

The Cultural and Natural Heritage of Caves in the Lao PDR: Prospects and Challenges Related to Their Use, Management and Conservation

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Abstract

This paper introduces the human uses for and values placed on caves and karst environments in the Lao People's Democratic Republic (Lao PDR), and discusses some of the prospects and challenges related to their use, management, and conservation based on their value as cultural and natural heritage. In the Lao PDR, caves and karst have a broad range of uses and meanings, formed over long time periods that include prehistoric, historic, and contemporary phases. These uses have generated distinct values and meanings for diverse groups, including the Lao government, local communities, international researchers, and tourists. Caves are unique in that they fulfill, at least to some extent, all of the criteria for natural, tangible, intangible and historical heritage protection, making management of them difficult. The past, present and future importance of caves and karst and their multiple users and meanings has not been consistently taken into account in measures to protect or manage them. The increasing pressure from economic development practices, including logging, mining, and tourism, also compounds management and conservation. In order to sustainably manage and conserve caves and karst in the Lao PDR, they must be viewed as 'living places.' This will require the acknowledgment of their unique and crosscutting significance, their natural and cultural heritage and their current and historic uses and meanings. These characteristics should be identified and valued as part of any future conservation, social and economic development planning.

Key Words: Lao PDR; caves and karst; natural and cultural heritage management

Introduction

Karst, with its constituent of caves, makes up approximately 30,000 km² in the Lao PDR and is found in all of its provinces, making it a common and extensive feature in the national landscape. As natural places, caves and karst support high levels of natural biodiversity, geodiversity, rare species, the remains of extinct species, and provide essential ecosystem services (Clements et al. 2006; Kiernan 2011; Uhlig 1980). Caves and karst support many remote communities, with long-term interaction between people, caves, and karst indicated through the incorporation of caves in land-tenure systems (Kiernan 2011), community-based fisheries management (Baird 2006; Shoemaker et al. 2001), and general village-level economic and subsistence-based activities, including wildlife harvesting and gold panning (Kiernan 2009; 2011). Caves also support other social-cultural practices

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through their incorporation in the religious and spiritual beliefs of lowland Buddhists and upland non-Buddhist minorities (Chamberlain 2007; Kiernan 2009). In prehistory, caves were used as places for human habitation, mortuary practices and intermittent occupation (Sayavongkhamdy and Bellwood 2000). A resurgence of cave occupation occurred during the Second Indochina War (American War) from 1965 to 1973 (Dreybrodt et al. 2013; Pholsena 2010; Prices 2007). Many caves, including those at Vieng Xai District and Houaphanh Province, have become key sites for the production and subsequent promotion of Lao nationalism and identity (High 2007). Caves and karst environments have become tourist destinations for their natural and cultural values and caves have been identified as having the potential to support economic and social development aimed at alleviating poverty in remote regions of the nation (Harrison and Shipani 2009; Kiernan 2013; Lyttleton and Allcock 2002).

Despite their history and potential, the cultural and historical heritage value of caves and karst remains poorly identified and managed and has been little studied nationwide. It is estimated that only 10 percent of the 30,000 km² of total karst area nationwide is protected within 10 national biodiversity conservation areas (NBCAs) (Day 2011; Day and Urich 2000). The Lao government has made little effort to manage or preserve caves and karst landscapes outright, and to thereby protect their natural and cultural value (Kiernan 2009; 2011; 2013). Rarely are the unique and significant values of caves and karst identified or incorporated into broader heritage planning either within or outside of current NBCA. Caves and karst are more often protected indirectly or by default when they are situated within larger NBCAs or are managed by communities who value them for economic, subsistence or spiritual reasons (Baird 2006; Shoemaker et al. 2001). Articulation of the meaning and human experience of caves and karst as used by ethnic Lao or ethnic minority communities, including the village-level management of caves and the experience of tourism in community-owned caves, is also highly limited (Suntikul et al. 2009).

Much, if not most of the research into cave and karst uses and their value is still in its infancy in the Lao PDR (Dreybrodt et al. 2013; Kiernan 2011; 2013; The Vientiane Times 2010). Research and management often occur in isolated or 'key sites' nationwide, including in the Nam Ha region in Luang Nam Tha Province, at *Pak Ou* in Luang Prabang Province, at Vieng Xai in Houaphanh Province and at Vang Vieng in Vientiane Province. Research findings about cave and karst use in these locations and the interconnection between environmental and cultural values and uses are generally not reported or linked across disciplines. The location and geographic distribution, physical condition and natural and cultural heritage value of caves and karst can be sourced from only a few detailed studies (Kiernan 2009; 2010a; 2011; 2013), with most reported information on caves and karst available indirectly from caving projects (Steiner 2013), archaeological research (MMA 2010; Sayavongkhamdy and Bellwood 2000), economic development reports and assessments of tourism-based enterprises (Lyttleton and Allcock 2002; Manivong 2011; Rogers 2009; UNESCO 2008). Currently, there are no significant data sets that explain what is prevalent in cave or karst use over any significant time period. A shortage of baseline data and natural or cultural heritage management planning for caves and karst makes detailed analysis of values, uses and meanings extremely difficult. As a result, analysis must rely simply on linking examples of cave and karst

use to the problems and successes of management practices as they have been reported across research spaces and throughout specific time periods.

This paper provides background information on research associated with cave and karst in the Lao PDR, followed by a summary of the reported natural value of cave and karst environments in the country and the human uses for them (including prehistoric, historic, and contemporary use). A discussion of some of the prospects and challenges related to their use, management and conservation and to their unique and often crosscutting natural, cultural and historical heritage will follow. The unique values caves and karst hold to diverse groups of people, and issues arising from the growing use of caves by emerging actors, including the Lao government, local communities, tourists and heritage and other professionals, will form the basis of this discussion. Issues with the management of caves and karst nationwide are juxtaposed against increasing economic development pressures that have heightened the risk of damage or destruction to the caves and karst and the communities that use and rely on them. In this paper, I argue that caves and karst are 'living' places and that their sustainable use and management will require the identification, management and protection of their unique and crosscutting values, including natural and cultural heritage values, as well as an understanding of their new and old uses and meanings.

Cave and Karst Research in the Lao PDR

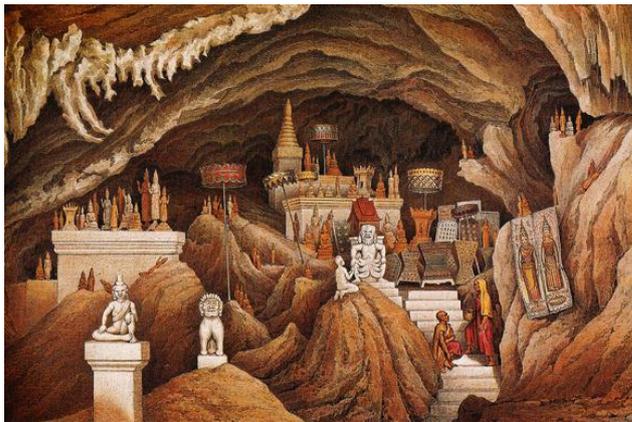


Photo 1: De Lagree and Sorrieu's 19th century representation of the interior of *Tham Nam Hou*, located near Luang Phrabang (De Lagree and Sorrieu, in Garnier 1873).

Caves and karst were first recorded by French cartographers and explorers in the course of their mapping and mineral exploration of French Indochina during the 19th and early 20th century. In the Luang Phrabang region, *Tham Nam Hou* was described by Francis Garnier and sketched by Doudart De Lagree (see Photo 1), the leaders of a French team that explored the Mekong River catchment between Saigon and the southern Chinese province of Yunnan between 1866 and 1868 (Garnier 1873). Caves in the Khammouane region were

explored by Jauques Fromaget during the mid-to-late 19th century (Kottelat and Steiner 2010). While he was exploring for mineral deposits, Fromaget discovered human fossils in the *Tham Hang* Rockshelter. Subsequent archaeological excavation work by Fromaget led to the discovery of another 17 anatomically modern human skulls in the rockshelter (Shackleford and Demeter 2011). During the early 1930s, another French archaeologist, Madeleine Colani, led prehistoric archaeological investigations in an unnamed cave adjacent to the *Plain of Jars* in Houaphanh Province. Colani speculated that use of this cave was connected to the iron-age culture located at the *Plain of Jars*. Other French researchers, including Edward Saurin, were also active as archaeologists in the Lao PDR during the 1930s and

1940s, but no other specific accounts of cave research are reported from them² (Kallen 2004).

Beyond initial investigations by French explorers and researchers, caves and karst in the Lao PDR did not receive significant or specific attention in natural or cultural scientific research until the 1990s. This period was marked by the easing of political and economic restrictions, following the 1986 New Economic Mechanism (NEM), which directed the centrally planned economy toward a market orientation, initiating regional and global market integration and the emergence of a new social and economic development initiative nationwide (Phimphanthavong 2012; Stuart-Fox 1997). During the 1990s, 'Western,' university-trained Lao national archaeologists from the Department of National Heritage began research and conservation efforts on key cave sites in Luang Phrabang and adjacent provinces (Sayavongkhamdy and Bellwood 2000). When non-Lao Western archaeologists re-entered the country after 1990, sites like *Pak Ou (Tham Ting)* in Luang Phrabang Province became locations for intensive joint efforts to conserve Buddhist shrines located within the caves. Between 1992 and 1996, Lao government archaeologists, Australian archaeologists, and other conservation specialists coordinated a restoration project in *Pak Ou* that was sponsored by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) (Egloff 1998; Egloff 2003; Johnson 1997; UNESCO 2004). Restoration and conservation followed international standards such as those developed by ICOMOS, and in most instances provided successful outcomes. The process did, however, raise a number of issues for managing and conserving caves considered 'living places.'

The historical built heritage of the Lao PDR gained UNESCO World Heritage status in 1995, with the official listing of the town of Luang Phrabang. The *Pak Ou* caves were also incorporated within heritage-management planning at Luang Phrabang as tourist sites, given their close proximity to Luang Phrabang and the historical connection of these caves to the town. The listing of Luang Phrabang also encouraged the Lao government to shift towards a 'tourist economy,' with the World Heritage site providing an economic resource that had the potential to mitigate rural poverty and discourage swidden cultivation, considered at the time to be environmentally destructive (Suntikul 2011). Following after Luang Phrabang, in 2001 Vat Phou Champasak in Champasak District, Champasak Province, also gained a UNESCO World Heritage listing as a 'cultural landscape.' The Vat Phou cultural landscape incorporated two sandstone rockshelters that contained Khmer inscriptions. These inscriptions were associated with the development and use of the historical cultural landscape of Vat Phou (Government of Lao PDR 1999). As with Luang Phrabang, Vat Phou has become a major tourist attraction, and it retains the local use of the Vat Phou complex for annual religious festivals and other community events.

During this period, archaeology continued to play a major role in cave research in the Lao PDR and by mid-2000, large-scale, jointly run archaeological projects had developed. These international projects involved Lao government archaeologists, Lao National Museum staff, the National University of Laos and

² Colani, Saurin and Fromaget were part of the *Ecole Francais d'Extreme Oriente (EFEO)*, an institute created in 1898 dedicated to the study of French Indochina, in particular its history, archaeology, and philology. The EFEO was based in Hanoi, Vietnam, and was not very active in the Lao PDR. Most work carried out there was between 1910 and the 1950s. See Kalen (2004) and Karlstrom (2009) for more information.

international academics and institutions. The partnerships supported structural capacity building for archaeology and international heritage management and conservation in many field sites nationwide. Jointly run, cultural heritage projects at the MMG-LXML Sepon Gold and Copper Mine, Savannakhet Province, have also been ongoing since 2006, incorporating archaeological surveys, excavations and research on the intangible cultural uses and values of caves within the mining tenement area (Chamberlain 2007; Mayes and Chang 2013). A Cultural Heritage Management Plan (CHMP) has been in place at the MMG-LXML site since 2007 (Mayes and Chang 2013). The Middle-Mekong Archaeological Project (MMAAP) has been performing archaeological surveys and excavations of cave sites (among other sites) in Luang Prabang Province since 2008 (MMAAP 2009; 2010; White et al. 2009), including caves like *Tham An Mah* (MMAAP 2013). Other collaborative heritage management planning at the Vieng Xai caves was ongoing during the 2000s, representing an effort to forge stronger cross-cultural cooperation and engagement there, including at a cultural heritage field school in 2006 (Wills et al. 2007).

Other science-based research projects involving caves and karst environments in the Lao PDR also progressed with the easing of political and economic restrictions in the 1990s. Importantly, biologically and geologically based research began to illustrate other significant values and uses related to caves, including their biodiversity, geodiversity and palaeontology. Research between 1996 and 2000 identified and recorded over half of the 510 species of fish ever recorded in the Lao PDR, and 128 species new to science were described from 1998 to 2000 (Kottelat and Steiner 2010). In addition, Baird (1998) conducted a survey of aquatic resources in karst environments in the Phou Hin Poun NBCA (now the National Protected Area or NPA) in 1998 that showed that the communities of fish species found within aquatic environments linked by underground caves differed widely, resulting in considerable fish community diversity. Throughout the first decade of the 2000s, new species continued to be found in caves. Surveys in Phongsali Province in northern Lao PDR also reported 19 new spider species for Laos, with eight species new to science (Guilbert 2007). In 2007, Middle-Pleistocene mammalian fauna remains were found in the *Tham Hang* Rockshelter in Houaphanh Province, highlighting one of the few preserved ancient and extinct faunal remains found in a cave in the Lao PDR (Bacon et al. 2011). In the Xe Bang Fai drainage in central Lao PDR, a new species of fish was reported (Kottelat and Steiner 2010), and a new species of spider was also discovered in the *Tham Nam Lot* cave in the Khammouane-Ke Bang karst in central Lao PDR (Lourenco 2011).

In the 1990s, caves and karst also came to be used for the purpose of exploration and adventure. At the time, the Lao PDR was considered a “blank spot on the world caving map” (Dreybrodt et al. 2013: 68), with only minor caving expeditions reported by French and Dutch groups in the early 1990s in Luang Phrabang Province, and at Vang Vieng and in Khammouane Province. In 2002, an international group of speleologists called the ‘Northern Lao-European Cave Project’ (NLECP) officially formed and began exploring karst areas in northern Lao PDR thought to have a ‘high’ potential for caving. The teams began to systematically research and document caves as they explored them (Dreybrodt et al. 2013), mapping their physical structure, including their length and location, and documenting their geology and geomorphology, flora and fauna and cultural value (Dreybrodt and Laumanns 2005; Dreybrodt et al. 2013; Prices 2007). In 2013, the Lao Cave Project reported on a decade of cave surveys and expeditions in northern

Lao PDR, stating that the group had been responsible for discovering 24 species new to science. Species included a blind cave fish, an ancient scorpion and a huntsman spider (Steiner 2013). Regular reports of their expeditions are documented through publications, conferences and on their website, including the total length of caves explored nationwide.³ The NLECP is one of a growing number of groups that continue to explore and document caves and karst in the Lao PDR.⁴

The transition to a market-oriented economy in the Lao PDR led to assessments of economic development activities and their direct or indirect social and environmental impacts. The environmental and socio-cultural effects of logging (EIA/Telepac 2008), mining (Barney 2009; High 2010), agricultural change (Kenney-Lazar 2012; Baird 2011) and dam construction (Singh 2009) demonstrate the emerging change in use and meaning of the natural landscape. Surprisingly, throughout the 2000s, examples of use or impact on caves and karst by natural-resource-based economic development activities were irregularly or indirectly reported. Since the early 2000s, however, feasibility studies and assessments of ecotourism and community-based tourism projects have evaluated the human use and economic value of caves and karst across a number of locations nationwide (Lyttleton and Allcock 2002; Rogers 2009). During this period, Vieng Xai, Vang Vieng, and the *Pak Ou* caves were identified as sites with potential for cave-based ecotourism and community-based tourism for pro-poor and economic development projects.

Anthropological or sociological research on the human use of caves and karst by modern Lao and ethnic populations also remained largely overlooked during the 2000s. Anthropological and ethno-archaeological research on continuity in cave use and the modern use of caves throughout tropical Southeast Asia is considered limited (Pannell and O'Connor 2005), with greater attention being placed on the prehistoric human use of caves and the role of caves in past social trends and transitions (Barker et al. 2005). In the Lao PDR, a number of minor studies, however, did illustrate the importance of particular caves. Ethnographic accounts of the Vieng Xai caves indicate they are symbolically important to the modern Lao state and provide the basis for a narrative interpretation of their political development and legitimacy (High 2007). A socio-cultural study in Savannakhet Province reported the use of caves in religious practices and their role within mythic and spiritual beliefs by Buddhist and ethnic groups residing there (Chamberlain 2007). In southern and central Lao PDR, research highlighted how human populations utilized caves and karst in subsistence and economic-based activities via community-based fisheries management practices (Baird 2006; Shoemaker et al. 2001).

Since 2009, comprehensive research has begun to illustrate the nationwide distribution, geological and geomorphological variation, unique biodiversity and human use and meaning attached to or associated with caves and karst (Kiernan 2009). This research also indicates the important economic, subsistence and spiritual roles that caves and karst can play for human populations in the Lao PDR, and the anthropogenic impact on cave and karst. In more isolated regions of northern Lao PDR, such as the Nam Ou Valley, caves and karst are incorporated within land tenure systems and economic and subsistence-based activities like agriculture, wildlife harvesting and gold-panning (Kiernan 2011; 2013). In locations

³ <http://www.laoscaveproject.de/>

⁴ For more information on caving groups and societies in the Lao PDR see: <http://laos.eegc.org/liens.php>

such as the Nam Ou, human activities, including land-use changes through agriculture, road construction and mining and tourist enterprises, are reported to be having an impact on geodiversity, biodiversity and the cultural values of cave and karst in the region (Kiernan 2012; 2013). The impact of economic development and social practices in this and other regions nationwide is identified as posing potential problems for the sustainability of cave and karst environments, both now and in the future. Research indicates the need to identify and prioritize specific heritage values in cave and karst environments, particularly the role of karst as a naturally functioning system with unique geodiversity. Regulated management practices were also suggested in order to sustain caves and the natural and cultural heritage values they contain and support into the future (Kiernan 2011; 2013).

Identified Natural Value of and Human Uses for Cave and Karst in the Lao PDR

Prehistoric Cave and Karst Use

The earliest documented dates for human occupation in the Lao PDR come from caves. Vientiane, Luang Phrabang, Houaphanh and Khammouane have the earliest recorded dates for prehistoric cave use, based on the number of caves and amount of karst in these provinces, and because most research has tended to focus on these provinces. The earliest dates for their use by humans in the Lao PDR are from Vientiane Province, where a human fossil (skeleton) buried in *Tham Pa Ling* has been dated between 46,000 and 51,000 years ago (LiveScience 2013). There has been criticism of the consistency of the stratigraphic dating of this fossil, but the age of the fossil has been confirmed and represents the earliest date of human occupation in the nation (Demeter et al. 2012), making this one of the earliest date for anatomically modern humans in mainland Southeast Asia (Higham 2012). Evidence does suggest, however, that humans began populating the area now included within the Lao PDR more consistently during the Mesolithic period or shortly after this time, about 20,000 years ago. Caves were also used regularly up to the Bronze Age, and were used consistently during the Iron Age for habitation and for mortuary practices (Higham 2002).

In Houaphanh Province, research in *Tham Pong* has reported Mesolithic-period human activity, with evidence of older human remains also discovered there. *Tham Pong* also includes a lower Neolithic burial site containing an adult buried on its back (Mouret 2004). In Khammouane Province, a high density of karst and associated caves reveal burial activity from the Upper Neolithic through to the late Iron Age, or around 400 BC. In *Tham Hang South* up to six human burials dated to the Neolithic period were recorded and are associated with pottery and ash blankets (Mouret 2004). Findings from Khammouane indicate the potential for the earliest prehistoric activity in the nation, with results from excavations in *Tham Hang* demonstrating that the cave and an associated rockshelter were occupied during the late Pleistocene to early Holocene periods (Demeter et al. 2009).

Luang Phrabang Province contains many caves with associated human activity dating from between 13,000 BP and the present (MMAP 2010). It is believed that caves in Luang Phrabang were used as part of a broader pattern of movement and trade between peoples and cultures along the Mekong and its tributaries (MMAP 2010). In *Tham Vang Ta Leow*, over 6,000 Hoabinhian stone cores and flakes were excavated, with two distinct periods of use and occupation identified. *Phou Pha*

Khao was occupied from at least the early to middle Holocene period and then again during the Iron Age. Up to six burial sites were cut through the initial occupation layer around 130-350 AD. Over 2,000 stone tools and almost 400 potsherds were found in association with the excavation (MMA 2009). Human occupation in *Tham Hao Phou* dates from around 4,500 to 3,500 BP over two distinct occupations. Considered a late Hoabinhian occupation, this cave supported either a large population or use of the cave that spanned a long time period. A number of Iron Age burials cut through the Hoabinhian layer at around 2,840 to 1,340 BP and objects from the graves included pottery, bronze objects, iron implements and stone and glass beads. *Tham Nang An* is dated to approximately 1,000 BP, and contained a jar burial with human and animal bones and three axe/adzes inside. The rockshelter associated with *Tham Nang An* exhibited an occupation sequence similar to *Tham Hau Pu*, with initial occupation by Hoabinhian hunters and gatherers followed by a secondary occupation by Iron Age agricultural communities (Sayavongkhamdy and Bellwood 2000).

At *Tham An Ma*, located close to the city of Luang Phrabang, research has identified a prehistoric occupation in the cave possibly dating to 13,000 BP (MMA 2010). This cave also contains numerous Iron Age burials with a later sequence of secondary burials. A ceramic jar burial with up to three human skeletons was found in the cave, dated from between 600 AD and 500 BC. The remains of two other pottery vessels, stone tools, and hearths were also found in association with this burial and in other layers in the cave. A white disc found in it resembles those found in the Plain of Jars, indicating possible links to that region during the Iron Age.

In Xieng Khouang Province, only one (unnamed) cave had been excavated during the 1930s, by Madeleine Colani. Colani excavated the cave in association with broader excavation work at the central site of the Plain Of Jars, near a village named Ban Ang (Kallen 2004). The cave entrance had been enlarged by humans and two holes in the cave roof were considered human made and used as chimneys. Colani suggests the cave functioned as a crematorium, and hypothesizes that the cave was used for funerary rites, supporting the theory that the Plain of Jars was a crematorium and was associated with a wider regional society. Nonetheless, mystery still surrounds the origin of the people who built this complex and the use of these sites, including the cave, and local legend regarding the origins and use of the jars differs from Colani's theory (Sayavongkhamdy and Bellwood 2000).

Historical and Buddhist Period Cave and Karst Use

In its early, historical period, what is today Laos was associated with the 'Indianization' of the region, the movement of *Tai* speaking people into the region and the development of state societies that included the rapid growth of Buddhism. The earliest recorded dates for the Buddhist use of caves in the region are in northern Thailand during the 15th and 16th centuries (Sidisunthorn et al. 2006). In the Lao PDR, the earliest recorded dates for the use of caves by Buddhists are in the Luang Phrabang region during the 16th century. However, Buddhism is recognized for its legitimizing influence in early state societies in what is today Laos since the 14th century, particularly around Luang Phrabang (Stuart-Fox 1986), and the use of caves for religious purposes by Lao royalty, monks, and lay people was reported to continue around Luang Phrabang over many centuries.

The *Pak Ou* caves in Luang Phrabang were transformed for use in Buddhist religious practices as far back as the 16th century, and constitute the oldest known

use of caves by Buddhists in the Lao PDR. Located on the west bank of the Mekong River, the cave complex has two chambers - one lower chamber, *Tham Ting*, and an upper chamber, *Tham Theung*. As many as 4,000 statues of the Buddha were housed in *Tham Ting* in the 1990s and represented the various positions and postures of the Buddha (e.g., standing, sitting or lying). These statues were set atop a platform constructed of brick. *Tham Theung* also contained a large stupa inside the cave chamber with an elaborate wooden door and an entry to the stupa (Egloff 1998; 2003).

Tham Ting was used by the Luang Phrabang royal family and for the extended lay practice of Buddhism in Luang Phrabang. The cave is linked to the rituals and symbolic process of Buddhism and performed an important function for the incorporation of the royal patronage of Luang Phrabang in coronation ceremonies, having been used for religious pilgrimage and in other uses by the royal family. The King of Luang Prabang is reported to have travelled regularly to *Tham Ting* to perform ceremonies for public demonstration, an important ceremonial legitimization of the relationship between Buddhism and royal patronage in the old kingdom (Egloff 1998). Other caves in Luang Phrabang Province, such as *Tham An Ma*, have large artistic murals depicting images of the Buddha or meditating monks that cover the cave or grotto walls. The earliest dates of these paintings are not known to the author, and the symbolism or use of these paintings is also unknown. Nonetheless, evidence from the *Pak Ou* caves and *Tham An Ma* indicate Buddhist cave use in this part of the Lao PDR from between the 16th and 21st centuries.

In southern Lao PDR, Vat Phou in Champasak Province contains a sandstone rockshelter and overhangs on the slopes of *Phou Kao* (Kao Mountain). For centuries, caves were reportedly used for meditation, and some were inscribed with symbolic religious inscriptions and iconography. Directly above the main sanctuary at Vat Phou is *Tham Lek*, an overhang that contains two inscriptions in Sanskrit and Khmer dating to the 7th and 8th centuries AD. The sandstone rockshelters and overhangs were reported to have been used in conjunction with and within the broader functions of the Khmer society of Champasak, including their incorporation into religious structures and ceremony and the natural elements of the sacred city that developed along the banks of the Mekong River from the 5th century AD (Government of Lao PDR 1999).

Pre-Buddhist spiritual beliefs about caves in what is now Laos have also been recorded in historical reports but are not commonly reported more widely. Overall specific information about the use and meaning of caves by pre-Buddhist or non-Buddhist ethnic groups with animistic beliefs is very limited, and such beliefs and practices are much less recognised or understood than those of Buddhists. Non-Buddhist beliefs and practices incorporating caves include creation myths and legends of ancestral or other mythical beings. At *Pak Ou*, for example, *Tham Ting* was reported to be the location for a river spirit (referred to as *phi*) that was venerated by local people before the arrival of Buddhism sometime around the 14th century. Upon the arrival of Buddhism, and officiating it as the state religion during that century, the cultures that worshiped *phi* were urged to join their beliefs with those of Buddhism (Egloff 1998).

Post-Historical Religious and Spiritual Use of Cave and Karst

Caves and karst continued to be utilised for religious and spiritual purposes by ethnic Lao and those from other ethnic groups nationwide. Buddhist and

animistic uses of caves for spiritual purposes continue to the present day (Kiernan 2009). The *Pak Ou* caves are still used by Lao people as a Buddhist shrine (Kiernan 2010a; 2010b; 2011) and ritual practices by the local community include the offering of incense and flowers (Johnson 1997). Since the mid-1990s, there have been ongoing efforts to protect and preserve the Buddhist integrity of this and other cave sites by the Lao government, local monks and communities. The aim is to preserve and promote the spiritual value and historical material culture of Buddhism for the purpose of mediation, local worship and tourism (Egloff 1998; 2003; Kiernan 2009; 2011; 2013). However, the extent to which Buddhist monks following the Theravada tradition in the Lao PDR utilize caves for meditation and other rituals and rites is unclear. It is also not known whether Buddhist forest cave monasteries or ‘sacred caves’ are still active, as they are in neighbouring Thailand (Sidisunthorn et al. 2006).

Caves continue to be identified as important places for various ethnic groups in the Lao PDR and some ethnic groups have been reported to incorporate caves and karst within cosmological belief structures and mythical narratives. In Savannakhet Province, some caves provide a residence or locality for ancestral and forest spirits of some Mon-Khmer language-speaking groups. Ancestral and other spirits often reside in caves and also live in forests, mountains and rice fields. These spirits are regarded by ethnic Brou people as ‘guardians’ of the places and function as ‘protectors’ of local clan groups. Spirits that reside in caves are called upon for ceremonies throughout the lunar and agrarian calendar year. Villagers propitiate spirits regularly to keep their families and their villages healthy and their crops prosperous (Chamberlain 2007; 2010). In Luang Namtha Province, the *Vieng Phouka* karst is the location of an annual ceremony in January in which a local shaman entices large fish from the cave to provide a feast for those present at the ritual (Kiernan 2009).



Photo 2: Khamtay Siphandon chairs an administration meeting in a cave shelter in Vieng Xay, Houaphan Province, during the American War period (LNTA 2014)



Photo 3: Caves in the Vieng Xai area were modified to accommodate for schools and revolutionary seminars during the American War period (LNTA 2014)

American War (1965-1973): Use and Impacts on Caves and Karst

The use of caves during periods of conflict can be traced back to the Lang Xang period, hundreds of years ago. However, wartime impacts on caves during the 20th century, particularly between 1965 and 1973, had a far more noticeable and long-lasting influence on both the physical condition of caves and karst and on how caves came to be used and valued by Lao people (Kiernan 2010b; 2012). Many caves in Xaignabouly, Luang Phrabang, Xieng Khouang, Houaphanh, Vientiane (Kiernan 2009) and Savannakhet provinces (Pholsena 2010) were heavily impacted during the Second Indochina War. Evidence of heavy bombing raids by US forces and forced wartime occupation of these and other caves has been preserved in both the physical structure of many caves and the material and physical objects left behind from the conflict (Kiernan 2009). Many caves were modified by revolutionary forces to accommodate guards and soldiers, were transformed into living quarters and offices and were also modified for use as training and re-education centers. Some caves in Vieng Xai even had human-made interconnecting tunnels, hospitals and a cinema built into them (see Photos 2, 3 and 4) (High 2007; Kiernan 2010b).

Caves became essential semi-permanent shelters for villagers who lived along the eastern border with Vietnam to avoid air-bombing raids (High 2007). Pathet Lao leaders were also forced into caves during the war, and in the Vieng Xai region, they eventually centered their operational command there (Stuart-Fox 1997). After a cease-fire was called between the American and Vietnamese governments in 1973, the headquarters of the Pathet Lao temporarily shifted and was established adjacent to the caves, continuing to operate in newly built

administration centers outside the caves (High 2007). The experience of living in caves during the American War still sits firmly in the memories of many Lao people around the nation (Pholsena 2010). The caves at Vieng Xai are a memorial site protected under national heritage legislation as a significant heritage site based on their wartime legacy and contribution to national development, with Houaphanh Province and the caves increasingly promoted by the Lao National Tourist Authority (LNTA) as ‘the birthplace of Laos’ (Manivong 2011). In recent years the Vieng Xai caves have become a major tourist attraction for their wartime legacy and are increasingly considered a location for ‘dark tourism.’

Subsistence and the Economic Use of Cave and Karst

Cave and karst environments have played an important role in local economic and subsistence activities for many rural people in the Lao PDR, and were important places in prehistoric and hunter-gatherer lifeways (Higham 2012). Karst water catchments are recognized for providing human populations with suitable environments for growing wet rice and for swidden cultivation, and in general, karst provides wild food resources and supports intermittent seasonal occupation for hunting and gathering purposes (Kiernan 2011) (see Photo 5).



Photo 5: A village situated within a karst landscape in Khammouane Province (Photo: Nicholas Roberts)



Photo 4: Caves in Vieng Xai also provided medical services for civilians and soldiers during the American War period (LNTA 2014)

with hydrological systems are recognised as supporting subsistence-based activities for rural populations, with caves and karst often incorporated into local land tenure systems (Kiernan 2013). In Khammouane Province, some caves provide refuge for fish in dry-season pools until the caves are flooded out again by monsoon rains. Young fish are looked after by local villagers in the dry season and brooding stocks are not

eaten by locals during this time (Baird 2006; Shoemaker et al. 2001). In the Nam Ou Valley in Luang Phrabang Province, the Nam Ou River and its tributaries are used for fishing, gold panning and even micro-hydroelectricity generation by villagers (Kiernan 2013). *Tham Pakeo* is used for harvesting bats for food and also possibly for trade. Other caves, such as *Tham Pasang*, are reportedly used as a temporary habitation for fisherman, with structures being built in a cave entrance to support their intermittent occupation (Kiernan 2011). Site-specific research is limited, however, and the long-term or contemporary use and value of caves and karst for subsistence and economic purposes is not well known.

Tourist Cave and Karst Uses

International tourism in the Lao PDR was officiated around 1989 (Yamauchi and Lee 1999), however it was not until 1996 that restrictions on obtaining tourist visas for foreigners eased (Schipani and Marris 2002). Since the mid-1990s, visitor numbers and revenue raised from tourism have become a major component of the Lao economy.⁵ Tourism has become an increasingly important component of development policy, providing important economic revenue at the national level, and enabling an alternative path to economic development and poverty reduction in many rural and remote communities of the Lao PDR (Harrison and Schipani 2007; 2009; Suntikul 2011). The economic value of caves and karst as tourist destinations was identified across a number of locations nationwide from the late 1990s. Some of these locations included *Pak Ou* in Luang Phrabang (Egloff 2003), the Vieng Phoukha to Muang Sing region in Luang Namtha (Lyttleton and Allcock 2002) and at Vieng Xai in Houaphanh Province (Suntikul et al. 2009). The Nam Ha Ecotourism Project (NHEP) in Luang Namtha Province began in 1999 and was one of the first major tourism projects in the Lao PDR (Schipani & Marris 2002). NHEP incorporates a variety of caves as destinations for tourists among other natural and cultural heritage destinations (Harrison and Shipani 2007). The NHEP has been the longest-running and most successful project of this type and continues to provide economic benefits for communities engaged in the project (Equator Initiative 2012; Harrison and Shipani 2007; Schipani 2006).

By 2012, over half of tourists visiting the Lao PDR visited 'natural' sites, including caves, with the remaining tourist destinations either cultural or historical sites (Lao Statistics Bureau 2012). The most popular locations visited by international tourists include *Pak Ou* in Luang Phrabang, the Vieng Xai caves in Houaphanh, and the caves at Vang Vieng in Vientiane Province (Harrison and Schipani 2009). The LNTA, through support from international agencies, aims to protect and promote the nation's environmental and cultural resources through sustainable social and economic development, including tourism (Harrison and Schipani 2009; Kiernan 2011; UNESCO 2008). However, recent reports across a number of locations nationwide indicate that damage to caves, karst and other ecological and culturally valued sites is occurring through tourist operations (Kiernan 2011; 2013). Other reports highlight a need to link the economic and social development goals of the Lao government and private tourism operators with those of local communities engaged in community-based tourist operations (Suntikul 20011; Suntikul et al. 2009; 2010). Economic investment in structural and

⁵ Between 1995 and 2012, the Lao Statistics Bureau (2012) reported that annual tourist numbers increased exponentially from 346,460 people to 3,330,072 people, with annual revenue from tourism also increasing exponentially from US \$24.74 million to US \$513.58 million over the same period.

regulatory procedures is required to prevent damage to the ecological and cultural heritage of caves, both now and in the future, and to achieve environmental sustainability and ongoing and effective community economic and social development (Harrison and Schipani 2009).

Use, Management and Conservation of Caves and Karst: Prospects and Challenges

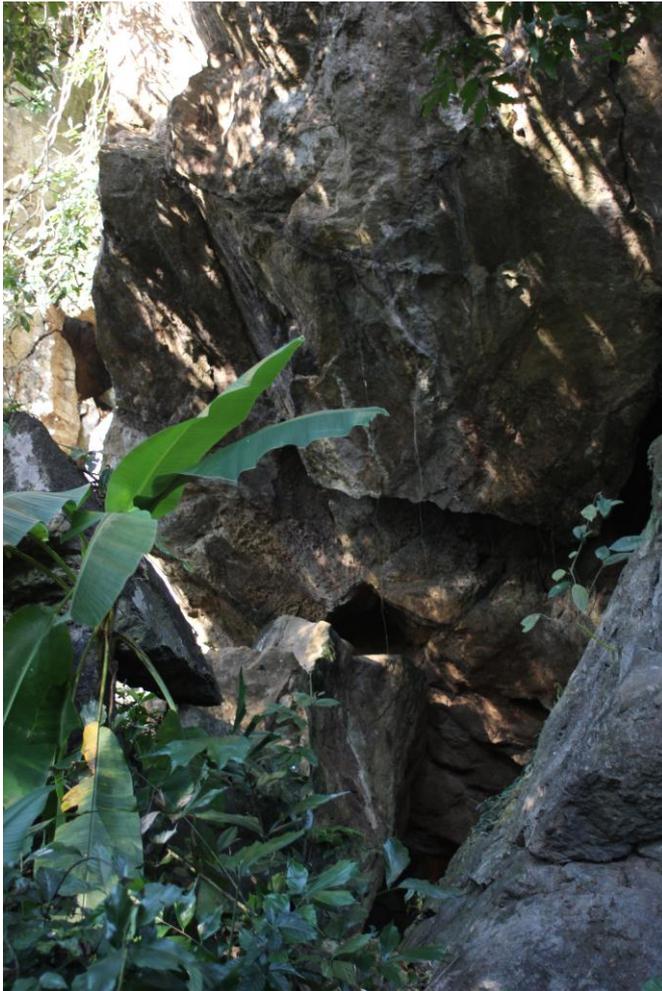


Photo 6: Entrance to *Tham Pakou*. Savannakhet Province (Photo: Nicholas Roberts)

Many caves and much of the karst in the Lao PDR can be considered 'living places' that contain multiple, cross-cutting and often competing past and present values, being actively incorporated within an ideological and geographical landscape (Pannell and O'Connor 2005). This is reflected through the variety of uses and values caves have had in the past, and the uses and values they continue to have as natural places that support local and national cultural traditions (see Photos 6, 7, 8 and 9) (Kiernan 2009; Latinis and Stark 2005; Sidisunthorn et al. 2006). Increasingly, modernity is placing pressure on caves to be self-supporting as ecological places in their own right, while also relying on their capacity to support existing traditional uses and values amid recent social changes and economic development activities. The uses and values found in caves and karst in the Lao PDR have become multifarious and often compete with each other, with new uses

and values superceding or replacing the old. In many instances, people are ascribing new uses and values to caves, with older uses and values as the basis from which they perceive, use or wish to use caves, and increasingly there is a desire to obtain something from a cave (Sidisunthorn et al. 2006). Caves are becoming increasingly useful and valued by non-local Lao or ethnic minorities, the Lao government, developers, tourists, and researchers (see Table 1, next page).

Table 1: Examples of Uses of Caves and Karst in the Lao PDR.

Place Name	Location	Identified Prehistoric Use	Identified Historical Use	Identified Contemporary Use	Management or Protective Framework	Management or Regulatory Bodies	Heritage Recognition	Identified Current and Potential Heritage Issues
Tam Ting (Pac Ou Caves)	Luang Prabang Province	None	Location for local phi cult prior to the introduction of Buddhism; Buddhist temple & location of Buddhist religious use since 16 th Century	Tourism; Archaeological research; Provincial, district and village-level economic development; Village-level economic & subsistence practices	Not known. Adjacent to the World Heritage Town of Luang Prabang	UNESCO; Lao National Government; Provincial, district and village-level	Historical (<i>national</i>) and Cultural (<i>langthab</i>)	Limited and under-resourced management and unregulated tourism has disturbed natural and cultural values, increasing risk of theft and vandalism of cultural materials (Buddha Statues) and damage or loss of prehistoric and historical cultural heritage materials and knowledge
Tam Hang Rockshelter	Houaphanh Province	Anatomically Modern Human Burials; Extinct Mammal Fauna	Cave explored and excavated by Fromaget during mid-to-late 19 th century	Scientific research for Archaeology and Palaeontology; Provincial, district and village-level economic development	Not known. (Ongoing research in archaeology and palaeontology)	Not Known	Not Known	Limited or lack of identified ongoing protective measures increases the risk of disturbance and/or destruction of the cave rock shelter and the loss of prehistoric/ historical material heritage. Increased risk of theft to cultural and natural heritage, artefacts and objects
Viang Xai Caves	Houaphanh Province	None	Headquarters of Pathet Lao and centre for Lao resistance during the American War Period (1965-1973)	Tourism; Archaeology; National, provincial, district and village-level economic development practices	Lao PDR Law on National Heritage (2005)	LNTA; UNWTO; ADR; other NGO; Deakin University (Australia); Provincial, district and village-level	National Historic Heritage Listed Site	Unsustainable or unregulated tourism infrastructure and tourism activities increases risk of damage to the cultural and natural heritage of caves. Safeguarding cave heritage and community values and knowledge of caves is required for sustainable cave management and local economic development
Nam Ha Region	Luang Namtha Province	None	Caves used by upland ethnic groups for economic, religious use and spiritual purposes	Tourism; Provincial, district and village-level economic development; Village-level economic, subsistence use, and spiritual beliefs and practices	National Biodiversity Conservation Area (NBCA)	DAPQ; UNESCO; LNTA; NGO; Provincial, district and village-level	Natural (<i>biological</i>) and Cultural (<i>langthab</i>)	Illegal logging, agricultural expansion, roads development and unregulated tourism threaten biodiversity values and cultural/natural heritage of cave and karst. Safeguarding heritage and community values and knowledge of caves is required for sustainable cave management and local economic development
Hin Namno	Khammouane Province	None	Historical material and cultural activities in caves located within the NBCA have been identified through archaeological studies	Tourism; Provincial, district and village-level economic development; Village-level economic, subsistence use, and spiritual beliefs and practices	National Biodiversity Conservation Area (NBCA)	LNTA; DAPQ; WWF; other NGO; Provincial, district and village-level	Natural (<i>biological</i>) & Cultural (<i>langthab</i> & <i>intangible</i>)	Enforcing NBCA regulation is required to prevent illegal natural resource use, for sustainable tourism development and future village-level expansion or resettlement. Ongoing biodiversity and social impact assessments and archaeological research is required to identify and manage local heritage values

The variety of uses for and values represented by caves and karst to some extent meet all of the categories required for national heritage protection, including natural heritage, historical heritage, and tangible and intangible cultural heritage. The Lao *Law on National Heritage*, introduced in 2005, provides the legislative framework for the protection of natural, cultural and historical heritage nationwide, recognizing significance on local, national or international levels (National Assembly 2005). Even though there is a provision for this within Lao heritage legislation, a low percentage of caves and karst are identified and protected nationwide, including in existing heritage management frameworks. Further, heritage management irregularly plans for or promotes multi-heritage uses and values of caves or karst. As has been identified by other research, when heritage values in caves or karst are not identified or managed appropriately, cave and karst environments and heritage values become at risk for



Photo 7: Decaying ancient wooden statues of the Buddha in a natural shrine at the rear of *Tham Pakou*, Savannakhet Province (Photo: Nicholas Roberts)



Photo 8: Material residue from cave use during the American War period. These include a broken glass syringe and a button from a military uniform. *Tham Pakou*, Savannakhet Province (Photo: Nicholas Roberts)

damage or degradation (Day 2011; Day and Urich 2000; Kiernan 2009; 2011; 2013; Lyttleton and Allcock 2002). When assessing its role, it can also be argued that heritage legislation and the use of heritage practices are part of nationwide social economic development initiatives (Sourya et al. 2005). This generates three questions: Why is heritage managed and protected? For what is heritage managed and protected? Who decides what type heritage is managed and protected?

A number of factors underlie these questions. The Lao PDR has limited financial and human resources or technological capacity and training to apply singular or even various and often overlapping natural, cultural and historical uses for and values associated with caves into frameworks for management and conservation (Kiernan 2009). Often heritage management practices



Photo 9: An offering of rice on a cave stalagmite made by local villagers to ancestral spirits. *Tham Pakou*, Savannakhet Province (Photos: Nicholas Roberts)

fail due to a breakdown in communication between village, district, provincial and national agencies, which each have the responsibility, but not the training or capacity, to protect and promote heritage sites. Often the failure to fully understand, interpret and apply heritage and other legislation at one or more of these officiating levels occurs concurrently. In the Nam Ha National Protected Area, for example, a National Protected Area Management Unit (NPAMU) has been developed. Its objective is to monitor and manage legal and illegal development activity within the



Photo 10: Prehistoric and historic artefacts are sold to tourists at street markets in Luang Phrabang. Some of these objects were looted from caves located nearby (Photo: Nicholas Roberts)

park. Protected area legislation and multi-level management systems, however, are unable to prevent illegal logging and peri-urban expansion, and destructive agricultural practices continue to damage and destroy significant natural heritage, including caves (UNESCO 2008). Cultural heritage items and sites are also being damaged, destroyed and looted by the same processes (see Photo 10). In Sepon, Savannakhet Province, cultural heritage management planning has been developed alongside mining activities to promote the cultural heritage of local communities and their natural heritage, including caves (Mayes and Chang 2013). However, minimal evidence of heritage-based outcomes has been reported by the mining operation outside of media releases. It thus cannot be established if other mines are being regulated to manage and preserve community values and protect significant natural environments like cave and karst in management planning or during operations, a worrying situation given the increase in large-scale mining nationwide (High 2010).

History has strongly influenced the development of current heritage management in the Lao PDR, with the root of modern heritage management practices tracing back to French scientific research during the 19th century (Kallen and Karlstrom 2010). The use of archaeology, and a focus on tangible and scientific practice in the past, has been reinforced since the 1990s by international influences emerging in Lao national heritage training and programs. Following the tradition of international influence, the Lao *Law on National Heritage* passed in 2005 and is built off ICOMOS and UNESCO principles and protocols of heritage management. Applying 'European' values of heritage conservation and management in non-Western nations has long been considered problematic because "different historical and philosophical perspectives towards authenticity, spirituality and historical significance" consider and value heritage differently and apply different motivations and strategies for management (Winter 2014: 125). More often than not, European heritage values and practices generate conflict with existing traditional ideology and management practices if they are applied without the consideration or consent of local community deliberations on 'heritage' (Smith 2007). As a result, archaeology, sites, buildings and structures take precedence over both natural heritage and intangible heritage. Cave geodiversity and biodiversity, and intangible values like myth, music and historical narratives are not identified or protected as 'heritage' as regularly as tangible structures or sites. The Lao PDR has no formal inventory of the nation's intangible cultural heritage and no element of intangible cultural heritage is inscribed on UNESCO's Intangible Cultural Heritage List (UNESCO 2012).

Applying international heritage management and conservation values like *preservation* to the Lao PDR is considered a "conflict in terms" (Karlstrom 2005: 339), where Buddhist ideology and value structures that promote a nonmaterial, impermanent attitude to material things pervades social thought and action. Buddhist temples and sacred objects used for making merit enable social practices important to individuals in the Buddhist culture, where material things can be sacred objects that contain spirits or hold affective powers. Conscious decay or destruction of physical structures and items, including temples, is accepted and at times ritually practiced, depending on the symbolic or representative value that material structure or item contains (Karlstrom 2005). This issue has been encountered in Luang Phrabang, where UNESCO practitioners were considered by some to be insensitive to local cultural values during the planning of infrastructure and economic development for the World Heritage town. Officials reportedly

overlooked local interpretations of how space is used, constructed and made meaningful, and local aspirations for sustaining and developing the towns 'authenticity' during heritage planning (Suntikul 2011). As a result, conflict between local communities and heritage planners continues over the use, management and conservation of buildings, temples and other places in Luang Phrabang.

Lessons can also be learned from the *Pak Ou* caves (*Tham Ting*) in Luang Phrabang Province, where efforts to conserve and restore Buddhist shrines and material structures in the caves have been ongoing since 1992 (Egloff 1998; Egloff 2003; Johnson 1997; UNESCO 2004). The restoration project, coordinated between the Lao government, international specialists and the local community, has struggled to manage or promote the heritage values in the caves effectively, with relations between project groups breaking down at times in disagreement over management and conservation methods (Egloff 1998; 2003). The local community used these caves before 1997, and has increasingly shared the use of the caves with heritage professionals and a growing number of tourists. Inadequate safeguarding of heritage materials still occurs, and has allowed vandalism and looting of Buddha images within the caves to persist. Poorly regulated tourism and visitor management at the caves has also led to environmental impacts on soil resources in some locations (Kiernan 2011). The question of who should be responsible for regular maintenance of tourist-based infrastructure remains open. Revenue earned through tourism at the caves is not fully reimbursed to the local community or reinvested to maintain tourist facilities. The lack of investment in infrastructure to maintain the natural values and the cultural infrastructure of the caves has reportedly created negative experiences for locals and tourists alike (Egloff 2003; Kiernan 2011; UNESCO 2004).

An ongoing issue for managing Lao heritage is the use of heritage by the government to promote or 'authorize' history for social and political control. As a political tool, heritage is used to endorse or authenticate nationalistic values and regulate a national social identity, generally through the promotion of specific people, sites, monuments and texts (Tappe 2013). This interpretation of heritage denies its other forms and its other significant values and meanings, including historical events in Lao history and contemporary society, and risks the loss or destruction of other forms of heritage through neglect or the denial of their significance. The authorisation of Houaphanh Province and the caves at Vieng Xai as the 'birthplace of the Lao PDR' by the LNTA is an example of this. These caves are among the few cave sites (the other is *Pak Ou*) protected under national heritage legislation, with their Second Indochina War history used to promote tourism and nationalism. A ceremony is now held there annually to commemorate the revolution and the citizens who died in the 'revolutionary struggle' (AsiaOne 2014). In much the same way, the Lao Government promotes and manages historical Buddhist values and Buddhist cave use as national heritage. Buddhist caves often contain what legislation describes as 'national treasures'—principally temples, standing Buddhist sculptures and statues made of wood, clay, silver and gold. The discourse of the *Pak Ou* caves legitimates a tangible link between the modern Lao polity and the Lang Xang Kingdom that reigned in the area beginning in the 14th century. Other values not identified as heritage at the caves include the ancient belief in a river monster that was worshipped prior to the introduction of Buddhism in the region, and current beliefs in spirits (*phi*) including the worship of spirits by the *Pak Ou* community (Egloff 1998).

Perhaps the greatest challenge to the heritage management of caves and karst in the Lao PDR is contending with rapid economic development practices that have an impact on natural heritage, tangible places and intangible cultural traditions and practices nationwide. The Lao economy is increasingly dependent on natural resource extraction and the manipulation of the environment to generate revenue, with natural resources by far the largest of all goods and services exported by the country in terms of gross domestic product (GDP). Growing national and regional demand for natural commodities from extractive industries like logging, mining and energy production from hydroelectric dams contributes greatly to the development of these industries. In 2011, total exports from natural-resource industries contributed 27 percent of GDP in the Lao PDR, increasing from 5 percent of GDP in 1999 and replacing agricultural production, which contributed 57 percent of GDP in 2005, providing the highest contribution to GDP (Menon and War 2013). In 2007, forest loss was occurring at a slow rate in the Lao PDR compared to other Southeast Asian nations. Adding to these pressures, however, were population growth, poverty and illegal logging, rendering already protected areas seriously imperilled (Laurance 2007). There is very little, if any, documentation of whether natural resource development is having an effect on caves and karst (see Photo 11). Communities in some rural and remote locations are moving off of traditional land and away from traditional subsistence and economic activity because of the pressure resulting from resource development activities and new cash-crop agricultural projects (Rigg 2006).

In light of the view that many caves are 'living places,' pro-poor and community-based tourism projects are currently an alternative that is arguably more sustainable for communities and the environment than is mining, logging and dam construction. It is possible to promote tourism while achieving environmental protection and sustainable economic benefits in remote communities. Nonetheless,



Photo 11: Mining haul roads encroaching on *Tham Bing* (top and center of picture) in Savannahket Province. A forested buffer-zone has been implemented to safeguard the natural and cultural values of the cave from mining-based impacts (Photos: Nicholas Roberts)

research indicates that more work is required to improve the visitor experience for tourists and the role of communities in cave-based tourism to make such tourist operations profitable and sustainable. In Vieng Xai (Suntikul et al. 2009; Suntikul et al. 2010) and Vang Vieng (Rogers 2009), tourists and community members were questioned about their tourism experiences. At Vang Vieng, visitors reported frustration and disappointment in the lack of access to caves and in the signage or interpretation at 'tourist' cave sites when visiting these areas. Local communities at Vang Vieng (Rogers 2009) and Vieng Xai (Suntikul et al. 2010) have expressed a clear interest in engaging with the tourist industry, but they also acknowledge that they have little understanding of what tourists want or how to provide for tourist needs. Communities in Vieng Xai have expressed the desire to control tourism within the community through local business and employment, stating that the Lao government and trusted private-sector organizations should provide financial and structural development and training to community members (Suntikul et al. 2010).

To be successful, community-based or ecotourism projects may require as much support as the Nam Ha Ecotourism Project (UNESCO-NTA 2004), which has been substantially assisted both structurally and economically by the Lao government and foreign donors since 1999. Regulating private-sector, pro-poor tourism and donor-assisted, community-based tourism is both a current issue and one that will be important in the future in order to manage the sustainable use of natural and cultural heritage sites like caves and karst and to develop a tourist infrastructure that produces sustainable economic outcomes for communities (Harrison and Schipani 2007; 2009). Natural-resource sustainability will be perhaps the most critical factor in sustaining tourist projects (Lin and Guzman 2007; Manivong and Sipaasueth 2007), because as the tourism industry will continue to be highly dependent on natural and cultural heritage resources like cave and karst, it will be essential to minimize the risks to these assets and resources.

Conclusions

Cave and karst environments are natural features in their own right, and they play an important role in supporting biodiversity and communities in the Lao PDR, particularly those in remote regions. The Lao PDR is currently undergoing rapid economic development, and how cave and karst environments adapt to changing social and economic circumstances remains to be seen. Modernization and globalization have also brought new values and meaning to karst landscapes and the caves they contain, creating competition for ownership and control of these places, their resources and their local communities. To manage these transitions and minimize impacts on specific natural and cultural resources like caves, heritage management will need to be performed with a greater degree of rigor and flexibility than is currently the case. There is a need for ongoing training and capacity building within Lao government departments to meet current and future challenges. Stronger multi-level heritage protection, including ongoing training and capacity development, across Lao government departments will also be required. Identifying localized values and uses of caves and karst and incorporating these into the emerging and competing uses and meanings in heritage management practices is essential to sustaining natural and cultural diversity. Ongoing commitments to nature conservation and community development practices through sustainable projects that support economic development, including tourism, could be part of a

long-term strategy to support cave preservation while fostering community development, particularly for remote communities. This will require structural and financial input from Lao government agencies and nongovernmental organisations (NGOs), and cooperation with tourists—and most importantly from local community members, who in many instances are the custodians of caves and karst and who hold the knowledge to sustain these natural places and make them culturally significant.

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