.

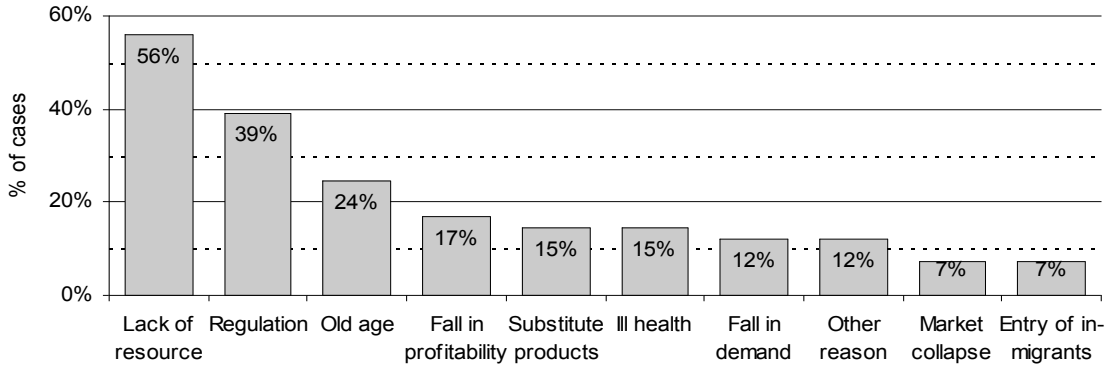
While questionnaires dealt primarily with wildlife obtained from wild sources, experts reported that harvesting was also derived at least in part from non-wild sources (38% of cases) – although the volumes derived were generally considered to be low (estimated at 25% or less by half of experts who provided information on this aspect). A relatively high proportion of experts (three quarters), however, believed that there was a general trend towards increased harvesting from non-wild sources.

It is difficult to discern any clear trends in the level of participation in harvesting wildlife for trade from the survey, although a general picture emerges of a mobile and dynamic group of harvesters whose composition and location shifts over time in response to changes in the availability of tradable wildlife resources. While a quarter of experts believed that the number of harvesters had increased over the last decade, a similar proportion considered that numbers had decreased (although in the latter case, this may merely reflect a shift to different species and products, or to new locations).

Local people were said to be involved in the harvest of the target species in nearly all of the cases, most commonly described as working independently (nearly 90% of all cases), but also frequently working for outsiders (approximately 60% of all cases). Harvest was also said to be conducted by outsiders, either working independently or for other outsiders, in approximately a half of the cases. It was also stated in just over half of cases that new players had entered the locality to harvest wildlife for trade over the same period; for the most part experts considered that in-migrants enjoyed the same level of access to resources as local people.

Just under half the respondents stated that they had seen evidence of harvesters leaving the trade over the past decade (although these observations may include harvesters shifting to different wildlife products and areas of harvest, rather than leaving the wildlife trade altogether). Experts believed that the primary reason for this was a decline in the availability of wildlife: the most commonly-stated reason was lack of a harvestable resource (just over half of respondents who cited movement out of the wildlife trade). A smaller, but notable, proportion (39%) expressed the view that regulation of wildlife harvesting had acted to discourage people from harvesting wildlife. Other motivations for shifting out of wildlife harvesting, including those based on market dynamics and the personal characteristics of harvesters themselves, were considered to be of relatively low importance by respondents (Figure 6).

Figure 6: Perceptions of the most important driver of harvesters leaving the wildlife trade

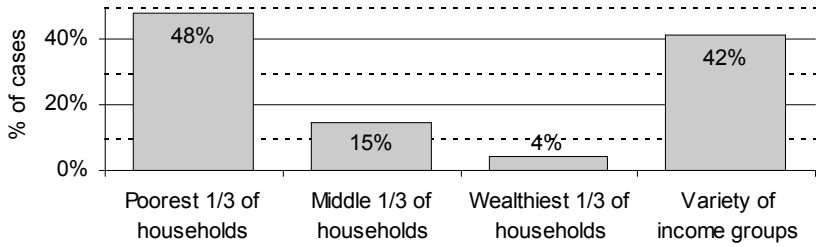


Data expressed as a percentage of respondents citing the exit of harvesters from the trade (n=41); total of all categories exceeds 100% as question allowed for multiple responses

4.4 Wildlife harvesting as a component of rural livelihoods

Although all income groups are involved in wildlife harvesting for trade, the poorest are notable participants. Almost half the respondents identified the poorest third of households as being the primary harvesters for that particular species or product, although in a similar number of cases harvesters were seen as being drawn from a variety of income groups (Figure 7). In far fewer instances were middle-income groups or the wealthiest considered to constitute the major harvesters of wildlife (just 15% and 5% of cases, respectively).

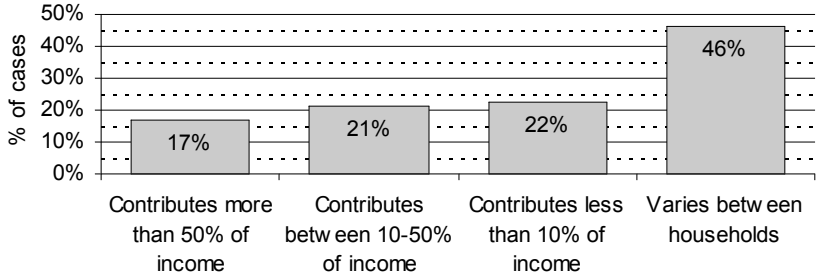
Figure 7: Wealth status of wildlife harvesters



Data expressed as a percentage of all responses (n=89); total of all categories exceeds 100% as question allowed for multiple responses

Expert opinion indicates that there is a high level of variability in the extent to which harvester households are dependent on the wildlife trade for cash income. In around a half of cases respondents considered that dependence on trade in the product described was so variable between households that no overall conclusions could be drawn, and opinion was fairly equally divided between cases where this trade was thought to contribute a small (less than 10%), medium (between 10-50%) and high (more than 50%) proportion of total household cash income (Figure 8).

Figure 8: Contribution of trade in specified products to cash income of harvester households

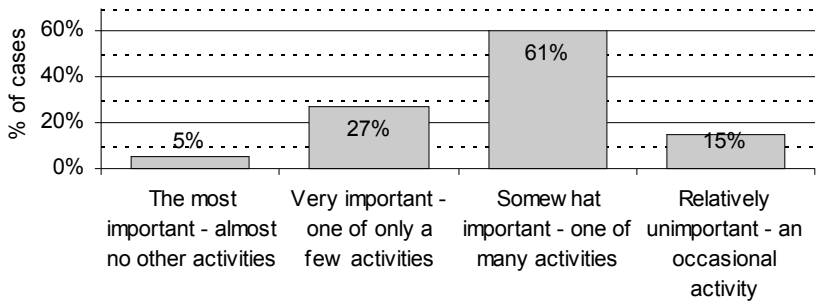


Data expressed as a percentage of all responses (n=89); total of all categories exceeds 100% as question allowed for multiple responses

Laotian family with wildlife for sale, 2001.
Credit: TRAFFIC/Emily Hicks

Similarly, the survey found that although the vast majority of experts believed that wildlife had some importance as a component of household livelihoods, very few thought it to be the most important source, although over a quarter believed it to be very important (Figure 9). It is worth noting, however, that in this survey most experts considered the range of livelihood opportunities to be small in wildlife harvester communities. It should also be noted that survey responses did not indicate that, in the cases being considered, experts believed that the wildlife trade was relatively more important as a source of livelihood where the poorest third of households were primary harvesters: the commonest response for this category of households was that wildlife trade was somewhat important, which was also the commonest response for all income groups.

Figure 9: Relative importance wildlife harvesting as a livelihood activity



Data expressed as a percentage of all responses (n=89); total of all categories exceeds 100% as question allowed for multiple responses

4.5 The impact of livelihood and poverty reduction interventions

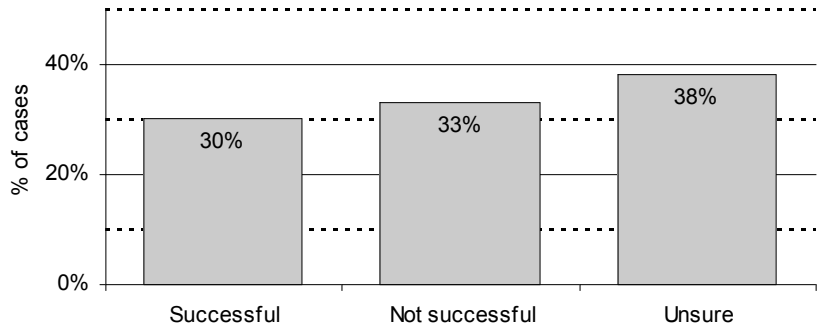
Nearly half (43%) of the questionnaire responses described cases where an external intervention to reduce poverty had taken place, and a similar proportion reported an external intervention to support alternative livelihood options for harvesters. While the majority of these respondents considered that poverty reduction interventions had been successful in achieving their primary goal (reducing poverty), they generally concluded that impacts had not translated into any reduction in wildlife harvesting for trade. More than 80% of experts responding on this point indicated that where poverty reductions had been successful in their primary goal, people had not moved away from wildlife harvesting for trade. In fact, for cases where the poorest third of households were deemed as primary harvesters and had been subject to interventions that were thought to have successfully reduced their poverty, it was perceived that they had not moved away from wildlife harvest in three times as many case studies (12) as those in which they were thought to have moved away (4).

Bamboo rats and bats at market in Houaphan Province, Lao PDR.
Credit: TRAFFIC/Emily Hicks

Although the poor are cited as primary wildlife harvesters in almost a half of cases (see Section 4.4) and over half (58%) of experts believed that people moved into harvesting wildlife for trade when their socio-economic status declined, fewer believed that the converse held. Just over a third of experts consulted believed that people moved out of the wildlife trade as their socio-economic status improved, compared with slightly more than half that did not believe this was the case.

Similar opinions were held in cases where external livelihood interventions had been set in place to provide alternative sources of income for harvesters. Just under a third of respondents believed such measures to have been successful in reducing wildlife harvests in general, another third believed them to have been unsuccessful, and slightly more than a third were unsure, i.e. were not able to discern any strongly positive or negative outcomes (Figure 10). Even less success was reported with regard to reducing harvest of the target species, with only a quarter of respondents reporting such declines where such approaches had been used, and 40% stating that such approaches were not successful. Relatively higher rates of success were noted by experts commenting on the reduction of harvesting of wildlife in general in Cambodia and Lao PDR.

Figure 10: The perceived success of interventions to create alternative livelihoods in reducing wildlife harvesting in general



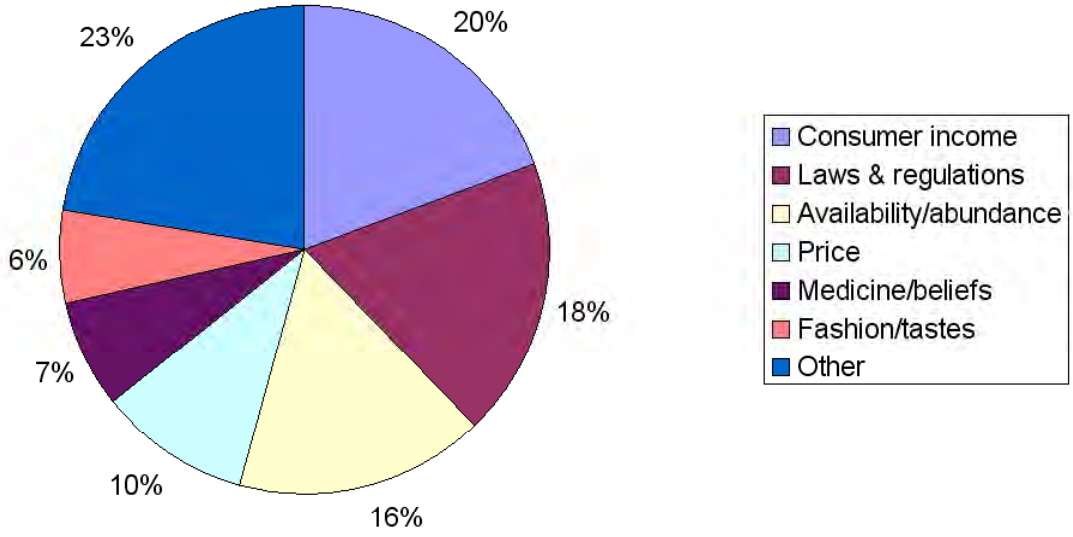
Data expressed as a percentage of responses commenting on the success of alternative livelihood interventions (n=45)

4.6 Market trends

Most of the survey responses dealt with species or products that are traded internationally: approximately one third related to trade which crossed just one national boundary, and just over half to trade which crossed multiple boundaries. The total volume of trade was believed to be increasing in approximately 40% of the cases and decreasing in 20%, with a third of respondents unsure on this point. International demand for wildlife and wildlife products was deemed to be increasing in a half of cases, and domestic demand was also stated to be rising by approximately 40% of respondents. Unsurprisingly, given increasing demand, real price rises were also mentioned by a half of experts.

As well as noting the effects of increased demand generally (international and national), experts cited consumer income and affluence, regulations and enforcement, and species abundance/availability as the primary drivers of changes in wildlife demand in relatively equal numbers. Price was thought to be less important (Figure 11). These perceptions accord with the view of the majority of respondents (60%) that the product they were describing could be considered to be a luxury good.

Figure 11: Perceptions of the most important driver of changes in wildlife demand

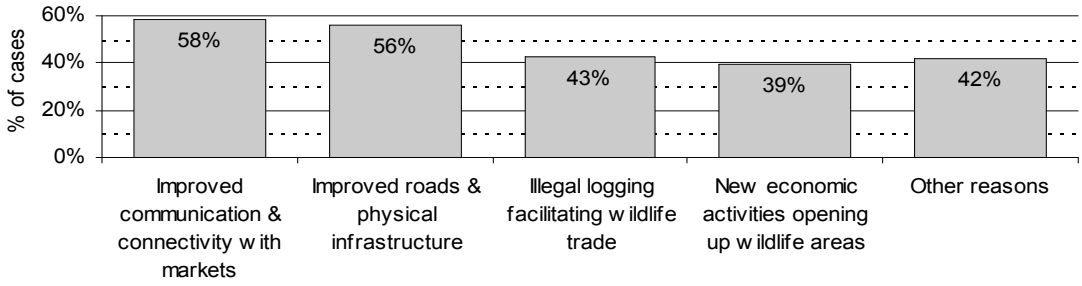


Data expressed as a percentage of responses on this point (n=67)

Producer prices were believed by nearly two thirds of respondents to have increased in real terms over the last decade, with prices on national and international markets also believed to have increased by a half of respondents. It is not, however, clear whether this has resulted in any change in the importance of the wildlife trade to harvester livelihoods. An interesting finding is that profitability is considered to be a relatively unimportant factor driving people's participation in wildlife harvesting. As described above (see Section 4.3), in less than a fifth of cases did experts cite reduced profitability as a major reason for harvesters leaving the wildlife trade.

As discussed above (see Section 4.2), respondents did not, for the most part, believe that increases in consumer demand were being met sustainably. Expert opinion pointed to the rising volume of wildlife trade being met through an expansion in harvesting areas, as harvesters shifted to new locations in response to the local exhaustion of harvestable wildlife stocks. The survey pointed to a number of factors that have enabled or facilitated an increased supply of wildlife to the market. The growing accessibility of wildlife areas was perceived as the major factor influencing the market availability of wildlife, resulting from improved communications, market connectivity, road and infrastructure development, and the opening up of wildlife areas because of illegal logging and other new activities (Figure 12).

Figure 12: Perceptions of factors that influence the change in supply of wildlife

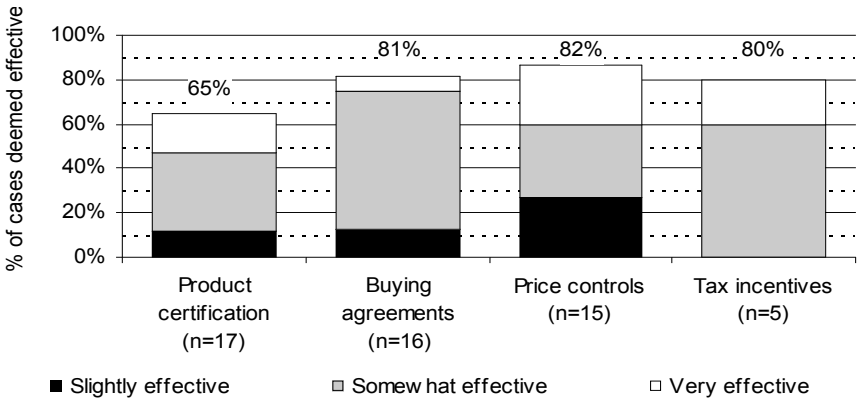


Data expressed as a percentage of all responses (n=89); total of all categories exceeds 100% as question allowed for multiple responses

4.7 Experiences of market-based instruments

Only a small number of respondents referred to price- and market-based instruments having been used in efforts to regulate the illegal and unsustainable wildlife trade. However, price- and market-based instruments, where applied (each in around a fifth of cases except for tax incentives, which were recorded in just five questionnaires), were perceived to be relatively successful (Figure 13). Price controls, tax incentives and buying agreements were all considered to have been at least slightly effective in more than 80% of cases, and certification in over two thirds of cases. As is the case with other types of instruments, it was felt that price- and market-based interventions were most effective when implemented at multiple points (and targeting a range of different participant groups) in the wildlife trade chain. Market-based interventions were most frequently cited for CITES-listed species, reflecting at least in part the predominance of CITES species in the dataset. However, this was not the case with respect to buying agreements, half of which were cited in relation to non-CITES species, including seven plant products. Of the CITES-listed species, market-based interventions were most frequently noted for tortoises and freshwater turtles (where only one case was considered unsuccessful) and agarwood, with success said to be mixed. Respondents also registered higher perceived rates of success in Indonesia.

Figure 13: Perceived effectiveness of price and market-based instruments



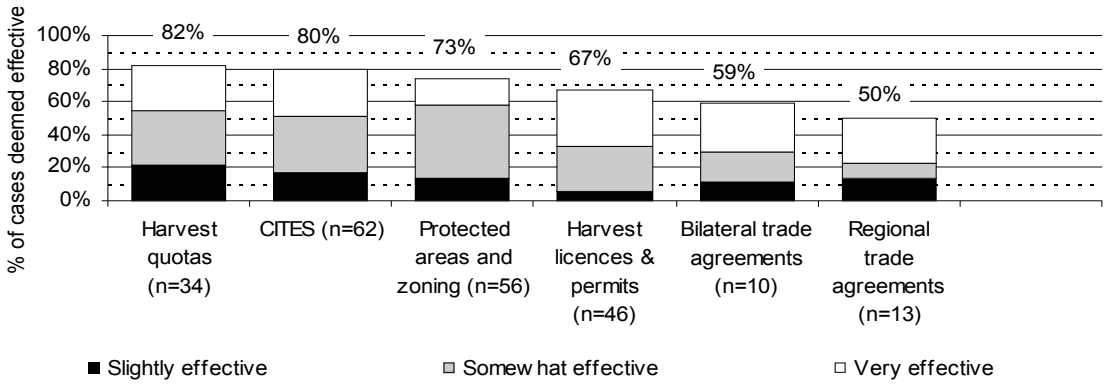
Data expressed as a percentage of responses providing effectiveness scores

4.8 Application of laws, regulations and regional agreements

The majority of cases covered by the survey face legal restrictions on harvest and trade, implemented through protected areas and zoning, licences, permits, quotas and trade agreements. Most respondents believed that the number and range of these instruments had increased over the last decade, and a half or more considered that they had been at least slightly successful in reducing illegal and unsustainable wildlife trade. The use of CITES, harvest licences, permits and quotas, protected areas and zoning, and bilateral and regional trade agreements were deemed to have been particularly effective where applied (Figure 14).

It should also be noted that in almost 90% of questionnaires, wildlife products were said to continue to be harvested from protected areas (such harvest being noted as legal in two cases). Even where quotas are in place, a fifth of respondents believed that they had never been implemented, and they were cited as being exceeded by a half of respondents. More positively, in most cases where species were covered under CITES (two thirds of species and products reviewed), related laws and regulations were considered to have been at least partly effective, with the notable exception of Lao PDR, where only one expert believed CITES to be effective, and in this case only slightly (N.B. Lao PDR has only been a CITES Party since 2004).

Figure 14: Perceived effectiveness of legal restrictions on harvest and trade



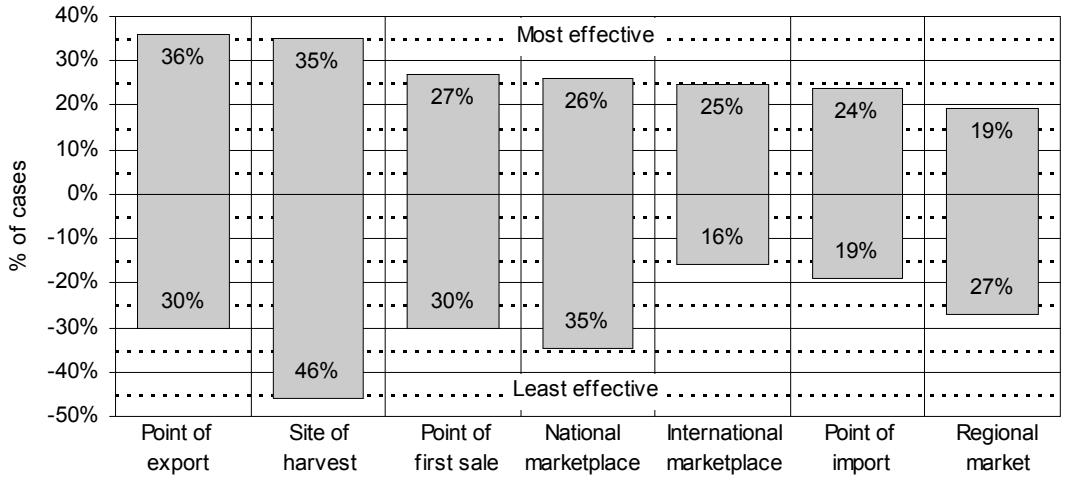
Data expressed as a percentage of responses providing effectiveness scores

4.9 Lessons on enforcement

As is the case with the number and range of laws and regulations relating to the wildlife trade (see Section 0), most experts considered that the level of enforcement of these controls had increased (almost half) or been maintained (over a third) over the past decade. It is, however, discouraging to find that their responses suggest that current enforcement levels remain woefully inadequate. Less than 40% of respondents believed that the likelihood of detection, prosecution, sentencing and penalties had been effective in controlling trade.

Although respondents were asked to comment on the relative effectiveness of enforcement at different locations along the trade chain, the results are not conclusive as regards a single point where enforcement is likely to be most (or least) successful if applied. The fact that responses – both positive and negative – are spread fairly evenly over different points on the trade chain (Figure 15) serves merely to reinforce the observations made elsewhere that the wildlife trade is highly variable between different products and locations, and that interventions are most effective when implemented as mutually reinforcing "packages" that simultaneously target multiple groups, locations and points of sale. This is further underlined by the finding that even when enforcement is considered successful at controlling trade along one route, almost two thirds of experts believed that the trade would merely shift to an alternative route.

Figure 15: Perceptions of enforcement effectiveness at different points in the trade chain



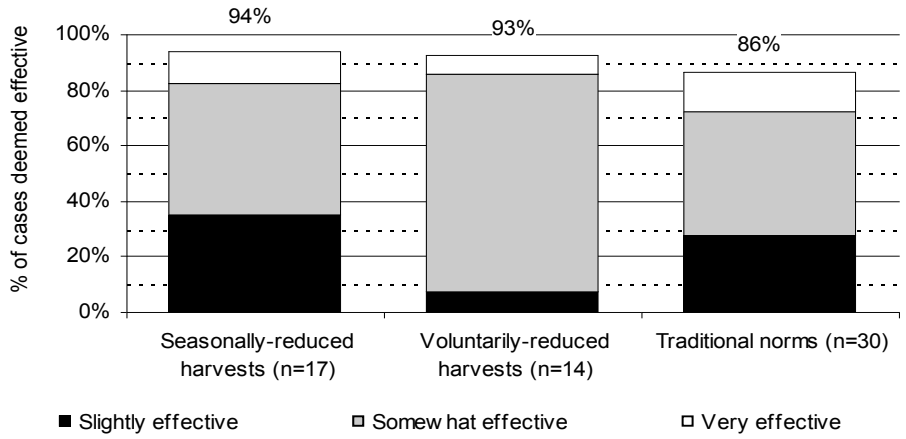
Data expressed as a percentage of all responses (n=89); total of all categories exceeds 100% as question allowed for multiple responses

4.10 The influence of local norms and voluntary agreements

Just under a quarter of experts were aware of such instruments currently operating among harvester communities (a smaller proportion of respondents stated that although such rulings and practices had existed in the past, they were no longer operational).

However, where they were recorded as being present (or where the experts consulted were aware and knowledgeable about their presence), customary norms and traditional practices were deemed to be at least somewhat and in some cases highly effective in regulating the volume of wildlife harvested (Figure 16). A range of other voluntary and non-legally binding agreements were also described by respondents for a minority of cases, and considered to be effective where applied.

Figure 16: Perceived effectiveness of local norms and voluntary agreements



Data expressed as a percentage of responses providing effectiveness scores

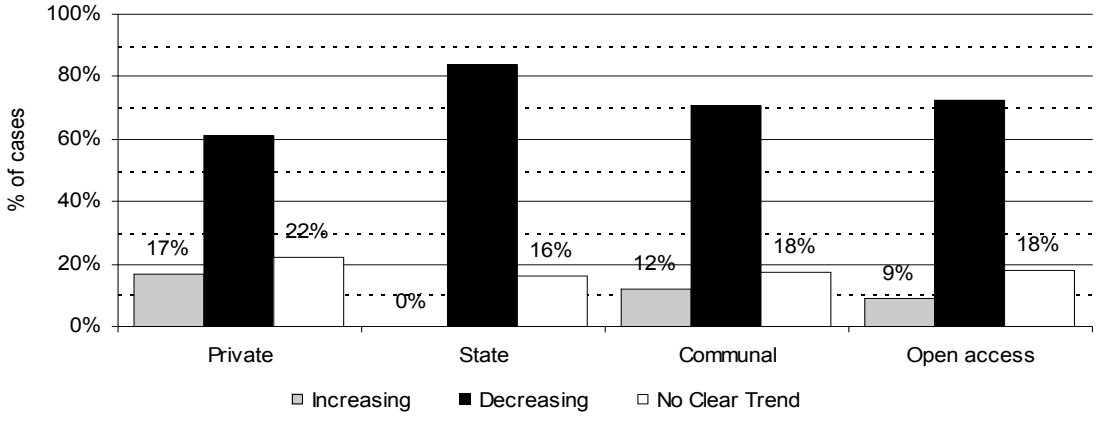
4.11 Changes in community tenure, rights and access

Just under half of experts reported on cases where a change in land tenure had taken place over the last decade, and a quarter stated that there had been changes in the tenure arrangements with regard to use of resources. In line with general trends in the region, the most common change reported was a shift towards the privatisation of formerly communally held or State-owned lands and resources. Experts felt that there had been no effect on wildlife harvesting in half of the instances where changes in tenure were reported, and equal numbers considered harvesting had either declined or increased.

Despite describing a situation where land is increasingly held at the individual or household level, more than half of experts believed that most wildlife continued to be harvested from State lands (including protected areas), and a fifth considered communal lands to be the main source. This observation is supported by the characterisation by two thirds of respondents of wildlife access rights as being insecure (e.g. no formal rights, open access, or common property).

Similarly, experts identified no clear differences between trends in species' abundance in harvesting sites according to tenure: all situations showed a similar negative pattern of decreasing species' abundance (Figure 17). However, there was a slightly higher incidence of observed increases and maintenance of species abundance (and lower perceived incidence of a decline) on private and communal lands.

Figure 17: Perceptions of impact of land tenure on species abundance in harvesting sites



Data expressed as a percentage of all responses (n=89)

4.12 Efforts to strengthen awareness

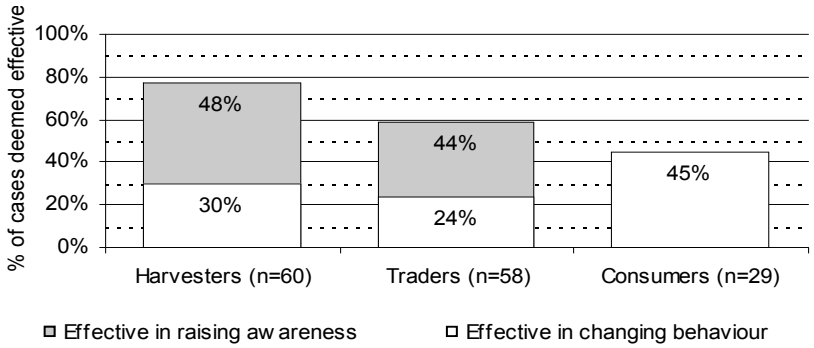
Efforts to strengthen awareness were mentioned by a relatively large proportion of survey respondents. Two thirds of experts reported on efforts to increase awareness of the illegality of the wildlife trade among harvesters and traders, and just over half on interventions to increase awareness of unsustainability and negative conservation impacts. A lesser number, one third, reported on consumer awareness campaigns.

Respondents generally perceived participants in the wildlife trade to have a relatively good awareness of legal and conservation concerns. Approximately a fifth considered that harvesters were unaware of national regulations governing wildlife harvesting trade, and 5% that traders were unaware (three quarters thought that traders were very or mostly aware). Most respondents believed that traders were also aware, although to a lesser degree, of international regulations on wildlife trade. Questionnaires show that experts considered that harvester and trader awareness of harvesting controls was increasing in half of cases and stable in around a third.

Ly Duc, a Vietnamese body-building athlete, one of several celebrities participating in a campaign designed to change consumer attitudes about unsustainable wildlife consumption, launched in Ha Noi, January 2007.
Credit: TRAFFIC/WWF

Where awareness-raising interventions had been applied, survey respondents considered them to be fairly effective in their goal of raising awareness (Figure 18). What is, however, important is that experts believed that increased awareness had not automatically resulted in success in changing people's behaviour – although this approach appears to be slightly more successful for the case of wildlife consumers (experts considered almost half of cases, where applied, to have been successful) than harvesters (nearly a third) and traders (just under a quarter). For consumers, the changes in behaviour resulting from improved awareness may, however, be relatively short-term: experts stated that such changes persisted for a year or more in only half of cases. Survey responses also indicate some variation in the perceived effectiveness of awareness-raising for different species, products, countries and wildlife trade participants.

Figure 18: Perceived effectiveness of awareness campaigns



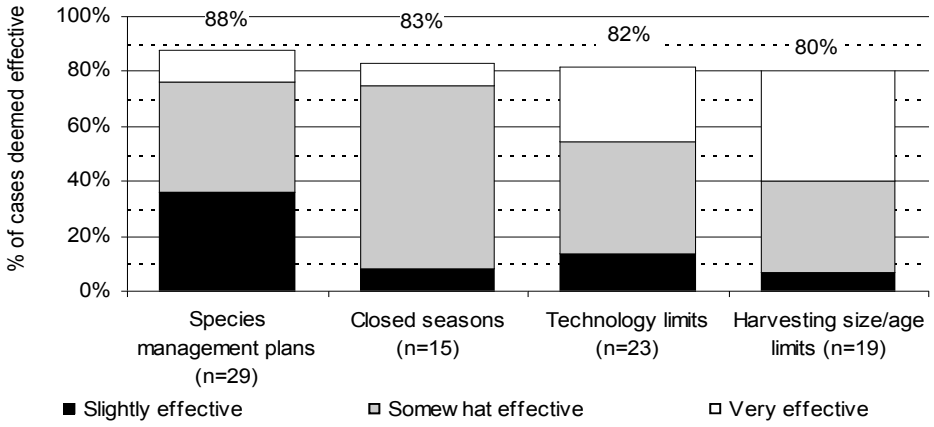
Data expressed as a percentage of responses citing the presence of awareness campaigns; no data available on the perceived effectiveness in raising awareness for consumers

4.13 Resource management interventions

Just over a third of respondents reported on cases where some form of external technical support had been provided to improve harvesting and management practices. These were believed, overall, to have been at least slightly effective in regulating illegal and unsustainable wildlife trade in approximately 70% of cases where applied.

Survey responses covered various forms of resource management interventions that were cited as having been at least slightly effective in the vast majority of cases where they had been applied (Figure 19).

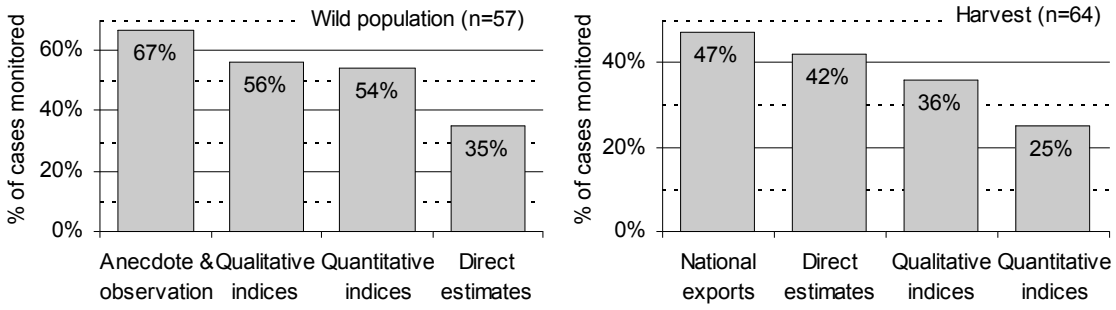
Figure 19: Perceived effectiveness of resource management interventions targeted at wild harvests



Data expressed as a percentage of responses providing effectiveness scores

Around two thirds of the questionnaire responses reviewed cases where some form of monitoring was being carried out on wild populations and harvests. Typically, a combination of methods were stated as being used, with anecdote and observation plus a range of qualitative and quantitative indicators being most commonly applied to monitor wild populations, and monitoring of national exports and use of direct estimates most commonly being applied to harvests (Figure 20).

Figure 20: Types of monitoring methods used



Data expressed as a percentage of responses citing the presence of monitoring; total of all categories exceeds 100% as question allowed for multiple responses

5 RESULTS FROM THE CASE STUDIES: understanding the regional trade in the Tiger, agarwood, tortoises and freshwater turtles

This chapter describes in more detail the regional trade in three taxa: the Tiger (Section 5.1), agarwood (Section 5.2), and tortoises and freshwater turtles (Section 5.3). For each, an overview is provided of conservation status, market dynamics and the trade chain, after which an analysis is made of the effectiveness of wildlife trade interventions, and a summary of key findings and recommendations is presented.

As noted in earlier chapters, it is important to bear in mind in considering the results that the study assessed the perceived effectiveness of different intervention approaches as they are currently applied, rather than the effectiveness of these same interventions if they were fully implemented/enforced.

5.1 Tiger

Background

There are three extant Tiger subspecies in south-east Asia – the Indochinese Tiger *Panthera tigris corbetti*, Malayan Tiger *P. t. jacksoni*, and Sumatran Tiger *P. t. sumatrae*. Two other subspecies historically found in south-east Asia, both endemic subspecies from Indonesia, *P. t. sondaica and P. t. balica,* are now recognised as extinct. The IUCN Red List of Threatened Species categorises the Tiger as Endangered, and the species is considered to be facing a very high risk of extinction in the wild (IUCN, 2007). As of 1998, it was estimated that fewer than 7000 Tigers remained in the wild, with approximately 9000 living in captivity (Seidensticker *et al.*, 1999). The effective population size has been re-estimated to number fewer than 2500 adults in the wild (IUCN/SSC Cat Specialist Group, 2002).

Tigers are threatened by loss of habitat and prey species. However, illegal hunting for commercial trade poses the greatest threat to the survival of the species. Other human-animal conflict also leads to the killing of Tigers, but killing to meet the demands of illegal trade has the greatest potential to wipe-out wild populations relatively quickly (Nowell and Jackson, 1996). The most common factor driving the harvesting of Tigers is the use of bones and other body parts in traditional medicine, especially in China (Nowell, 2000), but also in other countries such as Republic of Korea, Singapore, Malaysia, Vietnam and Japan (Shepherd and Magnus, 2004). In Chinese and Vietnamese cultures this includes the demand for Tiger meat, which is considered a health tonic. In some Malaysian restaurants, the meat is offered as a luxury or as a novelty food (TRAFFIC Southeast Asia, in prep.). While Tiger parts are also traded for ornamental purposes, this is generally thought to be less common than in the past, with the main exception being Tibet where the demand for Tiger pelts for use in traditional clothing persisted as a key factor driving the hunting of this species in Nepal (Dinerstein *et al.*, 2007).

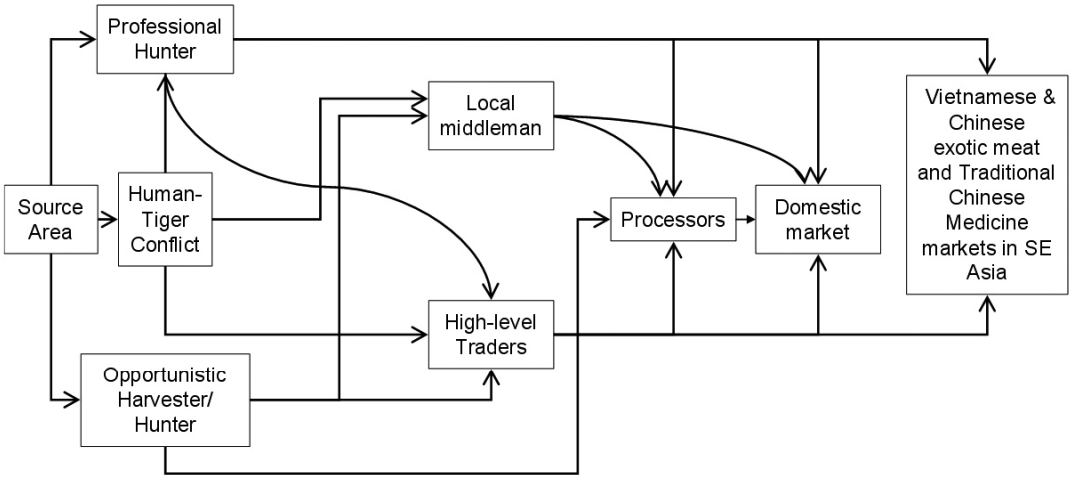
In many Asian countries with rapidly growing economies, and increasing purchasing power among parts of their populations, there is increasing evidence of persistent demand for Tiger and other wild animal products. One example includes a recent case in Vietnam where a woman and her accomplices were apprehended for illegally storing two chopped-up Tigers in a refrigerator for use in the preparation of traditional medicine. While the origins are uncertain, Vietnamese authorities have suggested that the Tigers came from Myanmar or Lao PDR, adding weight to the assumption that countries such as Malaysia, Myanmar, Cambodia, Lao PDR and other Tiger range States supply East Asian and Vietnamese consumer markets. There has been some evidence in recent years, however, that demand for medicines claiming to contain Tiger products has been slowly declining (Nowell, 2000), with the open availability of

Tiger products in China's domestic market for traditional medicines considered to have been significantly reduced through a combination of regulatory measures and awareness campaigns (Nowell and Xu, 2007). However, the proposed opening up of Tiger product sales from Tiger farms in China, particularly tonic wine for more general consumption would be likely to reverse this trend (Nowell and Xu, 2007). Despite declines in some markets, there was no evidence of a major reduction in Tiger poaching at the turn of the century (Nowell, 2000). However, more recent data based on assessments in Tiger Conservation Landscapes (TCLs) indicates that commercial poaching pressure on many Tiger populations has declined as a result of the domestic ban on trade in Tiger products in China (IUCN/SSC Cat Specialist Group, 2007), and as discussed in Nowell and Xu (2007), based on the work of Sanderson *et al.* (2006). However, poaching pressure remains high in some areas, e.g. in Sumatra, Malaysia and Myanmar.

Large areas of contiguous habitat and a substantial prey base are required for Tigers to survive, and thus Tiger populations have also been negatively affected by illegal and unsustainable hunting of prey species, considered the second-most severe threat according to Sanderson *et al.* (2006). Tigers are also threatened by habitat conversion and degradation, which causes declines in prey base as well. In Indochina (Vietnam, Lao PDR and Cambodia), the potential for this trend to be exacerbated is amplified by the imminent transnational economic corridors where large-scale infrastructure development including the upgrading and building of new roads which, if not managed carefully, is likely to further degrade and fragment important Tiger conservation landscapes (e.g. Shepherd *et al.*, 2007). Tiger habitat has decreased by 40% since 1995 and Tigers now occupy only 7% of their historical range (Dinerstein *et al.*, 2006). On Sumatra, the last island holding wild Tigers in Indonesia, the prey base and suitable habitat are rapidly declining (Shepherd and Magnus, 2004). It is worth noting, however, that Tigers recover quickly where sufficient protection is provided to enable prey base recovery and Tigers to live without threat of hunting (Dinerstein *et al.*, 2006).

Tigers have been identified as surviving in 76 TCLs, with a worst case scenario of 543 forest fragments across 13 countries holding remnant populations. About half of these TCLs are large enough to support an estimated 100 Tigers or more, with the largest seven offering the potential to support 500 Tigers or more (Dinerstein *et al.*, 2006).

Figure 21: Trade flow diagram for Tigers



Trade structures

The majority of Tigers are hunted by professional or semi-professional hunters who sell directly to traders (Nowell, 2000; Shepherd and Magnus, 2004). A significant portion of Tigers are killed as a result of conflict with or for profit by local communities with sale often to middlemen or smaller traders,

although as indicated above, the majority are killed deliberately for profit (Nowell, 2000; Shepherd and Magnus, 2004; TRAFFIC Southeast Asia, in prep.). The above trade chain diagram (Figure 21) illustrates the general flow from source to consumer of a Tiger and Tiger parts and derivatives as it relates to the four key countries (Cambodia, Indonesia, Lao PDR and Vietnam) in which this study was undertaken. It is important to note that this trade chain diagram is only generic and as such may not apply exactly in this manner across the region.

Source areas

While exact numbers are not known, now out-dated estimates from the 1980s suggested that there were approximately 400-500 Sumatran Tigers remaining in Indonesia, although it is likely that there are fewer now. Accurate numbers of wild Indochinese Tigers are not available but one dated compilation of estimates ranged from 1050-1750 (Jackson, 1993). More recent but still relatively outdated reviews (Duckworth and Hedges, 1998; Rabinowitz, 1999) have not included population estimates as the data were simply not available. In Indochina, where Tiger populations are so low, it is probably better to talk about the number of landscapes that may, if protected, provide sufficient resources for Tigers to survive. According to Dinerstein *et al.* (2006) this is 12, with only four landscapes with the potential for over 100 Tigers to survive, providing that they are adequately protected. India and Nepal are now the key source areas supplying East Asian markets.

Actors

Harvesters

Mostly professional or semi-professional male hunters, but also include, to a lesser extent, opportunistic hunting and revenge killing by locals in response to conflict with Tiger populations.

Traders

Includes local middlemen where Tigers are caught by local hunters, but is dominated by high-level traders who deal directly to local processors and retailers or internationally.

Processors

Not widespread and largely consist of small-scale family-owned and -operated businesses processing for the traditional medicine market. This is particularly the case in Vietnam, but in other countries processors and retailers are usually one and the same. In Indonesia, where Tiger-based medicines are rarely used, the raw parts are exported, and are only partially processed locally (e.g. skinned, or with bones removed and sent separately).

Wild meat stall, Vietnam.
Credit: TRAFFIC

Retailers

Usually established traditional medicine businesses or restaurants that supply a demand in major urban centres, servicing demand from mostly ethnic Chinese and Vietnamese people, although in Sumatra, ethnic Indonesian people carry out much of the trade. Retailers include black-market or underground dealers who supply a limited and discrete client base. Demand includes traditional medicine and "exotic meat". Retailers usually operate in centres where enforcement is weak, and in some cases, such as in places in North Sumatra, Indonesia (Shepherd and Magnus, 2004), Tiger parts are sold openly.

Consumers
Usually middle- to high-income earners and in some cases, such as in Vietnam, consumption of wild meat generally is particularly associated with high-ranking government officials and the business community (Venkataraman, 2007).

Interventions

Livelihood-based interventions
Given that there are some reports of opportunistic hunting of Tigers by local communities, it would seem fair to assume that the species is recognised as a potential source of income for the rural poor. However, given low population densities, the dangers associated with hunting, and the potential of being caught and punished, it would seem to be very unlikely that local communities would depend to any significant extent on the poaching of Tigers as a means of supporting their livelihoods. Livelihood-based interventions aimed specifically at reducing harvesting of Tigers were considered to be largely unsuccessful. This is likely to be in line with the point made above suggesting that, by and large, local communities do not depend on harvesting of Tigers as an ongoing stable source of income, although Tigers may sometimes be hunted by local communities either opportunistically or to mitigate a conflict situation.

Those involved in the hunting of Tigers were said to be from a variety of income groups, including the poorest third of households. It is worth considering that, as high prices are paid for Tigers, those involved in hunting and trading of Tigers are less likely to be poor. The majority of Tiger hunters are professionals, often working as part of organised and well-financed teams.

Market-based interventions
Very few responses were recorded for Tigers with regards to the effectiveness of market-based interventions, including the effectiveness of artificially manipulated market prices, certification, and tax incentives – reflecting the fact that this is an entirely illegal trade.

Legislation and regulations
Tigers have been included in Appendix I of CITES since 1976. Further action was taken by CITES members in 1994, when they called for expanded Tiger conservation efforts, including the establishment of internal bans on trade in Tigers and Tiger parts.

CITES Resolution Conf. 12.5, adopted by consensus, reinforced these earlier measures by asking Parties to prohibit trade in Tiger parts and derivatives, both internationally and domestically, even from captive-bred specimens. Despite this, there has been recent interest in some countries, notably China and to a more limited extent Thailand and Vietnam, to legalise domestic Tiger trade from farmed specimens. However, there is no evidence that legalising such trade would reduce the pressure on wild populations, given such factors as the high costs involved in farming as compared to poaching, the likely premium value of wild-sourced products, and the difficulty in distinguishing the origin of products once on the market (Anon., 2007).

Despite internationally-recognised CITES protection, and protection at national levels, poaching networks in the region are generally well developed and professional, particularly where the trade in Tigers is concerned. Therefore, reducing the poaching of Tigers is a significant challenge. For example, in Indonesia, despite the establishment of specialised units by the government to reduce Tiger poaching, TRAFFIC's research indicates that Tigers in Sumatra continue to be poached on a large scale and Tiger parts are widely available in markets on the island (Shepherd and Magnus, 2004; Ng and Nemora, 2008).

Furthermore, the results of the questionnaire used for this study indicate that there is little consensus regarding the effectiveness of CITES as an intervention with responses representing a spread from very effective to not successful. By contrast, national level harvest legislation was generally considered to be somewhat to very successful by those that responded, and is consistent with the fact that in all three Indochinese countries and Indonesia there is relatively strong legislation in place to protect Tigers. This corresponds with the conclusions of Nowell and Xu (2007), based on data provided in Sanderson *et al.* (2006), that while international trade bans have helped conserve wild Tigers, national trade bans appear to have been even more effective. However, given the open availability of Tiger parts in Indonesia, and the continual decline of wild Tiger populations in all four countries, it is not clear if national legislation is effective in a practical sense, or if awareness alone of national legislation is high, but enforcement is still lacking.

Zoning and establishment of protected areas for Tiger conservation was considered somewhat to slightly effective with no response indicating that it was very effective. This is largely consistent with the responses for other taxa, such as tortoises and freshwater turtles and agarwood, as well as consistent with the trend across the four countries. This is not entirely surprising given than major causes in Tiger population decline include habitat loss and fragmentation and weak enforcement particularly at the protected area level (Dinerstein *et al.*, 2007).

In Indochina, where bilateral wildlife trade/conservation agreements exist between Vietnam and Lao PDR, for example, they are not focused on Tigers specifically and are largely considered to be ineffective because of a lack of funding and resources allocated to their implementation. Worth noting, however, is the response to traditional norms which suggests that respondents believed this measure to be somewhat successful and as such may be worth investigating further.

Awareness-raising

Generally, efforts to raise awareness about the plight of Tigers in Indochina and Indonesia have been part of broader education campaigns or elements of a particular site-based conservation project. Most conservation organisations have raised the issue in one form or another, but there has yet to be a concerted campaign directed solely at the various stakeholder groups involved in the hunting, trading, processing and consuming of Tigers.

Awareness-raising in the four target countries was largely considered to be unsuccessful as an intervention aimed at altering consumer behaviour [although it should be noted that, in Vietnam, at least, consumer awareness that Tigers are endangered is very high (Venkataraman, 2007)]. At the harvester level it was the other way around, with most respondents recording success in increasing awareness of harvesters. This was also true for efforts at raising awareness among Tiger traders, with most respondents indicating that this was a successful approach. However, it is worth noting that while awareness-raising efforts aimed at reducing the consumption of Tiger products in China, in combination with regulatory approaches, is generally considered to have been successful according to a recent study by Nowell and Xu (2007), awareness-raising has not seemed to have had a noticeable effect on the levels of Tiger poaching in Indochina or Indonesia, where these animals are often sourced.

Improved resource management

Despite global investment in Tiger conservation by NGOs of over USD31 million between 1998 and 2003, populations are still said to be declining (Dinerstein *et al.*, 2007). One of the most successful efforts aimed at conserving Tigers has been in the Russian Federation, where strong enforcement has led to a significant recovery of the population. Enforcement has focused on protection of Tigers and their prey base in the wild, as well as anti-trafficking operations (Galster and Eliot, 1999). This has been done in combination with landscape-scale conservation initiatives (Miquelle *et al.*, 1999).

In Indochina, a number of initiatives are underway to improve landscape connectivity not only for Tigers but for the conservation of other species as well. However, these are still in the very early stages of development and as yet do not offer immediate potential to enhance the survival of Tigers across these landscapes. In terms of ongoing activities in Indochina and Indonesia aimed at Tiger conservation, limited information was available on the impact of improved resource management; suggesting that very few respondents had provided input or answered questions related to whether projects focussing on conservation resource management had had positive outcomes specifically in relation to Tiger conservation. Where responses were provided, and even though they were limited, the indication was that it was possible to achieve some moderate success in supporting Tiger conservation through resource management projects.

Non-legally binding agreements were only considered to be slightly effective, while species management plans for Tigers were shown to be at least slightly effective with approximately a quarter of respondents believing this method to be very effective.

Summary

Significant levels of funding have already been invested in the conservation of Tigers across their range, yet populations are still declining. Building on the body of knowledge and experience from conservation efforts to date, and using the outcomes of the study questionnaire, some important next steps can be identified.

Law enforcement efforts need to be increased throughout the various levels of the Tiger trade chain including among poachers/hunters, professional traders, processors, retailers, and consumers. In addition, stronger law enforcement on the ground in key locations is required to enable prey species populations and consequently Tiger populations to recover. Law enforcement activities need to be extended to enforcing controls on the sale of illegally harvested wildlife in restaurants in Indochina and in consumer countries such as China and Malaysia, with a particular focus on Tiger prey species, in order that the recovery of Tiger populations is not undermined by a lack of prey. It is also important that existing laws and policies banning trade in Tiger products, which are largely in place and generally well-developed in most countries, are maintained. Where such provisions do not exist, priority should be placed on integrating such bans into national level legislation.

Customs office on the Lao PDR/Cambodia border.
Credit: TRAFFIC/Emily Hicks

Multi-agency task forces, involving police, Customs and wildlife/forest officers, should be established to ensure that gaps in jurisdiction, power and resources are reduced to allow focus on the organised nature of the wildlife trade. These national and local-level task forces can then provide the building blocks for regional efforts to combat illegal trafficking under the Association of Southeast Asian Nations (ASEAN) Wildlife Enforcement Network.

Efforts to raise awareness among harvesters and traders should be continued, as these approaches have generally been considered to have been effective. However, as less success has

been recorded in terms of targeting consumers in some countries, new and innovative approaches and strategies may be required, especially in Indochina and Indonesia where significant consumer markets exist and where only limited awareness campaigns aimed at reducing Tiger product consumption have been initiated. This may include the use of mass media and education campaigns over the long term aimed at reducing the demand for Tiger products.

Recognising that the challenge of conserving Tigers from the threat of illegal trade is embedded in the socio-economic, political, and cultural complexity of the particular region in question, a unique and appropriate blend of interventions needs to be designed that takes into account this complexity.

5.2 Agarwood

Background

Agarwood, is a NTFP valued for its aromatic, medicinal and cultural uses, and is also known as eaglewood, aloeswood, *gaharu* (Malay), *chen xiang* (Chinese), *jin-koh* (Japanese), *oudh* (Arabic) *mai kritsana* (Thai), and *tram huong* (Vietnamese) among many other vernacular and trade names (Barden *et al.*, 2000). Primarily sourced from two tree genera, *Aquilaria* and *Gyrinops*, agarwood's aromatic and medicinal properties derive from resinous deposits in the tree's phloem that probably are produced as a response to wounding or infection – but this will not occur in every tree. Wild populations of agarwood trees are found in the lowland and montane tropical forests, with habitat varying for different species, and are distributed from north-east India eastwards through continental south-east Asia and the Indo-Malesian bio-geographic realm as far east as Papua New Guinea, and north to the south-east provinces of China. There are 13 range States (Bangladesh, Brunei Darussalam, China, Indonesia, India, Cambodia, Lao PDR, Myanmar, Malaysia, Papua New Guinea, Singapore, Thailand, Vietnam). All range States (excepting Singapore, which does not allow export of its native species) share a common characteristic of declining wild tree populations as a result of persistent over-harvesting and increasing habitat conversion (TRAFFIC Southeast Asia, 2004).

Eight species in the genus *Aquilaria* have been included in the IUCN Red List of Threatened Species, seven of which are classified as Vulnerable (including *A. malaccensis*), and one (*A. crassna*) classified as Critically Endangered (IUCN, 2007). *Aquilaria crassna* is historically the most common agarwood-producing species in three of the four target countries – Cambodia, Lao PDR and Vietnam – but is not found in Indonesia.

Collection is largely done by organised groups of male harvesters who spend various lengths of time in the forest searching for agarwood – often involving destructive harvest of the tree (although harvesters do not necessarily cut down every tree to determine whether any resinous deposits are inside the otherwise valueless white wood). The price earned by harvesting communities for sale of agarwood, compared to other forest products makes it a significant contributor to livelihoods (Wollenberg, 2001). Where wild population estimates for agarwood-producing species have been made (e.g. Indonesia) these are only to genus level and not for individual species (Soehartono and Newton, 2000). Anecdotal reports from traders and harvesters suggest that in all range States, there is a decline in both quality and quantity of harvestable wild agarwood, and that there is much more time required on harvesting trips in order to find comparable returns. Prices per kilogramme, however, have generally increased with levels of scarce supply, particularly for higher quality grades.

Since 2005, international trade in all *Aquilaria* and *Gyrinops* species has been controlled as a result of the listing of these two genera in CITES Appendix II, which requires export (and re-export) permits to be issued by producer and trading countries. The CITES Appendix-II listing also requires a sustainability assessment known as a "non-detriment finding" to be conducted, and for legal provenance to be guaranteed in order for a permit to be issued. From 1995 to 2004, only one species, *Aquilaria malaccensis*, was listed in CITES Appendix II, which generated a limited data set on legal international trade while at the same time leading to several complications with identification. All producer countries require permits to be issued for any legal domestic harvest, as well as export, of wild stocks, but this is not generally enforced with any great efficacy. Many countries, particularly Vietnam, Lao PDR and Thailand, have recently invested in development of cultivated agarwood production from plantations, while in north-east India, local producers have been cultivating agarwood in "home gardens" for over 50 years. As yet, cultivated agarwood stocks are not able to supply large volumes, nor the higher grades or quality of agarwood product, but quality has begun to improve with the application of technology to induce resin formation.

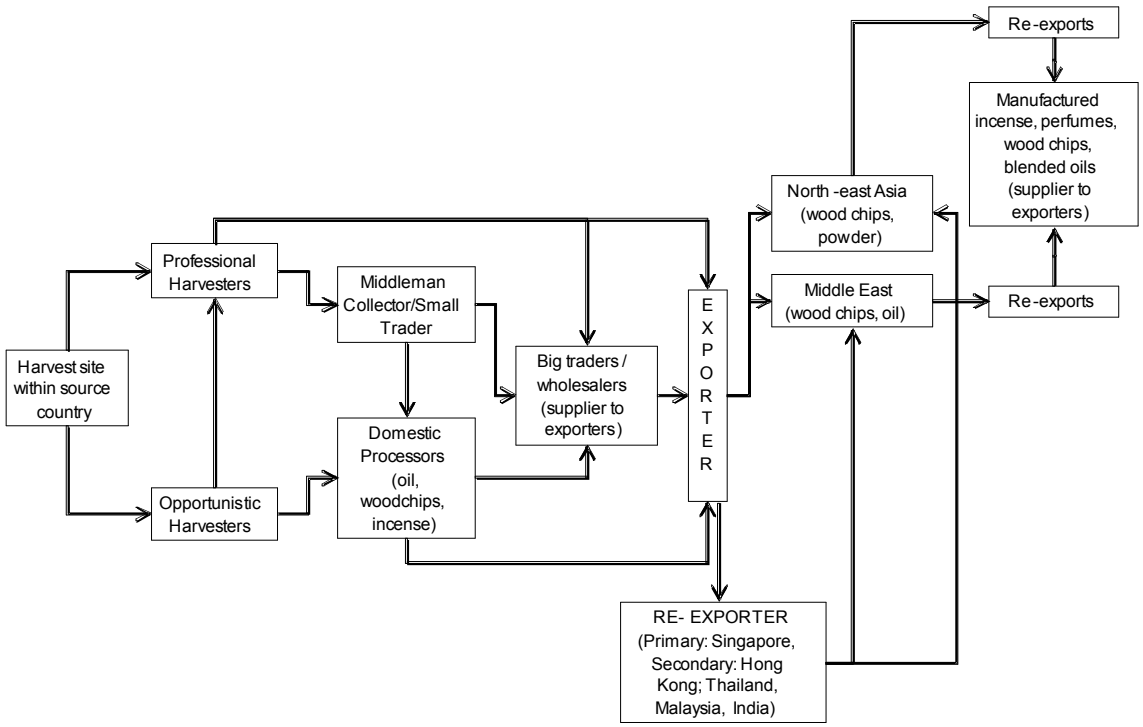
Trade flows

Two geographic regions form the major end-use markets for agarwood: Arabic-speaking countries of the Middle East or west Asia, and a cluster of consumer cultures in north-east Asia including Japan, Republic of Korea and parts of China. The Middle East market, with Saudi Arabia and the United Arab Emirates the dominant importing countries, is largely driven by demand for cultural and aromatic use of agarwood in the form of wood chips (for burning), essential oil (for perfumery) and manufactured incense and blended perfumes. In north-east Asia, however, there is considerable demand for agarwood (in the form of wood chips, pieces, powder) in traditional medical applications, as well as for a range of aromatic products including manufactured incense, and the use of agarwood in largely Buddhist religious rituals (Compton and Ishihara, 2004). Very little demand for agarwood oil exists in north-east Asia at the present time, which contrasts with the Middle East. Overall trade data is reliant on reported CITES trade since 1995 and national Customs statistics, which together suggest that Taiwan (China) is the most significant market destination (TRAFFIC East Asia, 2004).

Small in-country demand may occur in producer countries, but it is fair to say that over 95% of harvested agarwood is exported in raw or processed form from range States, acknowledging the role of re-exporting centres as well as direct source-to-market trade, to supply either the Middle East or north-east Asia. Prices in end use markets range up to several thousand US dollars per kilogramme, depending on the wood's oleoresin content, country of origin, structure and aroma, among other characteristics.

Singapore plays the most significant role as a trading entrepot from south-east Asia, particularly for re-exports of agarwood coming from Indonesia and Malaysia. Historically Hong Kong has played a similar role in supplying north-east Asian market demand, but this has declined in the past 10 years. Bangkok is also significant as a trade hub for agarwood sourced from continental south-east Asia, exporting wood sourced not only from Thailand but also from Myanmar, Lao PDR, Cambodia and Malaysia (Compton and Ishihara, 2004). In recent years Dubai in the United Arab Emirates has increased in its importance as a re-export hub to surrounding Arabian Gulf countries including Saudi Arabia, Bahrain, Kuwait and Qatar (Antonopolou *et al.*, in prep.).

Figure 22: Trade flow diagram for Agarwood



The above trade chain diagram (Figure 22) illustrates the general steps and actors in the flow from harvest source to end-consumer market for agarwood products in trade from the four key countries (Cambodia, Indonesia, Lao PDR and Vietnam) in which this study was undertaken. It is important to note that this trade chain diagram is generic by nature and may not apply exactly in the same manner across the entire geographic region.

Interventions

In the four target countries, a variety of interventions have been applied in the past 10 years, mostly focused on legislation and regulation (national harvest controls, quotas for harvest and trade, and international trade regulations under CITES), and some examples of improved resource management.

Livelihood-based interventions

Among the four focal countries, plantations have been established in Lao PDR and Vietnam, in particular, these plantations being at a variety of scales from home gardens and mixed smallholdings through to extensive monoculture plantations. These initiatives have partly been rationalised as encouraging livelihood diversification and economic development in rural areas. In the future, cultivated agarwood supplies could have impacts on overall resource management but at present there is no significant level of supply from plantations in these four countries. The effectiveness of interventions in terms of poverty alleviation specifically for agarwood-harvesting communities were considered somewhat successful by expert respondents to this study, while there was a lack of certainty on whether any alternative livelihood options had reduced wild harvesting of this product. Jensen and Meilby (2006), however, note that, based on studies of agarwood income determinants in Lao PDR, harvesters obtain a comparatively high proportion (20% of the final sale price at national level) of the resource rent compared to other NTFPs – which suggests significant potential for further investigation on targeting of livelihood-based interventions.

Market-based interventions

At the present time, the global agarwood market is characterised by a lack of transparency, and therefore market understanding is largely asymmetric. While there is a lack of formal policies in place to control the market, there were mixed perceptions from survey respondents on the effectiveness of any current interventions in the four target countries to fix prices. Certification of products or production systems has yet to have any impact on agarwood harvest and trade, and tax incentives were not rated to have had any discernible effect. There have been some recent efforts at product substitution, particularly from Indonesia, impregnating white (normally valueless) wood, to create a product known in the market as "black magic wood" or BMW. While this product has created a low-value market niche in the Middle East, it has not affected harvesting patterns, unless possibly to increase harvesting of uninfected trees.

Legislation and regulations

Internationally, the CITES-listing of a single species, *Aquilaria malaccensis,* in 1995 affected only Indonesia of the four target countries of this study, as Cambodia, Lao PDR and Vietnam are not range States for that species. The subsequent listing of all *Aquilaria* species, along with the related genus *Gyrinops*, however, brought uniformity of international trade regulations to all four countries (and other CITES Parties) since 2005. This includes the requirement for a sustainability assessment known as a CITES "non-detriment finding", which as yet has only been addressed in part by Indonesia. The effectiveness of CITES towards regulating international agarwood trade, however, was rated equally as very, slightly, or not effective by expert respondents to this study. Annual export quotas have been set in Indonesia since 1995 at national level, and divided between geographic regions within the archipelago (CITES Management Authority of Indonesia, 2005). In Lao PDR, annual quotas are set without reference to inventory data or resource status (Jensen, 2006). Restrictions on export exist in Cambodia where no

export is permitted, in Lao PDR, where only processed material is allowed to be exported, and in Vietnam, it is considered that no wild populations remain outside protected areas. Wild harvesting rights by villagers in Lao PDR are dependent on permissions granted to a processor, who is often a wholesaler, and therefore any harvesting without this connection to processing permission is thus illegal (Jensen, 2006). Licences or permit systems were rated as very or somewhat effective by more than half of respondents, as were the effectiveness of national harvest controls, in reducing harvest volumes, while over 90% of respondents on agarwood considered local norms to have had a positive effect on reducing harvest. All four countries, as members of ASEAN, have agreed to a *Regional Action Plan on Trade in Wild Fauna and Flora 2005-2010*, which includes objectives to improve regulatory controls, enforcement networking, scientific information sharing and involvement of the private sector. While this has much potential, its application to agarwood specifically has yet to be realised, an uncertainty which was reflected by the survey respondents when considering the effectiveness of regional agreements.

Selling agarwood, Vietnam.
Credit: TRAFFIC/Steven Broad

Awareness-raising

There has been very little targeted outreach to agarwood trade participants, whether harvesters, traders or consumers, to encourage legality and sustainability of the trade. Exceptions have occurred, however, in Indonesia with regular meetings between government regulators and the members of the Indonesian Gaharu (agarwood) Traders Association, and more widely with two global forums under the banner of the International Agarwood Conference (2003 and 2007), as well as a CITES Agarwood Experts Group meeting in 2006, which brought together industry representatives with scientists and government regulators. In Lao PDR and Vietnam, encouragement to invest in agarwood plantation development has raised the awareness of the tree's potential as an economic resource, which has led to incidences of individuals and companies beginning to plant seedlings at various scales. Some new players have speculatively entered the market as a result. In the responses from experts questioned by this study, there was a balance between perceptions about whether any effectiveness on harvest, trade or consumption had been achieved through awareness-raising with actors across these three segments of the trade chain. This suggests that further investigation should be conducted.

Improved resource management

A majority of expert respondents to this study assessed external technical support to resource harvesting and management as having been at least slightly effective. For agarwood, the major intervention has been the increase in the application of technology to the production system in the past 10 years. Of the target countries, researchers in Indonesia, Lao PDR and Vietnam have conducted trials both in the wild and in plantations with various techniques to induce increased and faster resin formation, with varying degrees of success. Depending on the quality of the resultant oleoresin deposits in the phloem of the trees, the

value of wood to be harvested is likely to increase in a shorter period of time. This has happened alongside a boom in plantation establishment in Lao PDR and Vietnam. However, at the same time, the market is still predominantly supplied by wild-harvested product – and plantation or cultivated product is not yet competitive at commercial volumes. The effectiveness of management plans for agarwood specifically was rated at least somewhat effective by 90% of expert respondents to this survey, while the effectiveness of voluntary reduction in harvests was rated somewhat effective by expert respondents to this study. In Indonesia, where national export quotas have been in place for more than 10 years, quotas were first reduced, and then maintained at the same level, following interactions between CITES, forestry and industry stakeholders. Consultation with Indonesian agarwood industry representatives by TRAFFIC, however, suggests that although quotas may control legal levels of export, harvest continues all year round to levels far beyond an annual quota – creating huge stockpiles (over 350 t registered at the beginning of 2007; CITES, 2007).

Summary

The balance between management interventions to promote legality and sustainability of wild harvest, and promoting sustainable production from plantations, needs to be carefully monitored. Currently the business investment interests in plantation production far outweigh the attention being paid to the conservation of, and managed extraction from, remaining wild populations. This could have potentially negative repercussions in the future for genetic diversity and therefore quality of agarwood-producing trees if mother trees and seed stock are not secured. Management plans that acknowledge agarwood as a key species in overall forest management and development strategies need to be supported by more efficient law enforcement and clearly defined tenure rights, particularly as trees are selectively targeted wherever they are found, whether in protected areas or other forested lands. In addition, agarwood harvesting is often the vector for incursions into protected areas, which impacts other species of wild plants and animals, as organised harvesters may operate illegally for several weeks or months on a single expedition (Anon., 2006). The greatest gap to the effectiveness of interventions for legality and sustainability at this point in time may be the opacity of the trade chain and the asymmetric information flow between harvester→trader→consumer, including government regulatory agencies.

With the consistent reports of decline of wild stocks, in both quality and harvest per unit effort, and probably low genetic variation in plantings, emergency interventions focused on awareness-raising, legislation and regulation, and resource management need to be made if legal and sustainable trade from the wild is to remain a possibility. Compulsory registration of trade participants may be one way to combat the lack of control over the way the industry is functioning relative to sustainable harvest levels and adherence to regulatory guidelines. Clear government policies on harvest and trade management are needed in order to ensure that stakeholders are supported by positive economic incentives and therefore themselves are at least part beneficiaries from the management of the production system. Better implementation and enforcement of existing laws and policies in the countries of origin will be essential to conserve viable wild populations. As *de facto* open access natural resources such as agarwood are prone to over-exploitation and unsustainable harvest, strong State control may be crucial to maintain the sustainability of its use (Soehartono and Newton, 2002). In theory, the price per kilogramme of this resource could provide the necessary incentives to institute substantially improved management of supply, and create great potential for socio-economic benefit in producer countries. However, as noted by Wollenberg (2001), it is necessary to consider several factors in tandem when analysing incentives for sustainable management by harvesting communities.

In consumer countries, the current lack of awareness about where the end-product originates from, and the threats faced by remaining wild agarwood populations, needs to be addressed in order to change patterns of demand. There may be opportunities in both the Middle East (e.g. United Arab Emirates, Saudi Arabia) and north-east Asia (Japan, Republic of Korea, Taiwan (China)) to increase the

understanding of end-consumers, traders and retailers, and government regulators to institute a more transparent industry. Ideally the demand for high-quality wild product could be matched through ethical investment from consumer markets into site-based production systems in range States, which could in turn catalyse best-practice sourcing parameters that would support legality and sustainability.

5.3 Tortoises and freshwater turtles

Background

Tortoises and freshwater turtles are traded for a variety of purposes, including for use as meat, ingredients in traditional medicines and as pets. Illegal and unsustainable trade in these species in south-east Asia and elsewhere has resulted in many species becoming threatened (Compton, 2000; Lopez and Schoppe, 2004). Currently, 27 tortoise and freshwater turtle species are recognised to be native to Indochina, and at least 29 species are native to Indonesia (Samedi and Iskandar, 2000; van Dijk, 2000; Auliya, 2007). Of the 29 species occurring in Indonesia, 27 are included in the IUCN Red List of Threatened Species (IUCN, 2007).

Virtually all of the tortoise and freshwater turtle species of Indochina and Indonesia are involved in international trade. Softshell turtles are primarily traded for consumption as meat and "tonic foods" in traditional medicine, e.g. Asiatic Softshell Turtle *Amyda cartilaginea* and Malayan Softshell Turtle *Dogania subplana.* Hard-shelled taxa are harvested for consumption, use in traditional medicines and as pets. Most hard-shelled turtles and many softshell turtles are exported to China, while wild-caught soft-shell turtles commonly end up in domestic markets of Indochina, notably Southeast Asian Softshell Turtle (D. Hendrie, Wildlife Conservation Society, *in litt*. to S. Warne, TRAFFIC Southeast Asia, 2007). Species traded for pets are often sold to markets in the European Union (EU), USA and Japan (Shepherd and Ibarrondo, 2005), and increasingly in urban market centres in south-east Asia (e.g. Jakarta, Bangkok, Kuala Lumpur) as well (Nijman and Shepherd, 2007). As species become increasingly rare, or are given protected status, there is evidence that the demand actually increases, as has been shown by the trade in Roti Island Snake-necked Turtles *Chelodina mccordi*, a threatened Indonesian endemic (Shepherd and Nijman, 2007).

Freshwater turtles seized in Vietnam.
Credit: TRAFFIC

Particularly rare and endemic species of Indonesia are in demand for the international pet trade, e.g., Roti Island Snake-necked Turtle, Sulawesi Forest Turtle *Leucocephalon yuwonoi* and the Pig-nosed Turtle *Carettochelys insculpta.* This applies also to several species from Indochina: Three-striped Box Turtle *Cuora trifasciata,* Big-headed Turtle *Platysternon megacephalum* and Vietnamese Pond Turtle *Mauremys annamensis.* Subsistence use and consumption of turtles in remote areas with limited access to markets may threaten certain species such as Impressed Tortoise *Manouria impressa,* native to continental south-east Asia (Auliya, 2007; D. Hendrie, Wildlife Conservation Society, *in litt*. to S. Warne, TRAFFIC Southeast Asia, 2007), although the bulk of tortoises and freshwater turtles harvested for consumption from the four target countries are exported. For example, in late 1999, approximately 25 t of tortoises and freshwater turtles were being exported per week from North Sumatra, Indonesia (Shepherd, 2000). Quantities have since declined and dealers claim that obtaining supplies is becoming increasingly difficult because of declines in populations.

The impact of commercial trade on south-east Asia's tortoise and freshwater turtle species was already evident by the late 1990s (van Dijk *et al.*, 2000). Increasing demand from China, where local populations were severely depleted, pushed harvesting into other countries in Asia, including Vietnam, Lao PDR, Cambodia and Indonesia (van Dijk *et al.*, 2000). In many cases, established traders (e.g. reptile skin

traders in Sumatra and Kalimantan) simply expanded their business to embrace the lucrative additional income available from the trade in tortoises and freshwater turtles (Shepherd, 2000; Auliya, 2006). Low levels of domestic trade and consumption of hard-shell turtles has been documented in Indonesia, although it is not evident whether increased consumption and trade is a growing trend, as it clearly has been for domestic consumption for other wildlife products, as the standard of living improves (D. Hendrie, Wildlife Conservation Society, *in litt*. to S. Warne, TRAFFIC Southeast Asia, 2007).

Trade flows for Cambodia and Vietnam

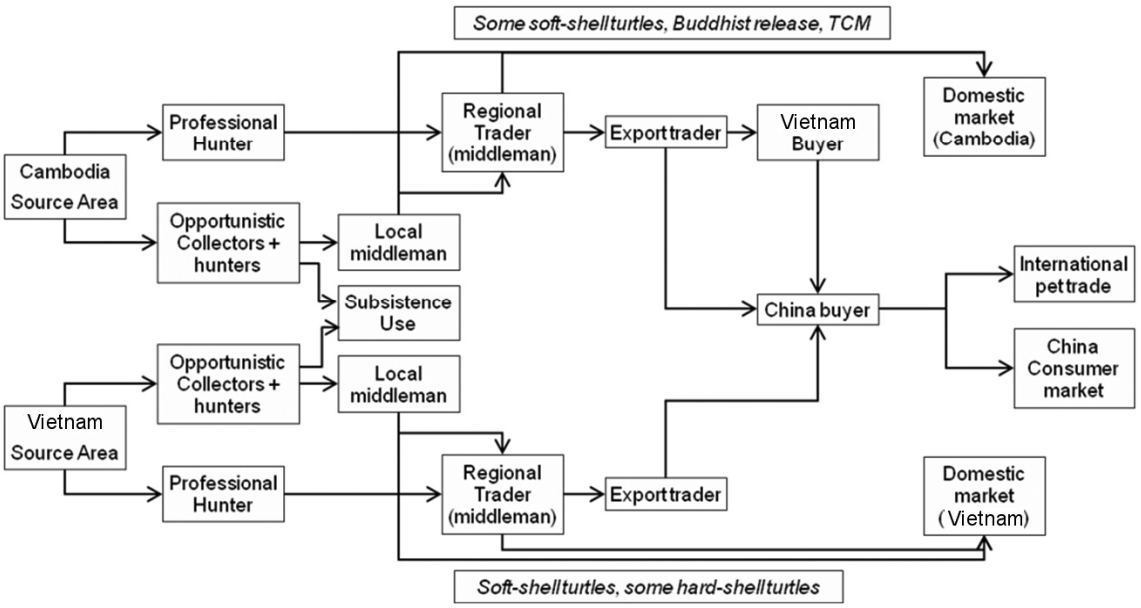
The diagram below (Figure 23) depicts trade flows from the freshwater turtle and tortoise range States of Cambodia and Vietnam. It has been developed based upon anecdotal information provided through discussions with hunters and trade investigations, accumulated over time.

Professional turtle traders may consolidate trade of tortoises and freshwater turtles at one or more stages within the process. For example, syndicates with their origin in China or Vietnam may in many cases employ professional hunters to collect turtles, removing middlemen along the value chain in doing so. However, opportunistic collection is likely to also be a major source of turtles entering into the trade.

Local hunters and collectors sell turtles to local buyers who in turn sell the turtles to larger buyers. The volume of turtles increases at each collection point. Most hard-shelled turtles that are sourced from Cambodia and Lao PDR are smuggled across the border into Vietnam before being shipped north to China. Soft-shell turtles sourced in Cambodia and Lao PDR are both consumed domestically and exported to Vietnam where there is substantial demand amongst consumers for soft-shell turtles.

The flow chart indicates general flows from Indochina to the main destination market, China, but it is also important to note that the EU, USA and Japan also have existing pet trade markets for south-east Asian tortoises and freshwater turtle species (Nijman and Shepherd, 2007).

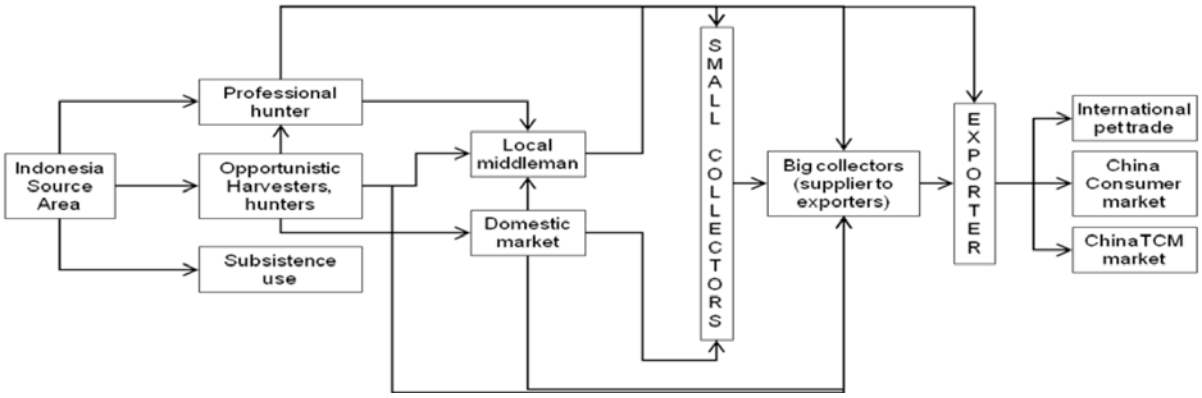
Figure 23: Trade flow diagram for tortoises and freshwater turtles: Cambodia and Vietnam



Trade flows for Indonesia

The diagram below of the Indonesian market chain from harvest to end-consumer (Figure 24) reveals a much more dynamic trade structure of tortoises and freshwater turtles than that exemplified for Indochina. Although standard trade chain links are similar between the harvesters/hunters and the exporter, each trade segment does not necessarily link sequentially to the next segment or actor towards the final exporter, i.e. some harvesters trade directly to big exporters, bypassing market intermediaries. Also, local consumption of soft-shell turtles seems much less important in Indonesia than in Indochina, owing to dietary and culinary differences, as well as religious laws.

Figure 24: Trade flow diagram for tortoises and freshwater turtles: Indonesia



Interventions

The following summarises the responses for selected intervention approaches with regard to the trade in tortoises and freshwater turtles as articulated by the 11 respondents providing questionnaires for this group. This outcome is assessed with regard to the research data collected by this project from expert opinion, combined with experiential information from this case study's authors.

Livelihood-based interventions

Approximately three quarters of questionnaire respondents believed that harvest for trade was undertaken as a planned activity, a similar number noting that harvesters most often worked on a contract basis for middlemen or suppliers, and approximately half noting that harvesters (also) worked independently. Harvest was most often said to be undertaken by local people rather than outsiders. Harvest is typically viewed as a year round activity and undertaken by men.

Approximately half the respondents considered harvests to be undertaken by the poorest one third of households, and half by a variety of income groups. Trade was overwhelmingly considered the primary reason for harvest, and all cases referred to international trade (with only two noting trade at the national level). Approximately half the respondents believed that trade contributed less than 10% of household income, with only two of the case studies stating that trade contributed between 10% and 50% of household income, with this contribution said to vary among households in the remainder of responses.

Four respondents cited interventions to create alternative livelihood options to reduce harvesting of the product; of these only one was considered with certainty to have resulted in a reduction in harvest. However, each of the three respondents citing interventions specifically to reduce poverty considered these to have been somewhat successful in doing so, and two were also considered to have resulted in people moving away from harvesting wildlife. Given the small number of questionnaire responses for

where livelihood interventions were noted, it remains difficult to evaluate the relationship between trade in these species and poverty alleviation efforts.

Harvesters of wildlife, whether professional or opportunistic, interact with a dynamic set of variables. Profits to be made from harvesting tortoises and freshwater turtles are influenced by, among other things, competition within the trade structure, national and international legislation, alternative and/or more secure means of securing an income, and the tendency to exploit all available resources with an economic value. Some of these are discussed further below.

Market-based interventions

For tortoises and freshwater turtles, market-based interventions were rated as somewhat effective; artificially manipulated markets and tax incentives were considered to be at least somewhat effective in the three cases, as was certification in the three out of four cases where it was said to have been applied.

Legislation and regulations

A variety of harvest and trade control measures are in place for tortoise and freshwater turtle species in the target countries. Opinions were equally divided regarding whether national legal harvest controls were at least slightly effective, or not, at reducing harvest volumes within approximately two years. Respondents commenting on the effectiveness of harvest quotas varied in their views, with four cases in which they were believed to be fully implemented, and two not implemented at all, and four considering that quotas were exceeded by actual harvest. It is important to note that annual harvest quotas in Indonesia are established based upon previous years' quotas and export volumes. Harvesting of species continues illegally even after the harvest quota has been reached, which complicates monitoring and triggers further illegal activities.

Opinions also varied with regard to the effectiveness of licences and permits: of the five respondents that assessed their effectiveness in regulating trade, three considered licences and permits to be at least somewhat effective and two not effective. Respondents considered CITES listing of tortoise and freshwater turtle species to be very effective (by approximately a third of respondents), somewhat effective (by approximately a quarter), and only slightly effective by approximately a fifth, with another fifth considering that CITES was not effective.

TRAFFIC and partners train Customs staff in Vietnam, 2007.
Credit: TRAFFIC

National laws in Indochina and Indonesia are yet to meet the protection needs of turtles in these countries, while current laws and their implementation lag well behind the devastating impact that hunting and trade has had upon some species. As harvest and export quotas are established without baseline data on species' populations, these cannot be expected to ensure sustainable trade. The involvement of various authorities and departments in various aspects of management and trade control complicates the management system (e.g. establishing annual harvest quotas, issuing capture permits or export permits). However, there have been efforts to increase capacity, e.g. through awareness activities focussed on capacity building and training of enforcement officers in Vietnam.

Species identification may be a key factor in the effectiveness of regulatory interventions in the marketplace – for example, to avoid confusion between CITES-listed species such as Southeast Asian Softshell Turtles being exported as the look-alike and non-CITES Malayan Softshell Turtles. For these interventions to succeed, expertise and knowledge on species identification must be improved in regulatory authorities such as Customs.

Site-based/species-focused initiatives aimed at immediately and urgently protecting populations of seriously endangered turtles are rare in Indonesia. A recent study on Indonesian populations of the Southeast Asian Box Turtle strongly recommends further action to address the largely unsustainable trade impact on the species (Schoppe, in prep.). In Indochina, there are some good examples of site-based/species-focused initiatives aimed at immediately and urgently protecting a population of Critically Endangered turtles at a specific site. For instance the re-discovery of River Terrapin *Batagur baska* in 2001 on the Sre Ambel River in southern Cambodia resulted in the launching of a project aimed at securing nesting beaches and habitat within the river system. In Indochina, particularly in Cambodia and Vietnam, a large number of tortoise and freshwater turtle projects are proposed or are under way, either on the entire species group, e.g., the Cambodian Turtle Conservation Team Project and the development of the Cuc Phuong Turtle Conservation Center (TCC) in Vietnam or on selected priority species of the region represented by members of the soft-shell turtles and many hard-shell species.

Awareness-raising

Three questionnaire responses noted targeted consumer awareness campaigns to reduce consumption of tortoises and freshwater turtles, of which two were considered to have led to changes in consumer behaviour lasting between one and five years. Seven questionnaires cited interventions to increase awareness among harvesters of the illegality of wildlife trade, an approach that was considered to be effective in increasing awareness in nearly 60% (four) of the cases. These may not provide a comprehensive picture, however, with consumer awareness campaigns for tortoises and freshwater turtles requiring improved implementation particularly in Indonesia.

Since the late 1990s, a range of interventions in Indochina have been put in place, which have included influencing public attitudes, as well as those of decision-makers, along with awareness campaigns with particular focus on communities bordering some key protected areas in Vietnam.

Improved resource management

Species management plans were noted in four cases, these were considered slightly or somewhat effective for three of the four cases where these were said to be in place. Two respondents noted species management plans in Indonesia, however, species-specific management plans are not known to be in place, or where they are, they have not been implemented effectively. Voluntarily reduced harvest seemed to be more effective than species management plans, with respondents considering this to be somewhat effective in all four situations where they were said to occur.

Summary

Given the relatively small number of questionnaires specifically for this group and the variation in perceptions of the effectiveness of difference intervention types, it is difficult to draw any definitive conclusions regarding the effectiveness of one approach over another. Rather, as with the wildlife trade in the region more generally, it appears that the most significant impact will stem from supporting an expansion of the range of intervention types at different points along the trade chain.

At present, however, the majority of interventions currently in place throughout the four focal countries are not yet effective in addressing issues of legality and sustainability for the trade of tortoises and

freshwater turtles. Even in the case of Indonesia, where a variety of legislation and regulations are in place, quota-setting is not based on scientific data, and the lack of effective enforcement does not allow for effective implementation (Siswomartono, 1998; Shepherd and Ibarrondo, 2005). The extremely complex geography and extended borders in Indonesia are undoubtedly a major challenge in this respect.

In fact, the lack of research to date towards assessing the size of wild populations for any species in the four target countries indicates the difficulty in measuring thresholds of sustainable harvest and trade. Where relative health and viability of wild populations for individual species have been estimated, e.g. based on nesting counts of female River Terrapins in Cambodia, hunter surveys collectively suggest steep declines in wild populations, as measured by reported reduced harvests over time. A recently conducted study on trade of the Southeast Asian Box Turtle in Indonesia indicated that the mean body size of harvested populations had decreased (Schoppe, in prep.). The Southeast Asian Box Turtle, along with other *Geoemydidae*, has a late maturity and low reproductive output, which cannot withstand current levels of harvest (legal and illegal) without detrimental effects on the longevity of wild populations (Schoppe, in prep.). Such indicative data are alarming and bring survival of local populations, and sub-species, into question, particularly in areas of intense harvest.

Trends in the tortoise and freshwater turtle trade over the past 10 years clearly show a decrease in the volume of specimens that are sourced from Vietnam, as indicated by the relative absence of native Vietnamese species (including Vietnam endemics) that were previously common in trade seizures during the late 1990s (D. Hendrie, Wildlife Conservation Society, *in litt*. to S. Warne, TRAFFIC Southeast Asia, 2007). This trend is more than likely to reflect reduced wild populations resulting from nearly 20 years of unrestrained exploitation since the economy began to be liberalised; this appears to be the case in Indonesia as well.

Given the developing nature of the economies in all four target countries, the challenge will be to combine the right balance of interventions to ensure that the national focus on developing human livelihoods does not conflict with management and conservation of wild animal and plant species, including tortoises and freshwater turtles. Socio-economic development should not compromise the existence of endangered/over-exploited species and any human livelihoods that they support.

Tortoises and freshwater turtles would benefit from a focus on improved resource management. Because of their long-lived, slow-breeding characteristics, sound scientific information is essential to provide the key to establishing an appropriately sustainable management system – if indeed the species can sustain any offtake at all. Any system that allows for harvest and trade must be defined by supportive legislation and regulation – in a workable framework with a clear "rulebook", that is backed up by monitoring and law enforcement.

If livelihoods from harvesting tortoises and freshwater turtles are to be sustained beyond sequential boom-and-bust scenarios as harvest locations become depleted, there must be some consultative design that involves collaboration between regulatory officials, harvesters, and technical advisors with a grasp of both biology and socio-economics. This will require concerted efforts to raise awareness and political will to upgrade the level of attention given to wildlife trade as a component of sustainable development. However, the critical intervention to enable a well-designed system to work for the benefit of tortoise and freshwater turtle species, as well as the socio-economic development of human communities, must be effective enforcement of an optimized regulatory framework where regulations are implemented, enforced and monitored.

6 DISCUSSION: what do experts believe drives the wildlife trade, and is working to control it?

This chapter analyses and discusses the findings of the survey of expert opinion and detailed case studies as presented in earlier chapters in the light of other research and studies dealing with these topics carried out both in the region and globally. Specifically, it revisits the two basic questions being addressed by the study (what drives the wildlife trade?, and which interventions are most effective in reducing illegal and unsustainable wildlife trade?) through investigating whether expert opinion and experience support the various assumptions made about economic and social drivers made when wildlife trade interventions are designed and implemented.

This study began by positing a framework of "intervention logic" that schematised the background thinking that informs the design and implementation of wildlife trade interventions, according to particular hypotheses and assumptions made about the drivers and conditions that act to determine people's participation in the wildlife trade, and which therefore need to be influenced, manipulated and changed if illegal and unsustainable trade in wild species is to be reduced (see Chapter 3).

The study aimed to test whether these hypotheses and assumptions were borne out in practice according to expert opinion, and to ascertain how effective respondents believed that the resulting interventions had been in reducing illegal and unsustainable wildlife trade in Cambodia, Indonesia, Lao PDR and Vietnam. The following sections discuss each of the research questions investigated by the study.

An embedded, and therefore unstated, hypothesis was that distinct groups or "types" of wildlife trade products and scenarios would emerge from the data analysis for this study, and that these would be shown to move in similar ways in response to interventions. This was not the case for the variables selected, although could emerge through an expansion of the dataset, and further analysis. Rather, the survey of expert knowledge and opinion indicates a high degree of complexity, specificity and variability within the wildlife trade, even within the same product groupings. It is possible that these differences are so great that certain findings and/or trends within this study for certain groups may be masked by aggregation of the data; equally, the study findings cannot be considered as generally applicable to specific species or products included in the study sample. The same is true with respect to the applicability to trade in and from the individual target countries; the latter point was specifically noted by government staff consulted in the course of reviewing project findings.

Finally, as noted in Chapter 2, the discussion is of experts' opinions regarding how well different intervention approaches are working as they are currently being applied. The results should not be interpreted as implying that certain approaches do not work, or would not be very successful if used at a greater intensity and/or targeted more effectively. Nevertheless, it is also important to bear in mind the present scale of illegal and unsustainable trade despite investments to reduce it. Furthermore, while it is hoped that the resources available to address this trade will increase significantly in future, it seems likely that they will still fall short of what is needed in the near term. It is therefore hoped that the following analysis will support further consideration of how resources and effort can be more effectively directed and applied in future.

6.1 Livelihoods

The study investigated the assumptions that reducing poverty, increasing income and/or diversifying livelihoods among rural communities would reduce participation in harvesting wildlife to supply the illegal and unsustainable wildlife trade. Neither the results of the survey of expert opinion nor the literature consistently supported this view. Although investments in basic poverty reduction and livelihood improvement activities in poor rural areas of Cambodia, Indonesia, Lao PDR and Vietnam undoubtedly generate positive (and much-needed) development benefits, it would therefore be a mistake to assume that they would, alone, automatically lead to reductions in unsustainable and/or illegal wildlife harvesting and/or trade.

Certainly, the poor harvest wildlife to sell. It is widely recognised that the wildlife trade represents an accessible, attractive and lucrative livelihood option, especially to the poorest, because of its characteristically low technical and financial entry requirements, ability to provide quick short-term gains and cash payments, and because of the relatively freely accessible nature of the resource itself (Neumann and Hirsch, 2000). This is reflected in the survey data, with the poorest third of households said to be harvesting the product in question in approximately half the cases. This dependence is also reflected in the literature. Data from northern Lao PDR, for example, show that poorer households are much more dependent upon income generated from forest plants and animals than less poor households, and forest product harvests also make a far higher contribution to overall household subsistence among the poor (Emerton, 2005). Similarly, Raintree *et al.* (2007) observed the poorest houses located near or in forested areas in Vietnam are typically the most dependent on NTFPs and the most active collectors.

Plant and animal wildlife trade is considered the single-most important source of income for much of the rural population in Lao PDR, Rosales *et al.* (2003) reporting that wildlife trade accounts for 71% of overall household income – declining to 42% as people move away from absolute poverty – in the rural areas of this country. Research by Heang (2007) on the disadvantaged tribal communities of Ratanakiri province documents the "safely net" role that NTFPs play in Cambodia directly as food, and indirectly as income, for communities over vast rural areas, whose rice production provides only enough food for half the year.

Selling forest products along the Lao-Thai border, 2001.
Credit: TRAFFIC/Emily Hicks

While many other studies confirm that the poorest households harvest the greatest range of wild products, and are most dependent on them relative to other livelihood sources (see for example Raintree *et al.*, 2007), most of this literature refers to subsistence products, and does not point to the poor as major players in the wildlife trade. The contribution of the trade to livelihood income varies significantly according to the experts participating in this study, with less than a fifth considering income from trade in the products specified to be very important, and just over a fifth stating that it contributed less than 10% of income. Nearly half considered the income contribution to vary between households. This variation in importance could in part be explained by households and communities adopting different wildlife-based livelihood strategies, as discussed further below, and bearing in mind that roughly 60% of respondents believed that wildlife harvesting more generally was at least somewhat important as a livelihood activity. In many cases it is likely that multiple products are harvested for trade.

However, the links between wealth, poverty and participation in the wildlife trade are complex: people involved in the trade are not necessarily poor, with a variety of income groups said to be participating in wildlife harvests in approximately 40% of the cases. Furthermore, the poor who are involved do not necessarily motivate the harvests. According to survey respondents, harvesters often either were, or worked for, outsiders. Indeed, the trade in wildlife in the region involves some extremely wealthy individuals and groups (Compton *et al.*, 1999; Nooren and Claridge, 2001). Interventions that target only the poorest households therefore are likely to exclude a significant proportion of the participants who are engaged in the wildlife trade. This is also true of interventions targeting only those living local to the resource.

The study data indicate that the wildlife trade provides a regular source of income for some, and a safety net and coping strategy to meet sudden or unexpected needs for income for others. Other studies also support this finding. Ruiz Pérez *et al.* (2004), for example, suggest that NTFP livelihood strategies can be classified as "coping", "diversified" and "specialised", with each type representing a progressively higher share of household income and degree of integration into the cash economy. This classification was further developed by Marshall *et al.* (2006), who categorised the strategies as either "safety net", "gap-filling", or "stepping stone". There is some evidence that poorer people are more likely to be seasonal harvesters, using the wildlife trade as a safety net at critical times during the year, and in one third of cases the wildlife trade provides an emergency source of income for rural poor populations. Seasonality is important for many harvesters, who often combine opportunistic hunting with planned NTFP harvesting trips – e.g. mushroom collection with monitor lizard hunting, as described by Singh *et al.* (2006b).

Singh *et al.* (2006a) observe that neither high-value species (such as pangolins), which tend to be caught infrequently, nor low-value species, which generate small amounts of income, are of great importance to livelihoods, and that rather it is medium-value, regularly harvested wildlife species and products (in Lao PDR, mushrooms, turtles, monitor lizards and yang oil, for example) that influence livelihood strategies the most. It is precisely because of the activity-combining noted in the preceding paragraph that livelihood activities can be financially worthwhile for both harvesters and traders, who may travel large distances to collect from villages (Marshall *et al.* 2006). Trapping for trade can also be combined with unrelated activities; owing to a decline in turtle populations, trappers today rarely catch turtles as a full-time occupation as was the case in the past, but rather collectors are usually fishermen, plantation workers, farmers, and other rural workers who supplement their income on an opportunistic basis (Shepherd, 2000).

Of those products covered by questionnaires that are collected by the poorest harvesters, three quarters are animal as opposed to plant species. This result could reflect in part that more animal than plant products were included in the project dataset. However, it also supports the view held by some that trade in terrestrial vertebrates is more important for income generation than for direct subsistence and food security (Singh *et al.,* 2006b). In the past, people hunted primarily to eat but now many hunt primarily to

sell, illustrating the effect that lucrative market opportunities have had on changing hunting as well as consumption patterns (Grieser Johns, 2004).

Although approximately a third of experts consulted for this study believed that individuals moved away from harvesting wildlife as their socio-economic status improved, approximately half did not. Several other studies also suggest that improving the income or livelihood status of harvester communities does little to reduce participation in the wildlife trade – and in fact may increase participation. There is little evidence in the literature that people move out of the wildlife trade as their socio-economic conditions improve, with increasing wealth found to have little effect on levels of harvest and trade in the case of terrestrial vertebrates (Bennett and Robinson, 2000; Eves and Ruggiero, 2000; Wilkie and Godoy, 2001). In some cases, evidence points to households increasing their level of engagement in wildlife harvesting as an income-generating activity as they become richer. Studies carried out around protected areas in northern Lao PDR show that while the richest and the poorest households participate most in wild animal and plant harvesting, to the highest absolute and relative value, their motivations and nature of engagement differ (Emerton, 2005). While the poor tend to be engaged much more in harvesting products to meet basic needs for subsistence, richer households focus on harvesting higher-value products for sale. It has also been noted that the trade in rare and valuable wildlife products is becoming increasingly a specialist preserve of highly trained hunters (Grieser Johns, 2004).

Just as rural livelihoods, and socio-economic status are not static, so changes in market demand appear to have shifted the dynamics of and participation in wildlife trade. Ultimately, harvesters and traders are responding to market demand, not creating it, as discussed in more detail below. There is evidence that harvesters (and thus the traders who buy from them) are highly mobile, shifting in and out of areas and products in response to changing availability and market opportunities. Harvest was said to be conducted by outsiders, either working independently or for other outsiders, in approximately a half of the cases. This would seem to indicate that efforts to improve the income status of people living local to wildlife resources being targeted for trade are unlikely to have an impact on wildlife harvest rates unless the issue of devolving ownership and exclusion of outsiders from harvesting is also addressed.

In many cases, the provision of improved livelihood and income-generating opportunities have at best proved additive or supplementary, rather than substitutional, to wildlife trade, with only a third of experts consulted believing that interventions based on creating alternative livelihood options had reduced wildlife harvests. The ineffectiveness of these livelihood interventions may in part be explained by the vast commercial wild animal trade in many parts of Asia supplying goods to urban markets, rather than local demand influencing harvest (Bennett and Rao, 2002), and the challenge of providing comparable rural income-earning opportunities to that provided by wildlife (IUCN, 2007). Rural income-generating options centre largely upon the exploitation of natural resources, and where labour has an opportunity cost, and people have a choice of activities, they will choose the highest income-generating opportunity. Because wildlife harvesting and trade can generate high returns, are easily accessible, and may involve products that can easily be stored and transported, they tend to have few rivals as cash-generating activities (Fa *et al.,* 2003). Furthermore, whilst wildlife trade represents an accessible safety net in times of socio-economic decline, as levels of poverty improve, harvesters and traders continue to be involved in the wildlife trade precisely because it represents an income-generating opportunity.

These observations would all support the view that wildlife trade interventions focusing on poverty alleviation and/or livelihood diversification need to be designed according to the nature and motivation for people's engagement in wildlife trade, and according to the particular species or product being targeted. Furthermore, livelihood interventions targeted solely at subsistence activities, or on poorer households who harvest wild products primarily for their own consumption, seem likely to have little impact on the harvesting of wildlife for trade in order to generate cash income.

6.2 Markets and prices

The study investigated the assumptions that the supply of wildlife products to and through the market is responsive to changes in producer price and profitability, and that consumer demand for wildlife products is responsive to changes in retail price. Neither the findings of this study, nor the broader literature, provide strong support for the assumption that rises in price act as a deterrent to wildlife consumption, or that decreases in profitability have caused people to stop harvesting wildlife. The study, however, confirms that many believe that rising prices for wildlife and wildlife products, driven largely by high demand, act as a major stimulus for wildlife suppliers to remain in or enter the trade, in response to these lucrative market opportunities.

The survey reinforced findings reported in the literature that the market for many wildlife products is driven by a high and rising demand. Rising hunting pressure to meet increased urban demand is cited for numerous species and products, for example the trade in infant Orang-utans in Indonesia (Nijman, 2005).

Unsurprisingly, harvesters and suppliers are highly responsive to lucrative opportunities provided by the demand for wildlife products, showing a remarkable degree of mobility between products, locations and markets to meet demand. Experts surveyed believed that harvesters and traders themselves moved (between products and locations) to maintain their profits and production when the availability of particular species declined. In fact, literature suggests that in some cases harvesters will move into the exploitation of lower-value species (when availability of higher-value products declines), or the profile of harvesters will shift towards a group of more specialised hunters and trappers covering larger areas (Grieser Johns, 2004).

The literature also underlines that growing wildlife demand in the region has resulted in fiercely competitive trade networks as diminishing numbers of certain wildlife products enter the market place (Grieser Johns, 2004; World Bank, 2005). New markets are also emerging for species that were not formerly very valuable; this has been the case, for example, in Vietnam (Grieser Johns, 2004).

As noted above, both the survey findings and the broader literature point to rises in both domestic and international demand for wildlife and wildlife products (and also their prices) across the region. Rising demand for wildlife (particularly in urban markets and fast-growing economies such as China), coupled with declining availability of a growing number of wild resources, has contributed to a steep increase in the price of many high-value products. Increasing regulation of the trade is also likely to result in an increase in price (Moyle, 2003). Most studies suggest that higher prices for wildlife products (or relatively lower prices for substitutes) do not have a major influence on wildlife consumption in the region. This view was also largely held by the experts participating in this study, with demand predicted to decline in response to an increase in price in only a fifth of the cases.

Producer price was also believed to be an influential factor in relation to efforts to increase the value added to sustainable harvests (such as through certification, price controls, tax incentives and buying agreements), although there are as yet relatively few examples of the application of such instruments in the region. Where they have been applied, however, they are believed to have been relatively successful, with experts considering certification to have been at least slightly effective in over two thirds of cases, and the other approaches to have been at least slightly effective in more than 80% of cases. Although the literature provides some confirmation of the success of these measures (see, for example: Dickson, 2003), there seem to be few documented cases of their application in the region.

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demand for wildlife (particularly in urban markets and fast-growing economies such as China), coupled with declining availability of a growing number of wild resources, has contributed to a steep increase in the price of many high-value products. Increasing regulation of the trade is also likely to result in an increase in price (Moyle, 2003). Most studies suggest that higher prices for wildlife products (or relatively lower prices for substitutes) do not have a major influence on wildlife consumption in the region (see, for example: Bennett, 2003). This view was also largely held by the experts participating in this study, with demand predicted to decline in response to an increase in price in only a fifth of the cases.

One reason for the persistence of demand is that the consumption of wildlife products is tied closely to culture and tradition; for example the majority of food species traded and consumed in East Asia are thought to have beneficial properties that extend beyond nutrition, with many believed to impart increased virility, status, luck and health (Jenkins, 1995; Le Dien Duc and Broad, 1995; Compton and Le Hai Quang, 1998). In addition, with respect to many high value wildlife products, substitutes, where available, appear to have a limited role to play: the rarer and more expensive the species, the greater the associated benefits to be conferred (Grieser Johns, 2004). Some studies even report the development of speculative markets in wildlife, for example that rarity itself fuels the disproportionate exploitation of rare species, and renders them even rarer, and thus more desirable (Courchamp *et al.*, 2006). Earlier TRAFFIC research has found that some wildlife traders in south-east Asia closely track decisions within the CITES arena, with CITES listings viewed in some cases as conferring increased value on products in trade.

Shark fin consumption in Guangdong, China, was found to rise in proportion to per capita income.
Credit: Michel Gunther/WWF-Canon

Rising affluence and disposable income in consumer countries would appear to be the major driver of increasing demand and expanding markets in the region, especially where wildlife products are considered to be non-essential/luxury goods, as is perceived to be the case in nearly two thirds of the cases covered by questionnaires in this study. Various studies underline the belief that the vast commercial wildlife trade in numerous species in Asia is mainly supplying an urban luxury market (Bennett and Rao, 2002), and that urban markets (particularly in China) are booming with the rising affluence of consumers, acting as the driving force for much of the international wildlife trade in the region (Robinson and Bennett, 2002; Grieser Johns, 2004). Increasing affluence and income may too have acted to increase the number of consumers who are now able to afford (and aspire to consume) wildlife products that are deemed luxury goods. A recent model of shark fin consumption found that increases in per capita income in Guangdong, China, explained 80% of increases in consumption in that province (Clarke, 2003). It might therefore also be expected for a decline in affluence to have the opposite effect, i.e. to reduce demand, with one study (MacGregor, 2002) finding a significant correlation between the decrease in prices paid for high value crocodilian skins and declining consumer confidence in Japan.

Consumer income and affluence is also cited as a major factor stimulating the growth of domestic demand for wildlife products. Research in Vietnam for example suggests that highly educated people are more likely to have used wild animal products (Venkataraman, 2007), and findings from Lao PDR

indicate that even in rural areas better-off households consume greater amounts of wild meat, despite also having larger holdings of livestock for their own consumption (Clendon and Soydara, 2001).

Although rising consumer prices do not appear to have diminished the overall demand for most wildlife products (and, as discussed above, may in some cases have actually acted to stimulate demand), there is some evidence to suggest that it has contributed to a change in the profile of wildlife consumers. A recent survey conducted by TRAFFIC in Ha Noi found that Vietnamese consumers most frequently cited expense as a reason for not using wildlife products (Venkataraman, 2007), and findings from Lao PDR indicate that some wildlife has already been priced out of the reach of local consumers, and that products are being moved out of the country because local consumers can no longer afford them (Singh *et al.*, 2006b).

In some instances, especially where markets are competitive and relatively open, efforts to provide consumers with acceptable and more affordable substitutes can act to reduce demand for wildlife products (Bulte and Damania, 2005). However, for many of the products considered in this study (and traded more widely in East and south-east Asia) there is a lack of acceptable substitutes, and these market conditions do not hold. This may be changing, with over a quarter of the experts consulted noting an increase in the availability of substitute products.

There is broad agreement that while rising consumer demand acts as the key driver of the illegal and unsustainable wildlife trade in the region, various other factors have allowed the supply of wildlife products to respond to the growing market opportunities afforded by the expanding consumer base. The increasing accessibility of both wildlife areas and markets to wildlife harvesters and traders, in particular, has had a major influence. Experts completing questionnaires for this study largely concurred that improved communications and connectivity, road and infrastructure development, and the opening up of wildlife areas because of illegal logging and other new activities were the primary factors influencing the market availability of wildlife. There are repeated references in the literature to the impacts of improved regional trade networks, expanding road systems and increasing market integration on the wildlife trade. The increasing volume and value of the wildlife trade in Lao PDR, for instance, has been attributed to better infrastructure and improved ability to access more lucrative markets (Singh *et al.*, 2006b). Various studies point to the fact that more open borders, accessible markets and better transport and communications have led to a situation where wildlife moves almost unimpeded across the borders between Lao PDR, Vietnam, Thailand and China (Singh *et al.*, 2006b; World Bank, 2005).

Given the sheer size of the consumer base for wildlife products from the four target countries, the strength of demand, and the growing wealth among many consumers, it seems unlikely that interventions based solely on increasing the price of wildlife products will serve to reduce illegal or unsustainable trade. This seems likely to be particularly true for those species that have a long tradition of use, and/or are perceived as conveying some particular benefit or attribute to the consumer.

Based on the results of this study, market-based approaches, such as buying agreements and certification may hold greater promise. However, as mentioned above (Section 3.1), the application of financial and economic instruments to the wildlife trade is relatively recent, and is not as yet widespread. The low incidence of references to market-based instruments in the survey may also reflect the fact that these instruments typically rely on the presence of clearly established (and enforced) property rights and terms of trade, and on relatively open and competitive markets – conditions that do not hold across much of the wildlife trade chains in Cambodia, Indonesia, Lao PDR and Vietnam.

6.3 Legislation and regulations

The study investigated the assumptions that imposing restrictions and penalties, and strengthening community access rights over land and resources, reduced illegal and unsustainable wildlife trade. While the study findings did not refute these assumptions, they suggested strongly that enforcement and broader governance were the critical factors determining the effectiveness of legislation and regulations (both those restricting the use of wildlife resources themselves, as well as those governing rights and access to land and resources), rather than the presence of laws and regulations *per se*.

Restrictions, especially those that are complemented by incentives, are cited in the literature as having the potential to be a highly effective way of controlling the wildlife trade (see for example (Dickson, 2003; Hutton and Webb, 2003). This view was supported by study respondents, who considered that legal and regulatory measures exerted an important influence on people's participation in wildlife harvesting and trading. Respondents also noted that the number and range of laws and regulations governing the wildlife trade in Cambodia, Indonesia, Lao PDR and Vietnam had increased over recent years. Relatively high levels of success were registered in the use of instruments such as protected areas and zoning, licences, permits, quotas and trade agreements and, in the case of international trade, CITES.

However, an overriding problem noted both by experts contacted for this study and widely cited in the literature, is inadequate enforcement of existing laws and regulations. Survey respondents considered that even though the enforcement of wildlife trade laws and regulations had improved over the past decade, it was still inadequate, as testified to, for example, by harvest from within protected areas (noted in 90% of the cases). This view is reflected in the case studies on trade in Tigers, freshwater turtles and tortoises, and agarwood included in this report, and echoed in numerous other studies of the wildlife trade in the region (e.g. see Compton *et al.*, 1999; Stuart and Timmins, 2000; Nooren and Claridge, 2001; Grieser Johns, 2004; World Bank, 2005).

Experts consulted in this study varied in their views concerning the most important points on which to focus enforcement efforts. This could indicate that enforcement of such controls was considered important across the trade chain. There are examples to suggest that, where strongly enforced at multiple points in the trade chain, legal and regulatory restrictions can be very effective mechanisms for controlling wildlife trade. Examples include the establishment of a protected area and anti-poaching patrols for the threatened wild pig species Babirusa in northern Sulawesi, and stopping and searching traders' vans on main roads to interdict the meat of this and other protected species being taken to market (Clayton, 2003; Lee *et al.*, 2005), the recovery of Vicuna *Vicugna vicugna* populations in South America and of White Rhinoceros populations in Africa linked to strong anti-poaching measures in range States, bans on commercial international trade, and import controls in consumer countries.

Enforcement capacity and incentives to enforce are also emphasized in the literature as critical elements in the success of regulations and laws (Eves and Ruggiero, 2000). Levels of enforcement are determined to some extent by ability and willingness to act on the part of those agencies mandated to control wildlife harvesting and trade, including the resources and higher-level support provided to them. Guards in Vietnam cite a number of reasons as limiting their ability to address illegal wildlife trade including insufficient salary, lack of budget to pay informants, and general lack of equipment, resources and staff (Grieser Johns, 2004). Enforcement of wildlife trade controls and subsequent sentencing may be further undermined because many in the judicial system do not see the wildlife trade as a serious offence (Nijman, 2005). Also critically important are, however, the fundamental issues of governance, corruption and the rule of law in the countries where wildlife is harvested, traded and consumed. These issues were not explored in detail in the questionnaire, but are stressed in the literature. Smith and Walpole (2005), for example, comment on the importance of addressing corruption in relation to conservation initiatives, including with regard to harvest and trade in timber and other wildlife products, with Ferraro (2005)

drawing attention to the complexity of assessing its impacts. A specific example of concerns regarding corruption in the region is provided by Singh *et al.* (2006b), who report closely-knit social networks where enforcement bodies themselves may be implicated in illegal practices, and where prosecutors and the prosecuted know each other. Corruption is also cited as likely to be a factor in the failure to combat illegal trade in wildlife products, including bear products, smuggled across international borders in Asia (Williamson, 2006).

6.4 Customary norms, practices and tenure

A wide array of customary norms and traditional practices typically govern local land and resource use and management across Cambodia, Indonesia, Lao PDR and Vietnam (some of which have been enshrined in national legislation or incorporated into conservation interventions). The survey of expert opinion found that customary norms and traditional practices were deemed to be at least somewhat effective in regulating the volume of wildlife harvested in the majority of cases where they existed and still held sway. As noted by Robinson and Bodmer (1999), Bowen-Jones (2003) and others, however, in the case of hunting in tropical forests, traditional practices, which are primarily geared towards production for local consumption, are rapidly changing in response to the increased availability of new technologies and hunting to meet increased commercial demand. Bennett and Rao (2002) draw attention to the Master Plan for Wildlife developed in Sarawak, which involves local communities in management of protected areas and allows subsistence use of wild species, but bans commercial trade and places strict controls on the use of shotguns. The wider issue of the importance of tenure and security of local resource rights in relation to wild species used for meat is emphasized by Nasi *et al.* (2008), and more generally in relation to management of wildlife harvest and trade by many others.

The literature suggests that both land tenure and resource access rights are important determinants of wildlife management and sustainability (e.g. see Neumann and Hirsch, 2000; Davies, 2002. Roe, 2008). The situation in the study countries however remains somewhat ambiguous, and is shaped by many complex factors and forces. Even though tenure arrangements are generally undergoing change across the region (with increased individual and community rights emerging), it is not clear whether these changes serve merely to increase pressure on the remaining communal and State lands (including protected areas) where the bulk of harvesting is carried out. Although both the literature and the survey of expert opinion suggest that when people have more secure and well-defined rights to land and resources, they have a higher stake and incentive to conserve wild species, this will have little impact on participation in illegal and unsustainable wildlife trade if the lands that are under improved tenure arrangements are not the primary areas used for wildlife harvesting, or have already been denuded of wildlife.

As is the case with the effectiveness of laws and regulations restricting wildlife harvesting and trade, governance remains a major issue in matters relating to land and resource rights. The land administration sector in south-east Asia is reported to be one of the top three sectors prone to corruption, and the majority of rural households in the countries covered in this study lack formal land titles (Tola and McKenney, 2003; DFID, 2007). There is also evidence to suggest that in some cases, the wildlife trade is such a lucrative business, involving a range of such politically powerful actors and influential individuals, that any increases in the value of wildlife trade may in fact act to increase inequity, because they result in more powerful actors monopolising access rights to the detriment of local communities (e.g. see Neumann and Hirsch, 2000).

6.5 Awareness

The study investigated the assumption that increasing awareness among harvesters, traders and consumers reduced illegal and unsustainable wildlife trade. The study provided limited support for this assumption, suggesting that although such efforts were considered to be mainly successful in their primary goal (i.e. in raising awareness), in many cases this was thought to have had negligible impacts on the amount of wildlife harvested, traded and consumed illegally or unsustainably.

The view expressed by survey respondents that awareness of the illegality, and to a lesser degree the conservation impacts, of harvesting, trading and consuming banned wildlife species and products was relatively high at most stages in the marketing chain is not wholly borne out by the literature on the wildlife trade in south-east Asia (although it should be noted that experts expressed this opinion mainly in relation to harvesters and traders, rather than wildlife consumers). Several studies state that the majority of consumers are not aware of key legislation that protects endangered animal species and their habitats, and do not fully understand the connection between their own consumption and the illegal trade in wildlife (Henry, 2004; Venkataraman, 2007).

A relatively small proportion of the experts consulted in this study believed that improved awareness, where achieved, was reflected in some reduction in participation in the wildlife trade among harvesters and traders, although perceptions were more positive for consumers. To date, there is very little documented evidence – positive or negative – about the long-term impacts of awareness on rates of wildlife harvesting, trading and consumption. Understanding of the links between awareness, attitudes and practices are still at a very early stage in south-east and East Asia, and in-depth information about the factors influencing wildlife demand remains limited. The bulk of efforts to raise awareness have focused on animal products and on consumers rather than on the supply end of the wildlife trade chain; although there has recently been some innovative work, and notable successes, including work with Customs officials at major border points, efforts by the CITES authorities in Indonesia to raise awareness among commercial reptile traders, and campaigns targeted at users of pets, wild meat and medicines in Vietnam.

The results of studies carried out to look at the changes in attitudes and practices arising from improved consumer awareness demonstrate the potential for this approach to help catalyse changes in consumption patterns. In the late 1990s TRAFFIC surveyed households in Hong Kong to assess attitudes on wildlife conservation and the use of wildlife for medicine and food; results indicated that if information was provided, the majority of respondents stated that they would change their consumption patterns (Lee, 1998). A recent wildlife trade awareness campaign has been undertaken by the Wildlife Conservation Society in Vientiane, the capital of Lao PDR, which, together with improved enforcement, has contributed to an observed reduction in the number of wildlife products being sold at markets in the city (T. Hansel, Wildlife Conservation Society, pers. comm. to S. Warne, TRAFFIC Southest Asia, 2007). A recent review of the Tiger trade in China found that the sale of medicinal products containing Tiger parts had declined significantly since the 1990s as a result of awareness efforts and improved enforcement; directed hunting for commercial trade in Tigers for medicines was considered to have stabilised after concerted awareness efforts with the traditional medicine community, while increases in trade were observed for use in tonics (e.g. wine) and for fur (Nowell and Xu, 2007). Similarly, a survey of traditional Chinese medicine shops in the USA registered an increase in the awareness of shopkeepers of the negative conservation impacts of the demand for products containing Tiger bone and a decline in the sale of such products, although suggested that these changes may have been attributable more to a decrease in supply than to increased awareness among shopkeepers (Henry, 2004).

The literature reinforces the point that, as for other types of wildlife trade intervention, both enforcement and governance are key factors determining the success and long-term impacts of efforts to raise awareness. For example, work in Vietnam suggests that even though most villagers are aware of

regulations controlling wildlife harvest and trade, the weight of legal instruments to control the trade is undermined when local harvesters observe high-ranking officials consuming wildlife products, and see little action being taken against known traders (Grieser Johns, 2004; Singh *et al.*, 2006b). Similarly, although the expert survey provided some evidence that "name and shame" initiatives, such as publicising prosecutions, can be a successful means of changing consumer behaviour, low rates of prosecutions, low penalties and imposition of below-maximum fines all act as a limiting factor to enforcement success (Nijman, 2005).

6.6 Resource management practices

The study investigated the assumption that external support to improved resource management reduces the over-exploitation of wildlife for trade. There would appear to be grounds to support this assumption: experts believed that in the majority of cases where they had been applied, resource management interventions (such as species management plans, closed seasons, technology limits and limits on harvesting size and age) had been at least somewhat successful in controlling illegal and unsustainable wildlife exploitation. It was noted that the effectiveness of species management plans might be linked to the effectiveness of associated interventions being applied in conjunction with their implementation, including, e.g. regulatory approaches. It might also be that the process of developing management plans engenders people involved in the planning process with a greater sense of ownership of the subsequent rules developed to implement those plans.

Multiple factors influence the sustainability of any harvesting regime, including whether entire species or component parts are harvested, the biological and physical characteristics of the species harvested, habitat intactness and resource management systems in place (Milner-Gulland and Mace, 1998). This has prompted concern that such management efforts may therefore not be achieving sustainable outcomes, with some arguing that in reality there are relatively few proven examples of sustainable wildlife harvesting for international trade, and that the impact of wildlife trade on species diversity and ecosystem function remains poorly understood. It is notable that a weak information base acts as a constraint to improved resource management practices. In some cases the information that is used to derive sustainable management regimes or tools is lacking, out-dated or incomplete (Oldfield, 2003).

Another key information gap was identified in relation to the substitution or supplementation of wild harvests with products from non-wild sources. Although the experts consulted in this study noted that there was an increasing trend towards increased harvest from non-wild sources, this was thought to account for a relatively small proportion of harvest and almost always combined with wild harvests. It should also be noted that the development of non-wild sources is not technically or financially feasible in many cases. In addition, there remains considerable uncertainty (among respondents, and in the literature) as to whether such measures as domestication, cultivation and captive breeding really act to reduce the demand for wild-harvested products or merely (at best) substitute a part of the supply. In some cases, it is argued that increasing the supply of wildlife and wildlife products from non-wild sources in fact fuels the illegal and unsustainable wildlife trade by supporting and perpetuating markets for particular products. For example, serious concerns have been voiced about the impact of the sale of specimens of captive-bred Tigers, in terms of this acting to stimulate the illegal harvest and sale of wild specimens and allowing for the false declaration of wild specimens as being captive bred (IUCN/SSC Cat Specialist Group, 2007; Nowell and Xu, 2007).

7 CONCLUSIONS & RECOMMENDATIONS: towards more effective interventions to reduce the illegal and unsustainable wildlife trade in South-east Asia

Following on from the data and analysis presented in earlier sections of this report, this chapter draws conclusions about the nature of the economic and social drivers of the wildlife trade in south-east Asia, including consideration of beliefs regarding the most effective way to address them. It provides a series of recommendations, targeted at conservation and wildlife policy-makers, planners and managers, donor agencies and NGOs, suggesting how interventions might be better designed and/or applied to reduce illegal and unsustainable trade in the future. While specific to this study of south-east Asia, the following are likely to apply to wildlife trade more generally.

This study was undertaken in response to concerns that, despite the efforts of governments, inter-governmental organisations, NGOs and others, the illegal and unsustainable wildlife trade continues to drive declines in the populations of many species subject to trade. This not only threatens the species in trade, but also the health of the ecosystems in which they occur. Further, it reduces the availability of wildlife resources to people who depend on them as a source of goods and/or income, including their ability to serve as a "safety net" in times of hardship. The study did not set out to prove the existence of such declines, or of human reliance on the use and trade of wild species, areas well documented by numerous other studies and authors. However, it is worthwhile to note that, like this other work, the views of experts consulted during this study indicate that a wide range of species subject to commercial trade are declining, including species used for food and medicinal purposes. As noted by Roe (2008), further declines will not only affect the status of traded species and the ecosystems in which they occur, undermining achievement of Millennium Development Goal 7 (environmental sustainability), but will also hamper efforts to achieve the Goals related to poverty, hunger and health.

Despite the evidence that, thus far, those seeking to stop illegal and unsustainable trade are, for the lack of better terminology, "losing the war", there are also numerous examples demonstrating that individual battles are being won. The key motivation for this study was the desire to increase the number of battles being won, and, ultimately, to win the war, by improving the targeting and design of efforts to reduce illegal and unsustainable wildlife trade, bearing in mind both conservation and development priorities. This was based further on the recognition that resources to address illegal and unsustainable trade are limited, and therefore it is critical to consider how and where best to invest those resources to achieve the conservation and development aims of the people and countries concerned.

As noted in the introduction, this study is not unique in posing such questions, which are increasingly being asked within conservation more generally, and in the context of promoting development based on extraction of non-timber forest resources. However, it is believed to be the first review of the wildlife trade focusing on drivers and interventions across multiple countries and products in south-east Asia, and to seek answers to these questions in relation to the trade. This research has highlighted both the complexity of the trade and perceptions of the effectiveness of various intervention types. It points to the need for a greater effort to understand more fully this complexity and thereby how best to respond to it to achieve conservation and development aims.

Eight preliminary conclusions relevant to improving the effectiveness of interventions to reduce the illegal and unsustainable wildlife trade in South-east Asia made on the basis of this review are provided below. These are by no means definitive. They may not, for example, be universally applicable to individual products, or to the situation within different countries, the latter point highlighted by government staff considering the findings of this research. They are therefore proposed as a starting point for further investigation and refinement, including through collecting more detailed data on wildlife

harvest, trade, consumption and the application and impact of associated interventions. Recommendations for action based on these preliminary conclusions are also provided, in the belief that increased action is required alongside increased research in order to reduce illegal and unsustainable trade. A more detailed breakdown of expert suggestions for actions needed to reduce such trade provided during the second project workshop has also been included as Annex 2.

7.1 The evidence base for wildlife trade interventions needs to be strengthened

While not in any way definitive, this study has nevertheless provided additional insights into the workings of the wildlife trade, and indicates that the assumptions and hypotheses that inform the way in which interventions are designed are often common across product types. It also appears that in some cases they may be misplaced. The economic and social drivers of the wildlife trade are in reality far more complex than the way in which they are often conceptualised or acted upon. The challenge of responding to this complexity is complicated further by the fact that many of the individuals and agencies who are actively trying to reduce illegal and unsustainable trade have only partial, and often very specialised, knowledge of the trade and of the factors influencing it in different conditions, places and points in time. Cross-referencing between these actors is often negligible.

All of the intervention approaches used to date were believed by one or more of the experts consulted in this study to have been at least somewhat successful in reducing illegal and/or unsustainable trade in some situations. Unfortunately, and perhaps surprisingly, the analysis did not provide definitive results favouring one particular intervention approach over others, nor, in the case of enforcement of regulatory approaches, a particular part of the trade chain on which such efforts should be focused as a priority. Such information would seem critical to the better targeting of investments to reduce illegal and unsustainable trade in future.

Lack of a comprehensive and reliable information base, therefore, remains a key constraint in planning and designing wildlife trade interventions, and monitoring their impacts. Although this study provides an important step towards addressing this gap, it is only a single step, with further steps needed. The complexity of the wildlife trade dictates that there will never be a perfect knowledge base or a single "recipe" for achieving the desired conservation and/or development outcomes in relation to the trade in a particular species or from a particular place.

However, by further expanding and improving upon the existing knowledge base, including in relation to the outcomes of intervention efforts thus far, it will be possible to improve the design and targeting of future interventions and therefore the likelihood that they will be successful. There is growing support for moves toward a more "evidenced-based" approach to conservation (Sutherland, 2003), including through the work of Foundations of Success (www.fosonline.org), CIFOR (e.g. see Kusters and Belcher, 2004), the Conservation Measures Partnership (www.conservationmeasures.org), the Cambridge Conservation Forum (www.cambridgeconservationforum.org.uk), and others. Various tools have been developed and/or are being refined by these and other institutions to support the collection and sharing of information related to the outcomes of wildlife based conservation and development projects, and to improve the ability to predict those outcomes under varying social, economic and biological conditions (e.g. see Marshall *et al*. 2006; see Kapos *et al*., 2008).

Further research efforts are required, building on this study and the work of others noted above. In addition, there is a need to make this information more practical, policy-relevant and easily accessible to government agencies charged with designing and implementing wildlife trade controls, donor agencies supporting such efforts, NGOs, IGOs and businesses interested in addressing wildlife trade related concerns. This includes:

a) **Investing in developing the evidence base for wildlife trade interventions, and moving towards approaches that more clearly link to and build on this evidence-base.** This requires generating specific data on key aspects of the wildlife trade that remain under-researched or unknown (see c) below), and undertaking the type of higher-level generalised analysis presented in this study to further understand the linkages and chains of causalities between the different factors and conditions that drive the wildlife trade. Where appropriate, systems and approaches to obtain this information should be integrated into on-going and future projects.

b) **Making the communication of information and dissemination of research findings related to improving intervention effectiveness a priority**. Particular attention should be paid to generating practical and policy-relevant information for wildlife trade decision-makers and planners, and ensuring that it is shared in a useful and accessible form and in particular making it available in local languages. Mapping and models of wildlife trade dynamics and trade chains, for example, can serve as important tools for illustrating key features and intervention points, and providing decision-support information.

c) **Expanding the knowledge base on specific species, products, locations and stakeholder groups considered a priority in conservation and/or development terms**. A number of data gaps and priority areas for research requiring urgent and immediate attention emerged during the course of this study, including:

- the status of wild populations subject to harvest and trade;
- the impacts on human livelihoods of wildlife harvest and trade at different scales (e.g. household, community, country)
- the characteristics of end-consumers and consumer markets shaping wildlife trade dynamics from the target countries
- existing enforcement capacity and efforts; and
- the potential acceptability and mechanisms for promoting substitutes for products from wild-harvested species.

d) Increasing investigation of the potential to develop typologies for wildlife products in trade, and the use of scenarios, bioeconomic modelling, Bayesian Belief Networks and other analytical tools to assess the application of interventions under different conditions. Further discussion of these tools is provided in Annex 3. A particular emphasis should be placed on exploring the factors associated with specific interventions known to have been successful. Approaches that were considered by experts consulted in this study to have a relatively high rate of success in controlling the trade, but to be little-utilized, e.g. market-based instruments and local norms, should also be explored as a priority.

7.2 Wealth appears to be a stronger driver of illegal and unsustainable wildlife trade in south-east Asia than poverty

Some wildlife trade interventions are designed on the premise that efforts need to be concentrated on the rural poor in order to reduce unsustainable and illegal harvesting. However, the majority of experts consulted for this study believe that such endeavours have been relatively limited in their effectiveness. Furthermore, attributes associated with wealth, rather than poverty, were seen as a stronger stimulus for the current levels of demand for wildlife products. These survey findings are in line with a common conclusion in the literature that it is the high and rising demands of increasingly large and affluent urban populations that are the main drivers of the wildlife trade. At a macro level, rapid economic growth and infrastructure expansion are also having a significant impact, because they are increasing access to wildlife habitat and markets (see also under 7.3).

However desirable it is to target livelihood-based wildlife trade interventions at the rural poor living in areas from which wildlife is harvested, the impact of these interventions alone on wildlife trade seems likely to be low as long as other groups and processes that exert a major influence on the wildlife trade – and that are fostering the market opportunities to which others involved in the wildlife trade are responding – remain unaddressed. This is not in any way to say that efforts to achieve poverty reduction and improved livelihoods in the countries covered under this study are not necessary, but rather to point out that, unless combined with other measures, such efforts seem unlikely to significantly reduce illegal and unsustainable trade.

In the light of the above, there is a critical need to ensure that interventions are better targeted to, and more cognisant of, the dynamics of the increasing affluence and wealth, rising aspirations and demands, and wider processes of economic growth in the region that are believed to drive a major share of the trade. This need can also be seen in relation to the persistence of markets for wildlife goods from unsustainable and/or illegal sources in key consumer markets. Greater attention is therefore required to the following actions if wider dynamics are to be addressed successfully:

e) **Improving the targeting of interventions towards urban consumers of wildlife products**. This should include interventions aiming to improve awareness and enforce legal restrictions, and to the broader markets, products and commodities that reflect their growing affluence and changing aspirations (see also under 7.6);

f) **Targeting interventions towards those richer, more powerful and/or influential groups that exert a high level of control over the wildlife trade chain**. This should include consideration of the need to improve enforcement and support efforts backed by the high-level political support required to influence these groups (see also under 7. 8); and

g) **Ensuring that interventions supporting improvements in rural livelihoods are based on a clear understanding of local harvest and trade dynamics where these interventions are aimed at reducing illegal and unsustainable wildlife harvest**. Such interventions should be packaged with other intervention approaches, e.g. those linked to harvest controls and tenure, in such a way as to address harvest and trade dynamics.

7.3 The design of wildlife trade interventions needs to take into account the broader conditions and trends that act to drive illegal and unsustainable wildlife trade

Most wildlife trade interventions have focused on changing the behaviour of particular groups, e.g. harvesters, traders, consumers, and/or enforcers, without taking into account broader conditions and trends within which these groups operate, such as improvements in transport infrastructure, economic growth in consumer markets, or technological advances. Questionnaire respondents noted the importance of these factors in shaping supply and demand, points also echoed in numerous references (see, for example: Redford, 1992; Davies, 2002). Wider issues of governance, e.g. in relation to tenure and corruption, also shape the wildlife trade and therefore need to be addressed in the design and implementation of interventions (see below). In the light of these findings, long-term solutions to the problems associated with illegal and unsustainable wildlife trade need to incorporate a much deeper understanding of underlying conditions and trends, including:

h) **Investigating and considering the broader conditions and trends that influence both supply and demand for wildlife products**. These include increasing wealth, economic growth, infrastructure development, law enforcement, and governance. Such investigations should take place alongside interventions to tackle the direct manifestations and barriers associated with illegal and unsustainable wildlife trade (e.g. regulations, awareness or resource management practices); and

i) **Making strong efforts to ensure that wildlife trade concerns and safeguards are integrated into the planning and implementation of infrastructure development and trade promotion**. This includes working to increase the understanding of wildlife trade issues among development decision-makers and measures to promote regional co-operation in addressing the wildlife trade (see also under 7.4 and 7.8).

7.4 Laws and regulations stand little chance of success unless they are effectively implemented and enforced, and wider issues of governance are also tackled

The majority of wildlife products in trade are subject to one or more regulatory controls on harvest and/or trade. However, the survey of expert opinion indicates that the success of regulatory interventions as they are being applied is highly variable. Consultation with experts, including during project workshops, consistently pointed to poor implementation and enforcement and weak governance as posing the largest barriers to controlling illegal and unsustainable wildlife trade. This finding is strongly and repeatedly backed up by the literature. Even if interventions are well designed and correctly target the drivers and causes of illegal and unsustainable wildlife trade, they will have little or no long-term impact if they cannot be implemented in practice. This includes not only the detection of wildlife trade-related crime, but also the prosecution of offenders, increased awareness of which was believed by some experts to act as a deterrent to illegal activity. Low capacity and will to enforce controls on the wildlife trade, which in turn is underpinned by a range of factors associated with weak governance (such as corruption, breakdown of the rule of law, inadequate political will), remain critically important reasons why wildlife trade interventions fail in practice.

In the light of these findings, it is imperative that concerted efforts are made to strengthen the implementation and enforcement of measures to control the illegal and unsustainable wildlife trade, including promoting the good governance that is required to ensure their equitable and effective application, including:

j) **Integrating policies on management of wildlife harvest and trade with implementation and enforcement of that policy along the trade chain**. This is relevant to the full range of policy applications, e.g. defined chains of custody for legal trade, harvest controls, national-level trade bans, and tenure arrangements. Unless there are adequate staff resources and technical capacity, backed up by budget allocations, policy will make little difference on the ground;

k) **Ensuring that implementation and enforcement of wildlife trade policies and controls is targeted at those points in the trade chain likely to have the greatest impact**. As noted above, further work is required to identify these points in relation to the products in trade;

l) **Strengthening the judicial sector's understanding of the significance of illegal and unsustainable wildlife trade**. Such understanding is necessary to promote the foundations of good environmental governance, particularly the establishment of sufficient deterrents in the form of penalties and prosecutions;

m) **Focusing on the building of multi-agency law enforcement capacity**. This includes multi-agency taskforces and other mechanisms to promote cross-jurisdictional co-operation and reduce the likelihood of collusion; and

n) **Supporting expansion of multi-lateral enforcement efforts in the region**. Of particular importance are efforts being undertaken under the umbrella of the Association of Southeast Asian Nations (ASEAN) through the ASEAN Wildlife Enforcement Network. Multi-lateral efforts should be expanded to include also countries that are major markets for products from south-east Asia, e.g. China, Japan, the USA and the EU.

7.5 Non-regulatory approaches to controlling illegal and unsustainable trade, e.g. market-based interventions and support for improvements in resource management, are under-used

As indicated above, questionnaire results and the literature both point to the dominance of regulatory approaches in efforts to control the wildlife trade. However, experts surveyed believed that, where they were in place, non-regulatory mechanisms, e.g. local norms and traditions and market-based mechanisms such as buying agreements, were frequently effective at reducing illegal and unsustainable harvest and trade. The same was believed to be true of interventions designed to improve management of the resource, e.g. through species management plans. Greater emphasis should therefore be given to such approaches, including by:

o) **Increasing support for research regarding, and improvements in, the management approaches used for harvest of those wild species for which harvest is permitted**. This support should be linked to greater consideration of the links between management measures and local norms and traditions; and

p) **Encouraging greater investigation of, and where appropriate, investment in voluntary and market-based measures**. Instruments such as buying agreements and product certification should be explored, building on experiences thus far, including in relation to timber and fisheries products. Consideration should be given to the links between these measures and those aimed at awareness-raising.

7.6 Awareness efforts to reduce illegal and unsustainable trade need to be targeted to specific audiences and their effectiveness evaluated over time

Awareness campaigns were believed to be effective in changing behaviour in approximately half the cases where they were targeted at consumers, and in less than a third of the cases where they were targeted at harvesters or traders. Very little information was available in the literature on the effectiveness of such campaigns. Greater understanding is required, therefore, regarding how best to communicate to the various stakeholder groups involved in the wildlife trade in order to shift their behaviour away from illegal and/or unsustainable activities.

q) **Improving the knowledge base regarding the shaping of stakeholder attitudes towards the harvest, trade, purchase and consumption of wildlife products**. Particularly attention should be given to those species in trade of high conservation concern. The design of awareness efforts should be based on this knowledge, and pay attention to, e.g., the messaging likely to be most effective, the best communication channels to reach the desired stakeholder groups, and the minimum duration needed for such campaigns to have a lasting impact.

r) **Incorporating a monitoring and evaluation component into awareness campaigns**. Awareness campaigns should be developed in a way that will enable their impact to be assessed and subsequent campaigns to be modified in order to strengthen their impact further.

7.7 Co-ordinated packages of mutually reinforcing interventions are required to address illegal and unsustainable wildlife trade in a more comprehensive manner

Numerous references in the wildlife trade literature as well as experts consulted during the study workshops recommended that a variety of interventions was needed to tackle illegal and unsustainable wildlife trade more effectively. When applied in isolation, specific categories of intervention may be both effective and necessary to halt illegal and unsustainable wildlife trade for specific actors, places or

products. However, they are more likely to provide sufficient conditions to control this trade at a broader level when applied in combination.

With this in mind, there is an urgent need for better research, as called for above (7.1), to understand the effectiveness of interventions applied in combination. There is also a need to co-ordinate the design and application of different trade interventions better. This will help ensure that, acting together, such interventions establish sufficient conditions to halt illegal and unsustainable trade in the target species and/or in relation to the target site. Steps required include:

s) **Ensuring that interventions present a balanced mix of enabling and positive incentives together with more restrictive and punitive measures**. This mix should be considered whether applied to a single species, product, location or participant group in the wildlife trade chain;

t) **Ensuring that interventions are inter-linked and targeted across the different species, products, countries, locations, actors and stages in the wildlife trade marketing chain**. This includes, for example, ensuring that regulatory controls support resource tenure arrangements, that awareness efforts increase support for regulatory approaches and/or promote markets for sustainably produced products, etc.

u) **Actively fostering better co0ordination, data-sharing and joint efforts between different agencies, sectors and countries, according to their specific mandates, agendas, interests and capacities**. In particular, there is a need to promote improved collaboration between:

- Development and conservation agencies, both to address the broader threats posed by the wildlife trade, as well as to improve the co-ordination of measures undertaken;
- Countries that provide the source of wildlife that is traded, and those that are its major consumers. A regional framework of policy-related agreements would assist in this; such efforts in south-east Asia could be co-ordinated at least in part under the existing ASEAN Regional Action Plan on Trade in Wild Fauna and Flora, with links to China, Japan and other major consumer markets such as the EU and North America.

7.8 Increased attention and investment is required if wildlife trade is to be brought within sustainable levels and conducted according to national and international trade controls

The survey results demonstrate that a variety of approaches are being used to reduce illegal and unsustainable wildlife trade in south-east Asia. However, as noted in much of the available literature and by participants in the study workshops, and as evidenced by the on-going decline of many wild species in trade, increased action, particularly with regard to enforcement of trade controls, is needed to bring the wildlife trade under more effective control. There is therefore an urgent need to affect a shift in the way in which wildlife trade is perceived, and to raise the priority that is accorded to the policies, interventions and resources that are targeted towards addressing it. These include:

v) **Securing high-level political support to ensure that measures to address the wildlife trade are accorded a high priority in conservation sectors**. This includes ensuring that sufficient resources are allocated to implement these actions; and

w) **Mainstreaming wildlife trade issues not only within conservation policies, programmes and budgets, but also within policies, programmes and budgets that are targeted towards meeting socio-economic development and poverty reduction goals**. This includes increasing the attention to the role that wildlife products play in relation to delivery of the Millennium Development Goals, particularly in, but not limited to, rural areas.

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ANNEX 1:
Questionnaire used for the survey of expert opinion

	Background Information – Interviewee	Answer Choices	Comments (*Optional*)
A	Interviewee full name ……..…….. Institutional affiliation (if any) …….……..		
B	What are the sources of information upon which your opinion is based? *Select all that apply.*	☐ Primary research ☐ Grey literature ☐ Published literature ☐ Experience of project implementation ☐ Policy level research/implementation ☐ Direct involvement in wildlife trade ☐ Anecdotal information (e.g. opinions of others) Other:	
C	What is the scale at which you are commenting on for this product survey? (Please be as specific as you can)	☐ Country (Name:) ☐ Province (Name:) ☐ District (Name:) ☐ Village (Name:)	
D	What is the scale at which you are commenting on the trade network?	☐ International ☐ National ☐ Local	
E	What describes your role working with this product? *Select all that apply.*	☐ Conservation ☐ Development ☐ Research ☐ Private sector ☐ Intermediary trader ☐ Wholesaler ☐ Independent consultant ☐ Retailer ☐ Regulatory enforcement ☐ Other:	
F	Which part of the trade chain are you most familiar with?	☐ Harvesting/production ☐ Intermediate trade (including import/export) ☐ End consumption ☐ All parts equally	

	Background Information – Product & Product Characteristics	Answer Choices	Comments (*Optional*)
G	Product name ……..		
H	What species is it derived from? ……...		
I	What is the source of the product? - If it is an animal: - If it is a plant: - If it is a fungus:	☐ Whole or part of carcass (where harvesting kills the animal) ☐ Product made by the animal, such as honey, silk or birds nest (where harvesting does not kill the animal) ☐ Vegetative structure (such as leaves, branches, bark, roots) ☐ Reproductive structure (such as flowers, fruits, seeds) ☐ Plant product (exudate such as latex, resin, gum) ☐ Product of parasitic infection of plant (e.g. stick lac, agarwood)	

	Background Information – Product & Product Characteristics	Answer Choices	Comments (*Optional*)
		☐ Whole fungus (e.g. edible mushrooms) ☐ Product created by the fungus	
J	How perishable is the product?	☐ Not perishable ☐ Low (no processing or special storage facilities required for transport) Moderate (processing or special storage facilities required for transport) ☐ High (processing or special storage facilities required, but product still has ☐ short shelf-life)	
K	What is the spatial extent of the production area from which the raw material can be harvested, as compared to the region over which the product is traded?	☐ Small – approximate harvest area is less than 10% of trade region ☐ Medium – product can be harvested over 1/3 of the trade region ☐ Large – product can be harvested over more than 1/3 of trade region	
J	What is the scale of trade in this product?	☐ Local ☐ National ☐ International	
L	What has been the growth trend in human population in the production area (over the past 10 years)?	☐ Human population increasing ☐ Human population relatively stable ☐ Human population decreasing	

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
1	Is this product mostly harvested for trade or for subsistence use?	☐ Majority harvested for subsistence (within household) ☐ Majority harvested for trade (outside of household) ☐ Both equally important ☐ Unknown or impossible to specify		
2	What is the importance of trade in this product to overall household income?	☐ Contributes more than 50% of household income ☐ Contributes 10-50% of household income ☐ Contributes less than 10% of household income ☐ Varies from household to household		
3a	Are most wildlife harvesters:	☐ Operating independently ☐ Working for others as hired labour ☐ Working on an informal "contract" basis for suppliers/middlemen		
3b	Who harvests the species? *Select all that apply.*	☐ Local people working independently ☐ Local people working for outsiders ☐ Local people working for other local people ☐ Outsiders working independently ☐ Outsiders working for outsiders ☐ Outsiders working for local people ☐ Incoming settlers ☐ Commercial/private enterprise ☐ Government agency		
4	Is harvesting of this product primarily used to fill unforeseen/emergency income gaps (e.g. due to sudden cash needs, collapse of other income sources)?	☐ Yes ☐ No		
5a	Is harvest of the product carried out:	☐ Seasonally ☐ All year round		

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
5b	Is supply of the product available for harvesting:	☐ Seasonal ☐ All year round		
6	Does the importance of trade in the product to livelihoods vary at different times of the year?	☐ Yes ☐ No		
7	Which income level is primarily responsible for harvesting the product? *Select one answer.*	☐ Poorest 1/3 of households ☐ Middle 1/3 of households ☐ Wealthiest 1/3 of households ☐ Variety of income groups		
8	What genders/ages are primarily responsible for harvesting the product? *Select all answers that apply.*	☐ Children ☐ Adult men ☐ Adult women		
9	How are harvesters paid? *Select all answers that apply.*	☐ Cash advance, to harvest certain products ☐ Cash on sale ☐ Barter exchange ☐ Paid as formal/informal employees for time worked, rather than amount of product harvested		
10	How has the price paid (per unit of product) to harvesters changed **in real terms** during the last 10 years?	☐ Increased ☐ Decreased ☐ Stayed the same ☐ No clear trend		
11a	Have there been any external interventions aimed at reducing poverty among households harvesting this product or in areas where there are high levels of trade in this product?	☐ Yes ☐ No		
11b	If yes (to 11a), how successful have these interventions been in terms of alleviating poverty?	☐ Very successful ☐ Somewhat successful ☐ Unsuccessful		
11c	If 'very successful' or "somewhat successful' (in 11b), is there evidence that people have moved away from harvesting wildlife for trade?	☐ Yes, people have moved away from harvesting wildlife for trade. ☐ No, people have not moved away from harvesting wildlife for trade.		
12a	Do you believe that people shift away from wildlife harvest/trade and into other livelihood/income sources as their socio-economic status improves?	☐ Yes ☐ No		
12b	If yes, what other livelihood or income sources are they moving into?	*Please list briefly:*		
13	Do you believe that people move into wildlife harvest for trade as their socio-economic status declines?	☐ Yes ☐ No		
14	Are there other income generating opportunities that are available to harvester households (other than harvesting of the product)?	☐ Yes, there are many ☐ Yes, there are a few ☐ No, there are none		
15	How important is the wildlife trade (in this product and other products) as a livelihood activity to harvesters, in comparison to other livelihood options available?	☐ The most important – almost no other activities ☐ Very important – one of only a few activities ☐ Somewhat important – one of many activities ☐ Relatively unimportant – an occasional activity		
16	What percentage of annual harvester household income is generated from	☐ Less than 1/4th of total income		

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
	the trade of wildlife products <u>other</u> than the one considered in this questionnaire?	☐ Approximately ¼ to ½ of total income ☐ Approximately ½ to ¾ of total income ☐ More than ¾ of total income		
17	In general is harvesting of the product opportunistic or a planned activity?	☐ Opportunistic ☐ Planned		
18a	Have there been any external interventions to create alternative livelihood options for harvesters?	☐ Yes ☐ No		
18b	If yes (to 18a), is there evidence that these have resulted in a reduction in harvesting of wildlife <u>in general</u>?	☐ Yes ☐ No ☐ Unsure		
18c	If yes (to 18 a), is there evidence that these have resulted in a reduction in harvesting <u>specifically of this product</u>?	☐ Yes ☐ No ☐ Unsure		
19a	Is the product harvested from non-wild sources (e.g. cultivated or farmed)?	☐ Yes, harvested from wild and non-wild sources ☐ No, only harvested from wild sources		
19b	If yes (to 19a), estimate the percentage of volume produced for trade from <u>non-wild</u> sources.	☐ 0-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%		
19c	Are the same people involved in non-wild and wild harvest?	☐ In most cases ☐ Sometimes ☐ Never		
19d	If yes (to 19a), is there a trend towards increased harvesting from non-wild sources? Was this product previously wild harvested?	☐ Yes ☐ No		
20	What is the main reason for harvesting this product?	☐ Income ☐ Pest removal ☐ Enjoyment ☐ By-catch ☐ Culture/tradition ☐ Other:		
21	What is the primary motivation for harvesting wildlife (in general)?	☐ For own use, with the surplus sold ☐ For trade, with the surplus consumed at home ☐ Both/varies		
22	Is the product traded a by-product of another livelihood activity?	☐ Yes: ☐ No		
23a	Is there any evidence that harvesters have left the trade over the past 10 years?	☐ Yes ☐ No		
23b	If yes, why?	☐ Ill health ☐ Regulation ☐ Age ☐ Decline in demand ☐ Regulation ☐ Collapse of markets ☐ Immigrants ☐ Lack of harvestable resource ☐ Substitution with another product ☐ Decline in profitability ☐ Other:		
24	If consumer income increases, what do you believe would happen to the amount of product consumed?	☐ Increases ☐ Decreases ☐ Stays the same		

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
25	If product prices increase, what do you believe would happen to the level of demand for the product?	☐ Increases ☐ Decreases ☐ Stays the same		
26	For end-consumers, is the wildlife product considered a:	☐ Luxury good ☐ Essential item ☐ Other:		
27a	If supply increases (i.e. the amount of product being harvested), what do you believe would be the effect on price paid by consumers?	☐ Increases ☐ No discernible relationship ☐ Decreases		
27b	If supply decreases, what do you believe would be the effect on price paid by consumers?	☐ Increases ☐ No discernible relationship ☐ Decreases		
28	What have the trends been over the last 10 years? - Demand for the product in national markets has - Price of the product in national markets has - Demand for the product in international markets has - Price of the product in international markets has	 ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend		
29	Is the product easily substitutable (i.e. will consumers readily purchase an alternative)?	☐ Yes, with the same product obtained from non-wild sources ☐ Yes, with similar products obtained from other species ☐ Yes, with synthetics ☐ No		
30	Do you believe that changes in the prices of substitutes have a significant influence on market demand for the wildlife product?	☐ Yes ☐ No, because substitutes are considered inferior ☐ No, for other reasons		
31a	For each of the following, what have been the trends over the past 10 years? *Please tick the appropriate box.* - The abundance of the species in the wild is - The availability/affordability of substitutes is - The quality/availability of transport infrastructure is - The volume of Domestic trade in the product is - The number of harvest controls (including protected areas) are - The number of International trade controls are - Awareness of controls among harvesters is - Awareness of controls among traders is - Enforcement of controls is	 ☐ increasing *or* ☐ decreasing *or* ☐ stable ☐ increasing *or* ☐ decreasing *or* ☐ stable ☐ increasing *or* ☐ decreasing *or* ☐ stable ☐ increasing *or* ☐ decreasing *or* ☐ stable ☐ increasing *or* ☐ decreasing *or* ☐ stable ☐ increasing *or* ☐ decreasing *or* ☐ stable ☐ increasing *or* ☐ decreasing *or* ☐ stable ☐ increasing *or* ☐ decreasing *or* ☐ stable ☐ increasing *or* ☐ decreasing *or* ☐ stable		
31b	What is the most important factor that influences changes in product demand? (Select from the list in 37a, or identify an alternate factor.)	*Please state.*		
32	If the price of the wildlife product increases, do you believe that supply would:	☐ Increase ☐ Decrease ☐ Stay the same		
33	What is the relationship between supply and demand for the product?	☐ Supply exceeds demand ☐ Demand exceeds supply ☐ Supply and demand are matched		

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
34	Is demand for the wildlife product:	☐ Seasonal ☐ Dependent on special needs (e.g. medicine, ritual) ☐ Relatively constant throughout the year		
35a	How does the product move from harvester to trader?	☐ Traders visit the community to purchase from harvesters ☐ Harvesters bring the product to sell to traders ☐ Harvesters sell directly to consumers (if so, skip question 43b)		
35b	How often do harvesters and traders interact?	☐ Fixed/regular times ☐ Variable/irregular times		
36	Do traders rely solely on the trade of wildlife to make a living, or do they also trade other products?	☐ Specialise in trading only this product ☐ Trade a few wildlife products ☐ Trade any/many species		
37	What have the trends been over the last10 years? - Number of harvesters collecting the product has - Number of traders buying directly from harvesters has - Number of retail outlets where product is sold has - Volume of product consumed at national level has - Volume of product consumed at international level has - Total volume of trade has - Total value of trade has	 ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend		
38	Which of the following are true of the trade chain? *Select all that apply.*	☐ Relatively well established ☐ Relatively poorly established ☐ Markets are typically in same location from year to year ☐ People involved in harvesting and trade are typically the same from year to year ☐ Difficult for harvesters to access traders ☐ Involves temporary points of sale ☐ Crosses one international border ☐ Crosses multiple international borders		
39	Does the price of the wildlife product vary between seasons?	☐ No ☐ Yes, related to changes in demand ☐ Yes, related to changes in supply		
40	Which of the following have influenced the change in supply of this product? (Select all that apply.)	☐ Improved physical infrastructure (roads, etc) ☐ New economic activities opening up areas (mining, logging etc) ☐ Illegal logging facilitating wildlife trade ☐ Improved communication and connectivity with market towns ☐ Health scares and disease epidemics ☐ Other:		
41	Is the product harvested illegally from protected areas (PAs)?	☐ Always harvested from PAs ☐ Frequently harvested from PAs ☐ Sometimes harvested from PAs ☐ Never harvested from PAs ☐ Does not occur in PAs.		
42	Are there National legal restrictions on harvest in place?	☐ Yes		

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
		☐ No		
43	How have National legal harvest controls for the product changed in the past 10 years?	☐ Increased ☐ Decreased ☐ No change		
44a	Have these changes resulted in a reduction in volume harvested?	☐ No effect ☐ Yes, with immediate effect ☐ Yes, with effects felt in about 2 years ☐ Yes, with effects felt in about 5 years ☐ Yes, with effects felt in about 10 years		
44b	Have these changes resulted in any changes in the amount of corruption related to the wildlife trade (e.g. bribing officials)	☐ Yes ☐ No		
45a	Are there harvest quotas in place?	☐ Yes ☐ No		
45b	If yes, to what extent have these quotas been implemented? Why? *Please explain briefly.*.	☐ Fully *or* ☐ Mostly *or* ☐ Sometimes *or* ☐ Never		
45c	If yes (to 45a), how do actual harvest volumes compare to annual quotas?	☐ Actual volumes are about the same as quotas ☐ Actual volumes are lower than quotas ☐ Actual volumes are higher than quotas		
45 d	If yes (to 45a), how effective have these quotas been in regulating trade? Why? *Please explain briefly.*	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective _ _		
46a	Are licenses/permits required for legal harvest?	☐ Yes ☐ No		
46b	If yes (to 46a), what proportion of the harvest is covered by legal permits?	☐ All ☐ More than half ☐ Less than half ☐ None		
45 d	If yes (to 46a), how effective have these quotas been in regulating trade? Why? *Please explain briefly.*	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective _ _		
47a	Are there International legal restrictions on trade in place?	☐ Yes ☐ No		
47b	If yes, mark all that apply.	☐ CITES ☐ Bilateral trade agreements ☐ Regional trade agreements		
47c	How effective have these been in regulating wildlife trade? - Effectiveness of CITES o Why? *Please explain briefly.* . - Effectiveness of Bilateral trade agreements o Why? *Please explain briefly.* . - Effectiveness of Regional trade agreements o Why? *Please explain briefly.*	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective _ _ ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective _ _ ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective _ _		

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
48	Level of awareness of regulations related to harvest and/or trade: - How aware are harvesters of national regulations? - How aware are traders of national regulations? - How aware are traders of international regulations?	 ☐ Very *or* ☐ Mostly *or* ☐ Slightly *or* ☐ Not aware ☐ Very *or* ☐ Mostly *or* ☐ Slightly *or* ☐ Not aware ☐ Very *or* ☐ Mostly *or* ☐ Slightly *or* ☐ Not aware		
49a	How have regulations impacted the livelihoods of harvesters?	☐ Positive impacts on harvesters' livelihoods ☐ Negative impacts on harvesters' livelihoods ☐ Varied impacts on harvesters' livelihoods ☐ No impact on harvesters' livelihoods		
49b	How have regulations impacted the livelihoods of traders?	☐ Positive impacts on traders' livelihoods ☐ Negative impacts on traders' livelihoods ☐ Varied impacts on traders' livelihoods ☐ No impact on traders' livelihoods		
50a	Where along the trade have efforts to enforce national and international regulations been most effective? *Select all that apply.*	☐ Site of harvest ☐ Point of export ☐ Point of first sale ☐ Point of import ☐ Regional market ☐ International market place ☐ National market ☐ Other:		
50b	Where along the trade have efforts to enforce national and international regulations been least effective? *Select all that apply.*	☐ Site of harvest ☐ Point of export ☐ Point of first sale ☐ Point of import ☐ Regional market ☐ International market place ☐ National market ☐ Other:		
51a	Have any of the following been effective in controlling trade in the product? *Select all that apply.*	☐ Risk of detection ☐ Sentencing ☐ Prosecution ☐ Penalties		
51b	If there has been prosecution, is there any evidence that publicising the prosecution has resulted in a change in consumer behaviour?	☐ Yes ☐ No		
52	How has targeting of legal instruments to control trade influenced their effectiveness?	☐ More effective when targeted as a series of interventions across the trade chain ☐ Equally effective when targeted at one point along the trade chain ☐ Other:		
53	Where an intervention is effective at controlling trade along one trade route, is there evidence of the trade shifting to a new route?	☐ Yes ☐ No		
54a	Are there socio-cultural norms or traditions in place within harvester communities which restrict harvest and/or trade?	☐ Yes, norms currently exist ☐ Yes, norms existed in the past but no longer ☐ No, norms do not exist		
54b	If yes, is there evidence that these local norms have been effective in reducing harvesting volumes?	☐ Yes ☐ No		
55a	Use of non-legally-binding agreements to regulate trade in the product: - Are there any trade policies? o If yes, how effective have these been? o Where along the trade chain have they been most effective? - Are there artificially manipulated market prices? o If yes, how effective have these been? o Where along the trade chain have they been most effective?	 ☐ Yes *or* ☐ No ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective ☐ Site of harvest *or* ☐ Point of first sale *or* ☐ Area market *or* ☐ Nat'l market *or* ☐ Point of export *or* ☐ Int'l market ☐ Yes *or* ☐ No ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective ☐ Site of harvest *or* ☐ Point of first sale *or* ☐ Area market *or*		

Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
	☐ Nat'l market *or* ☐ Point of export *or* ☐ Int'l market		
- Are there any voluntarily reduced harvests? o If yes, how effective have these been? o Where along the trade chain have they been most effective?	☐ Yes *or* ☐ No ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective ☐ Site of harvest *or* ☐ Point of first sale *or* ☐ Area market *or* ☐ Nat'l market *or* ☐ Point of export *or* ☐ Int'l market		
- Are there any seasonally reduced harvests? o If yes, how effective have these been? o Where along the trade chain have they been most effective?	☐ Yes *or* ☐ No ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective ☐ Site of harvest *or* ☐ Point of first sale *or* ☐ Area market *or* ☐ Nat'l market *or* ☐ Point of export *or* ☐ Int'l market		
- Any other non-legally binding agreements? *Please list*. o If yes, how effective have these been? o Where along the trade chain have they been most effective?	☐ Yes *or* ☐ No ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective ☐ Site of harvest *or* ☐ Point of first sale *or* ☐ Area market *or* ☐ Nat'l market *or* ☐ Point of export *or* ☐ Int'l market		
56 How has targeting of non-legally binding instruments to control trade influenced their effectiveness?	☐ More effective when targeted as a series of interventions across the trade chain ☐ Equally effective when targeted at one point along the trade chain ☐ Other:		
57a Use of incentives to influence legal trade in the product: - Are there any buying agreements? o If yes, how effective have these been? o Where along the trade chain have they been most effective?	 ☐ Yes *or* ☐ No ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective ☐ Site of harvest *or* ☐ Point of first sale *or* ☐ Area market *or* ☐ Nat'l market *or* ☐ Point of export *or* ☐ Int'l market		
- Are there any certifications? o If yes, how effective have these been? o Where along the trade chain have they been most effective?	☐ Yes *or* ☐ No ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective ☐ Site of harvest *or* ☐ Point of first sale *or* ☐ Area market *or* ☐ Nat'l market *or* ☐ Point of export *or* ☐ Int'l market		
- Are there any tax incentives? o If yes, how effective have these been? o Where along the trade chain have they been most effective?	☐ Yes *or* ☐ No ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective ☐ Site of harvest *or* ☐ Point of first sale *or* ☐ Area market *or* ☐ Nat'l market *or* ☐ Point of export *or* ☐ Int'l market		
- Any other incentives? *Please list.* o If so, how effective have these been? o Where along the trade chain have they been most effective?	☐ Yes *or* ☐ No ☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective ☐ Site of harvest *or* ☐ Point of first sale *or* ☐ Area market *or* ☐ Nat'l market *or* ☐ Point of export *or* ☐ Int'l market		
57b How has targeting of incentives influenced their effectiveness?	☐ More effective when targeted as a series of interventions across the trade chain ☐ Equally effective when targeted at one point along the trade chain ☐ Other:		

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
58	What is the tenure arrangement over the species harvested?	☐ Private ☐ State ☐ Communal ☐ Open access		
59	What are the characteristics of harvest access rights?	☐ Secure and permanent (e.g. private) ☐ Secure with long term tenure (e.g. 20 year) ☐ Secure short term (e.g. concession) ☐ Insecure (e.g. no formal rights, open access, common property)		
60	Where are most natural resources harvested from:	☐ State lands ☐ Communal lands ☐ Own lands ☐ Others' lands ☐ Variable/mixed type areas		
61a	Have there been changes in land tenure (from communal/state to private) in areas where this product is harvested over the past 10 years?	☐ Yes, from communal/state to private ☐ Yes, from private to communal/state ☐ Yes, from private or communal to protected area ☐ No changes ☐ Other:		
61b	If yes, how have these changes in land tenure affected levels of harvest?	☐ Have caused harvest to increase ☐ Have caused harvest to decrease ☐ Results have been variable ☐ No effect on harvest		
62a	Have there been changes in species/resource tenure in areas where this product is harvested over the past 10 years?	☐ Yes, from communal/state to private ☐ Yes, from private to communal/state ☐ Yes, from private or communal to protected area ☐ No changes ☐ Other:		
62b	Have changes in species/resource tenure (from communal/state to private) affected levels of harvest:	☐ Have caused harvest to increase ☐ Have caused harvest to decrease ☐ Results have been variable ☐ No effect on harvest		
63a	Has access to the species/product been affected by an increased trade in the species?	☐ Yes, access has been reduced ☐ Yes, access has increased ☐ No, access has not been affected		
63b	Has access to the land where harvesting takes place been affected by increased trade in the species?	☐ Yes, access has been reduced ☐ Yes, access has increased ☐ No, access has not been affected		
64	Are there traditional norms in place governing local resource use?	☐ Yes ☐ No ☐ Uncertain		
65a	Is there evidence of immigrants moving into harvest areas and seeking to capture the economic benefits of wildlife trade over the past 10 years?	☐ Yes ☐ No		
65b	If yes, do these immigrants have the same resource access rights as local people *(vis a vis* this product)?	☐ Yes ☐ No		

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
66a	Have there been any targeted consumer awareness campaigns to reduce consumption of the product (including encouraging consumption of substitute products)?	☐ Yes ☐ No		
66b	If yes (to 66a), is there evidence that consumer awareness has led to changes in consumer behaviour?	☐ Yes ☐ No		
66c	If yes (to 66b), how long have the changes lasted?	☐ Less than 1 year *or* ☐ 1-5 years *or* ☐ 6-10 years *or* ☐ More than 10 years		
66d	If consumption has declined, have harvesting rates also declined?	☐ Yes, harvesting has declined ☐ No, harvesting has not declined ☐ Consumption has not declined		
67a	Have there been any interventions to increase awareness among harvesters of - the illegality of wildlife trade - the negative environmental impacts of wildlife trade	 ☐ Yes *or* ☐ No ☐ Yes *or* ☐ No		
67b	If yes, is there any evidence that awareness has increased among harvesters?	☐ Yes ☐ No		
67c	If yes, is there any evidence that harvesters have reduced harvesting as a result of increased awareness?	☐ Yes ☐ No		
68a	Have there been any interventions to increase awareness among traders of - the illegality of wildlife trade - the negative environmental impacts of wildlife trade	 ☐ Yes *or* ☐ No ☐ Yes *or* ☐ No		
68b	If yes, is there evidence that awareness has increased among traders?	☐ Yes ☐ No		
68c	Is there evidence that this increased awareness has reduced volume traded?	☐ Yes ☐ No		
69a	Has any external technical support been provided to improve harvesting and management practices?	☐ Yes ☐ No		
69b	If yes (to 69a), how effective have these quotas been in regulating trade? - Why? *Please explain briefly.*	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective		
70	What is the natural rate of reproduction of the species (as a factor of combined lifespan, maturity, fecundity, ecological adaptability)?	☐ Low ☐ Medium ☐ High		
71	What have the trends been over the past 10 years? - Extent of habitat for species in harvest area has - Quality of habitat for species in harvest area has - Abundance of species in harvest area has - Total amount of harvest has - Time required to harvest the same quantity has - Catch per unit effort has - Quality of raw harvested product has	 ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend ☐ Increased *or* ☐ Decreased *or* ☐ No clear trend		
72	Is there evidence of harvesting moving to different areas in response to	☐ Yes		

	Questions – Harvesting, Trade and Consumption	Answer Choices	Confidence	Comments
	over-harvesting of the species in traditional harvest areas over the past 10 years?	☐ No		
73a	Is there a formal management plan for the species?	☐ Yes ☐ No		
73b	If yes, how effective has implementation been? - Why? *Please explain briefly.*	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective _ _		
74	What methods are used to monitor the wild population? *Select all that apply.*	☐ Direct population estimates ☐ Quantitative indices (e.g. relative density based on surveys) ☐ Qualitative indices (e.g. rapid appraisal, extrapolation from harvest monitoring) ☐ Anecdotal, observation-based ☐ No monitoring has taken place		
75	What methods are used to monitor harvest? *Select all that apply.*	☐ Direct harvest estimates ☐ Quantitative indices ☐ Qualitative indices ☐ National monitoring of exports ☐ No monitoring has taken place		
76	What methods are being used to control harvest?			
	- Are there any harvest quotas?	☐ Yes *or* ☐ No		
	o If yes, how effective have these been?	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective		
	- Are there CITES export quotas?	☐ Yes *or* ☐ No		
	o If yes, how effective have these been?	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective		
	- Are there closed seasons?	☐ Yes *or* ☐ No		
	o If yes, how effective have these been?	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective		
	- Is there zoning/are there protected areas?	☐ Yes *or* ☐ No		
	o If yes, how effective have these been?	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective		
	- Are there any technology limits?	☐ Yes *or* ☐ No		
	o If yes, how effective have these been?	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective		
	- Are there size/age limits of individuals harvested?	☐ Yes *or* ☐ No		
	o If yes, how effective have these been?	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective		
	- Are there traditional norms?	☐ Yes *or* ☐ No		
	o If yes, how effective have these been?	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective		
	- Any other methods used to control harvest? *Please list*.	☐ Yes *or* ☐ No		
	o If yes, how effective have these been?	☐ Very *or* ☐ Somewhat *or* ☐ Slightly *or* ☐ Not effective		

ANNEX 2:

A sample of expert opinions of key actions required to reduce the illegal and unsustainable wildlife trade provided during the second project workshop

Governance, regulations and enforcement	• Generate the political will to move from 'paper-only' initiatives to practical action, e.g. by: - Creating the conditions whereby leaders within the region advocating that wildlife be protected and trade be addressed, taking genuine pride in their position on this issue; - Establishing "model countries" for wildlife protection; supported by donor communities through some certification process e.g. 'Green country of the year' – possibly linked to increases in tourism; - Linking aid to actions on the wildlife trade, e.g. loans from the World Bank's International Development Association (IDA); - Linking qualification for hosting international events such as the Olympics or south-east Asian Games to controlling illegal trade; - Increasing research and publication of the evidence of illegal trade, • Draw links between wider governance and security issues and the illegal wildlife trade, e.g. through making achievement of 'developed nation' status contingent on actions relating to the wildlife trade. • Address issues of corruption in implementing wildlife trade controls, e.g. among Customs and other regulatory authorities in exporting countries, through advocacy supported by evidence-based on research; • Strengthen the implementation of existing tools, e.g. CITES and the ASEAN Wildlife Enforcement Network (ASEAN-WEN) • Increase the level of penalties for illegal trade such that they form a deterrent, including through linking licensing (e.g. to restaurant owners) to adherence to wildlife trade codes of practice • Increase support from importing countries, particularly China, for implementation of international trade controls, e.g. by: - Establishing laws in importing countries that define imports as illegal if they involve goods exported illegally; - Suspension of imports of goods where there is concern regarding sustainability; - Encouraging China's leadership role in the region to include active support for a shift from illegal and unsustainable wildlife consumption to a stewardship economy for the wildlife trade • Improve enforcement of existing wildlife trade regulations, e.g. through increased: - Action by enforcement agencies and the judicial sector generally; - Collaboration among countries in investigating illegal trade; - Research on and capacity to use forensic techniques to assist in trade monitoring; - .Application of quarantine controls, tax laws and other trade-related regulations and controls that are available; - Enforcement of trade controls at the level of importers/retailers; - Communication of enforcement related information to the right people so that it can actually influence action on the ground • Address the issue of stockpiling to take advantage of the higher prices associated with increased scarcity • Increase attention to the need for airlines to enforce International Air Transport Association (IATA) regulations, including through raising awareness among the industry itself and raising the capacity of associated government enforcement personnel.
Communications	• Undertake research and publish information to highlight the problem of the illegal wildlife trade and support the case for interventions (i.e. an evidence-based approach); • Communicate and promote research findings, e.g. via a high profile summit to obtain political backing, for example by involving national political leaders, to build political will; • Increase awareness of harvesters of wildlife trade laws (with a lower focus on intermediaries) • Undertake awareness activities to make end-consumers more aware of what wildlife trade is illegal, bearing in mind that awareness is generally very low in the region for most species • Work to change consumer behaviour related to belief systems, e.g. to alter beliefs about medicines, tonic foods or those that confer 'power', raise awareness of the potential health risks of eating wild species, and the effectiveness of synthetic substitutes, possibly making use of existing networks or structures, e.g. traditional medicine networks, and by increasing the political will to communicate such messages; • Increase awareness amongst other actors in the value chain, e.g., transporters who sometimes do not realize that they are involved in illegal activities.
Research	• Identify information about the changes in trade that are occurring; • Increase transparency of market chains, including as this relates to benefit flows, and paying attention to the role of intermediaries; • Undertake research to provide evidence of the need to increase interventions
Non-regulatory incentives	• Consider making use of a name and shame approach with individuals and/or companies involved in illegal trade (it was noted that this approach could have negative consequences that could outweigh positive impacts); • Make consideration of illegality issues part of the wider business environment including in relation to the wider issue of corporate social responsibility • Explore options of 'eco-certification', for example of airlines that meet certain criteria, e.g. cease to carry wildlife products

ANNEX 3:
Tools to support further exploration of expert knowledge

Thus far, most analyses of the trade in wild species have taken the form of published papers and reports, sometimes incorporating trade chain and trade flow diagrams from producer to consumer countries (e.g. as included in the case studies on Tiger, agarwood, and tortoises and freshwater turtles), but much less frequently using diagrams to illustrate wider trade dynamics. However, a number of different diagrammatic tools are available that could usefully be used to illustrate the wildlife trade and support identification of which interventions are appropriate under different circumstances.

The sustainable livelihood framework, a conceptual model developed by the UK Department for International Development (DFID), supports planning of new development activities and the impacts of existing activities, by illustrating the main factors that affect people's livelihoods and the typical relationships between these factors. The framework stresses the multiple interactions between the various factors affecting livelihoods, while also focusing on core influences and processes (DFID, 2008). Guidance sheets on the framework, and the "sustainable livelhoods approach" of which it is a part, are provided on the "Livelihoods Connect" website (http://www.livelihoods.org/).

A simplified conceptual model developed specifically to illustrate frequently observed wildlife trade patterns within south-east Asia was developed by TRAFFIC, and is illustrated below. Trade of all wildlife species, for whatever purposes, can be placed along axes tending towards one of four categories (see Figure 25):

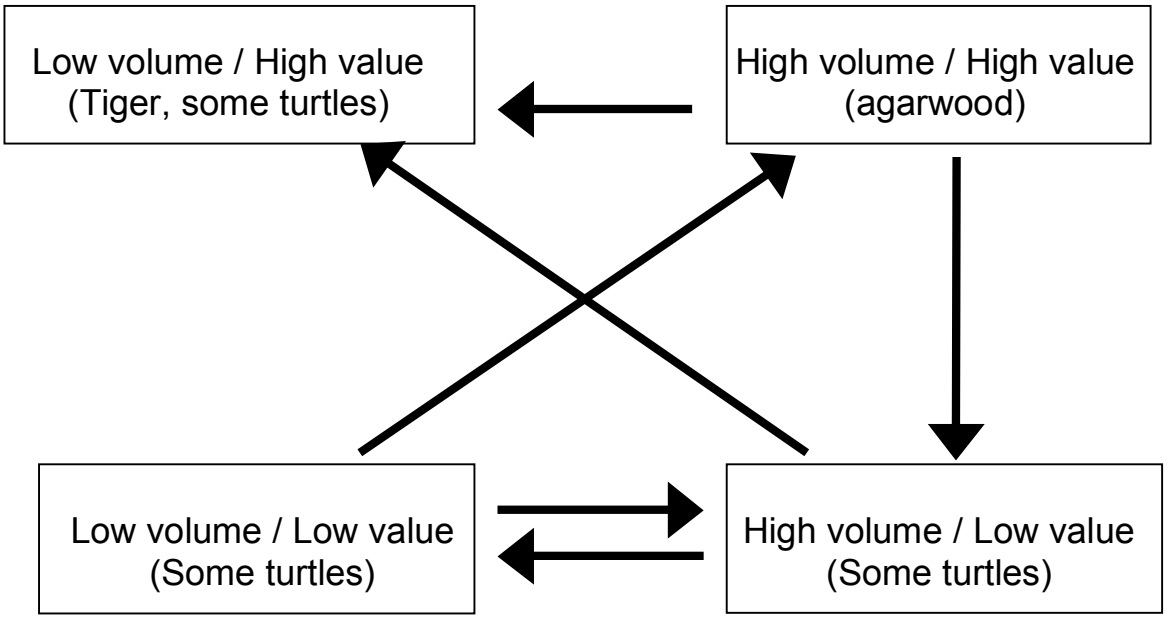
- Low Volume/Low Value
- Low Volume/High Value
- High Volume/Low Value
- High Volume/High Value

This model allows trends to be depicted and predicted, and can be used to help identify where interventions might achieve the greatest impact and/or are needed most urgently. This includes helping identify instances where wildlife populations are not yet threatened, but are likely to decline significantly if trade persists at current levels. Interventions can therefore be targeted with the goal of bringing and/or maintaining trade within sustainable levels rather than trying to ban it outright owing to conservation concerns.

As an illustration, species or groups of species with similar uses frequently move from one category to another as trade trends evolve. In the case of agarwood, for example, what was once a Low Volume/High Value trade (largely because of low numbers of harvesters) moved into a High Volume/High Value trade over the past 30 years, and in some local areas in Indonesia where quality has declined markedly, a High volume/Low value trade dynamic is increasingly evident. Wild populations within Viet Nam have now been over-harvested to the point where trade has moved through High Volume/High Value to what can now be characterised as Low Volume/High Value, owing to scarcity of the resource in the wild. Wild populations in Cambodia and Lao PDR are likely to follow a similar pattern through categories of volume and value if more is not done to bring trade within sustainable levels.

Often, species in the High Volume/Low Value group move to Low Volume/High Value as populations decline from over-harvesting, as their market value typically increases with increasing rarity. In the case of some species, the demand from end-users also shifts as the species decline, e.g. many species of tortoise and freshwater turtle may be sold primarily for human consumption (meat) while still numerous and inexpensive, trade shifting to the pet trade once hobbyists are prepared pay high prices for increasingly rare specimens. Some species, such as island endemic turtles and tortoises that were never common, may enter the Low Volume/High Value group soon after knowledge of their existence among collectors.

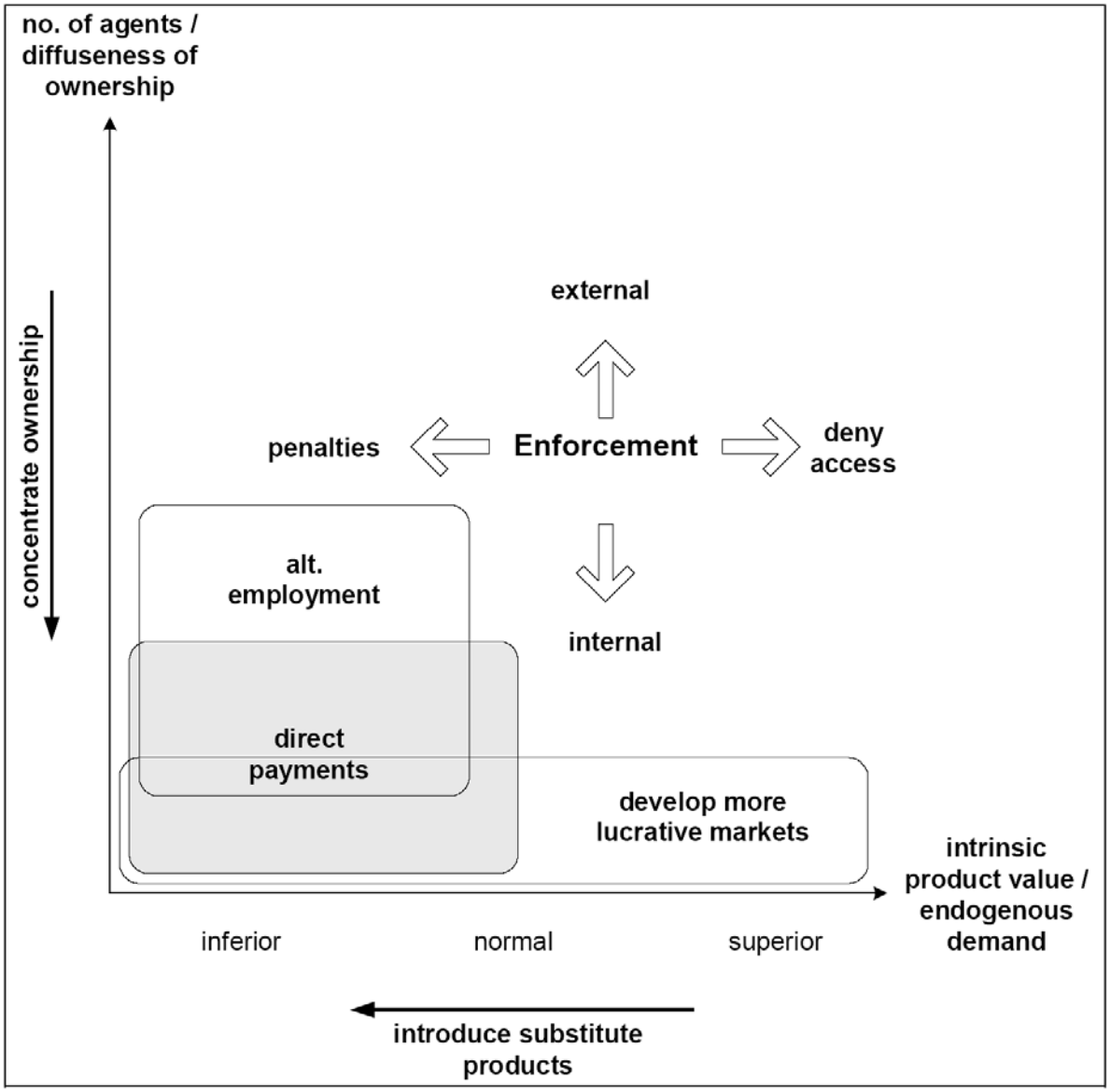
Figure 25: Potential framework for a bio-economic model of the wildlife trade



Source: Nijman *et al.* (in prep.).

Quantitative analytical models are also being developed that may be useful in relation to understanding the wildlife trade and its impacts. The most widely known of these are *bio-economic models*, which have been used to explore the economics of wildlife harvesting (Milner-Gulland and Mace, 1998). Bio-economic models are integrated economic-ecological models, which are generally used to define appropriate levels of stock and amounts harvested, to assist resource management decisions. Such models can therefore provide a useful tool for examining the feedback effects between human activity and natural resources. Based on such an approach, Ling (2004) presents a schematic diagram illustrating how different interventions might usefully be targeted with respect to wildlife products that are traded (Figure 26).

Figure 26: Schematic diagram of interventions, actors, resource ownership and product preference



Source: Ling (2004).

The indicative schematic diagram above illustrates the interventions that are likely to be effective in relation to axes correlated with the number of agents (or actors) and/or the diffuseness of resource ownership, and the strength of preference for the product derived from the resource and/or the demand for it amongst the group of agents in question. The direct payments box is shaded purely as a visual aid. Enforcement is indicated for all cases, but the balance of enforcement strategies varies with conditions as indicated by the arrows. The two interventions of concentrating ownership and introducing substitutes for the product in question are primarily used to alter conditions in order to favour the success of other interventions (Ling, 2004).

Elaboration of Bayesian Belief Networks

Bayesian Belief Networks (BBNs) offer a novel and informative approach for examining the effectiveness of interventions relating to the wildlife trade. BBNs are essentially analytical tools for combining and exploring different forms of evidence, and are particularly useful to situations where such evidence is characterised by a high degree of uncertainty, as in the case of the wildlife trade. BBNs represent the relationship between variables in the form of probabilities, enabling many different sources of data to be integrated and analysed according to a common framework. Presentation of model output in the form of probabilities has the added advantage of being relevant to the needs of decision-makers, who in the context of the wildlife trade require an assessment of risk associated with a particular intervention option.

The objective of this project was to define under what circumstances particular intervention options would be most likely to succeed. Evidence was collected in the form of expert knowledge, elicited using a questionnaire approach. The information was therefore collected in a way appropriate for exploration using a BBN, building on recent experience applying this method to analysis of non-timber forest product (NTFP) commercialization (Newton *et al.*, 2006).

A Bayesian Belief Network of the wildlife trade

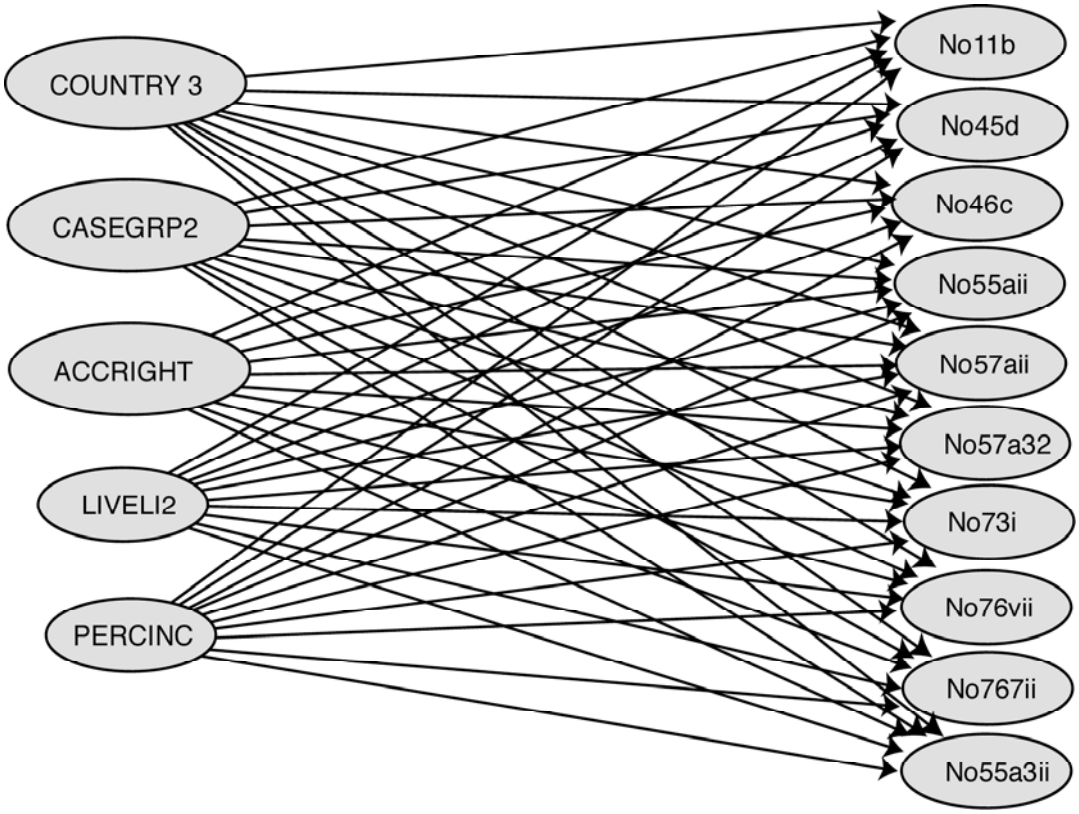
A network was constructed using the information obtained from the questionnaire survey. In each case, the aim was to use the BBN as a model, to predict the likely effectiveness of different interventions for different case study characteristics. The characteristics that were explored were selected focal product groups (Tiger, agarwood, tortoises and freshwater turtles), country where harvested, access rights, importance to livelihoods, and percentage of income derived from the trade. Using the BBN model, it was possible to assess which intervention options would be most likely to be successful for these groups.

The BBN was constructed using the Hugin Developer 6.3 inference engine (Hugin Expert A/S, Aalborg, Denmark, http://www.hugin.com/). In each case, variables were represented as nodes in the networks, and connected by arrows (directed links), which are indications of conditional dependence. A link between two nodes, from node A (parent node) to node B (child node), indicates that A and B are functionally related, or that A and B are statistically correlated. Each child node (i.e. a node linked to one or more parents) contains a conditional probability table (CPT). The CPT gives the conditional probability for the node being in a specific state given the configuration of the states of its parent nodes. When networks are compiled, Bayes' theorem is applied according to the values in the CPT, so that changes in the probability distribution for the states at node A are reflected in changes in the probability distribution for the states at node B. A BBN can be explored by changing the states of the nodes (or variables) incorporated within the model. When the state of a variable is known, it is said to be instantiated (Jensen, 2001). Once a node has been instantiated, then this will influence the probabilities associated with the states of other nodes to which it is linked, according to the values in the CPTs.

One of the features of a BBN is that the values in the CPTs can be "learned" from data (in this way, BBNs can be considered as a form of artificial intelligence). The process of refining the conditional probabilities in the CPTs is referred to as "sequential learning", which involves incrementally updating the knowledge incorporated in the network. The sequential learning algorithm implemented in Hugin is described by Spiegelhalter and Lauritzen (1990); see also Cowel and Dawid (1992) and Olesen et al. (1992). The procedure sequentially updates the initial values given in the CPTs by incorporating values derived from different cases. The algorithm performs a series of iterations, and maximizes the logarithm of the probability of the case data given the current joint probability distribution (Hugin, 2003). In this case, the probability values in the CPTs were derived from the questionnaire data using the sequential learning process. Outcomes were provided in the form of probabilities associated with different states of the node representing effectiveness of the intervention.

The BBN was constructed with a simple structure (Figure 27). Nodes representing the characteristics of the case study groups, with a state defined for each of the types considered, were each connected to single nodes representing the effectiveness of the intervention, each of which was given four states according to the scoring approach adopted ("very effective"; "somewhat effective"; "slightly effective"; "not effective").

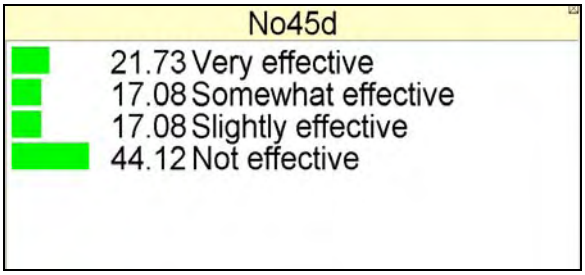
Figure 27: Structure of an example BBN for examining the effectiveness of trade interventions



The nodes on the left hand side represent different characteristics of the case studies (for example "country3" is the country where the product is harvested, and "accright" is the access rights of the harvesters, etc.). The nodes on the right hand side represent different interventions (numbered here in accordance with their numbering on the questionnaire).

The outputs of the BBN are provided in the form of probabilities of a particular intervention being effective. The BBN provides an indication of the likelihood of each of the four possible outcomes of an intervention as elicited during the questionnaire survey (Figure 28). The bars and numbers represent the probabilities associated with the four different outcomes, providing an indication of the likely effectiveness of this particular intervention.

Figure 28: Example of results obtained using BBN analysis



A series of analyses were performed using this BBN, incorporating the questionnaire data, to assess the potential of the BBN to help identify which interventions would be most likely to succeed for different case study groupings. Ten different intervention types were considered. The results indicate how the intervention type most likely to be very or somewhat effective varies between case study groups (Table 6); country of origin (Table 7); security of access to the resource (Table 8); and different levels of income provided by the wildlife trade (Table 9). In each case, the intervention marked by an asterisk is the one associated with the highest probability in being either "very" or "somewhat effective", as inferred by the BBN. "None" indicates that neither of these categories was associated with a probability of > 25%. Owing to the very small sample sizes for some groupings, these results should be considered as illustrative of the approach rather than indicative of likely outcomes. Nevertheless, an interesting pattern emerges in relation to the use of harvest licences and permits, these emerging as the most likely to be effective for the majority of groupings considered. As might be expected, these intervention types do not appear as effective interventions for Tigers, trade in which is banned, with species management plans instead found to be the most effective of the intervention types for this case study group.

Table 6: BBN prediction of which intervention is the most likely to be most effective for different case study product groups

Intervention	Agarwood	Turtles	Tiger
External interventions aimed at poverty reduction (Q11b)			
Harvest quotas (Q45d)		*	
Harvest licences / permits (Q46c)	*		
Voluntarily reduced harvests (Q55a3)			
Trade policies (Q55a1)			
Tax incentives (Q57a3)			
Buying agreements (Q57a1)			
Species management plan (Q73)			*
Traditional norms (Q76.7.1)			
Closed seasons (Q76.3.2)			

Table 7: BBN prediction of which intervention is the most likely to be most effective for different countries of origin

Intervention	Lao PDR	Vietnam	Cambodia	Indonesia
External interventions aimed at poverty reduction (Q11b)				
Harvest quotas (Q45d)				
Harvest licences/permits (Q46c)	*	*	*	
Voluntarily reduced harvests (Q55a3)				
Trade policies (Q55a1)				
Tax incentives (Q57a3)				
Buying agreements (Q57a1)				
Species management plan (Q73)				*
Traditional norms (Q76.7.1)				
Closed seasons (Q76.3.2)				

Harvest licences/permits again emerged as the most effective intervention type of those tested in relation to the three of the four target countries. In Indonesia, however, species management plans were the intervention most likely to be at least somewhat effective, followed by harvest licences/permits.

Table 8: BBN prediction of which intervention is the most likely to be most effective for different levels of security of access to the resource

Intervention	Insecure	Secure long term	Secure and permanent
External interventions aimed at poverty reduction (Q11b)			
Harvest quotas (Q45d)			
Harvest licences / permits (Q46c)	*	*	*
Voluntarily reduced harvests (Q55a3)			
Trade policies (Q55a1)			
Tax incentives (Q57a3)			
Buying agreements (Q57a1)			
Species management plan (Q73)			
Traditional norms (Q76.7.1)			
Closed seasons (Q76.3.2)			

Table 9: BBN prediction of which intervention is the most likely to be most effective for different levels of income provided by the wildlife trade

Intervention	Less than a quarter of annual income	Quarter to half of annual income	Half to three quarters of annual income	More than three quarters of annual income
External interventions aimed at poverty reduction (Q11b)				
Harvest quotas (Q45d)				
Harvest licences / permits (Q46c)	*		*	*
Voluntarily reduced harvests (Q55a3)				
Trade policies (Q55a1)				
Tax incentives (Q57a3)				
Buying agreements (Q57a1)				
Species management plan (Q73)		*		
Traditional norms (Q76.7.1)				
Closed seasons (Q76.3.2)				

These results highlight how a BBN can be used to explore the potential effectiveness of different interventions, and to identify which intervention is most likely to be effective under a given set of circumstances. The preliminary analyses presented here also illustrate how the method could be used to provide a decision-support tool regarding intervention choices. Obviously the reliability of the outcomes depends on the reliability of the probabilities incorporated in the CPTs, which ultimately depend on the reliability of the underlying data. However, the approach developed under this project could be developed further, for example by incorporating evidence from other sources (such as trade data) or from additional experts. As additional evidence becomes available, from a variety of such sources, it could readily be

incorporated in the network using its learning feature. Furthermore, a more comprehensive list of potential interventions and product characteristics could potentially be included.

It is also possible to generate predictions for different combinations of characteristics. For example, in the case of agarwood in Indonesia, in situations where trade is very important to livelihoods, the intervention predicted by the BBN as most likely to be very effective was harvest quotas (with a probability of 0.40). In the case of turtles, in situation where the trade is very important to livelihoods, two interventions (harvest quotas and licences/permits) were both predicted to be highly likely to be very effective (probability values >0.57). BBN outputs could also be of value in highlighting situations where the risk of failure of a particular intervention would likely be high.

One of the key characteristics of the wildlife trade is the high degree of uncertainty, not only in terms of the potential effectiveness of interventions, but also in terms of its importance to livelihoods and even the amount of trade taking place. One of the useful features of BBNs is that they allow such uncertainty to be explored, for example by varying the probabilities incorporated in the CPTs. It would be possible, for example, to explore the sensitivity of model output to the uncertainty associated with the questionnaire responses, or any other form of evidence that was available. Conflicts between different sources of evidence can also readily be identified, which can help focus future data-gathering efforts. Another approach that can readily be achieved using BBNs is the weighting of different sources of evidence, depending on their reliability. For example, the assessment of confidence in responses elicited during the questionnaire survey could potentially be used to weight the beliefs of different respondents, and the impacts on model output explored. Such exploration of a BBN model could enable the likely effectiveness of different interventions under different circumstances to be more fully explored. The value of this approach would be strengthened significantly, however, if additional evidence were incorporated in the model.

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