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Australia's crystalline heritage: issues in cave management at Jenolan Caves

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Abstract

This paper provides an environmental sustainability perspective on contemporary cave management issues in Australia through examination of Australia's most prominent tourist cave attraction, Jenolan Caves. Five key issues are discussed: the administration and funding of the Jenolan Caves Karst Conservation Reserve; the extent of baseline data available; long-term access and transport arrangements to the caves; visitor management; and the provision of interpretation facilities. Each of these illustrates the difficulty of balancing the competing values and interests represented by conservation, commercialisation and tourism. Cave management at Jenolan has improved in recent years but further changes in policy and management structures are required to ensure environmental sustainability.

Keywords: karst, tourist cave, management, Australia.

Introduction

Despite the significant natural heritage values of caves and their vulnerability to human impact, caves are seldom given the attention in environmental management and planning that such fragile environments deserve. Caves provide particular management considerations and unique challenges for their preservation, many of which hinge on broader issues of environmental sustainability. This paper examines the context of environmentally sustainable cave management practice in Australia using Jenolan Caves, New South Wales (NSW), as a case study.

Jenolan Caves exist within Australia's largest cave reserve and are the world's oldest currently open caves (Osborne et al., 2006). Highly accessible, heavily visited and well known, Jenolan Caves has a long history of tourism and conservation extending back nearly 150 years (Horne, 1994). Close proximity to Sydney and location within the tourism region of the Blue Mountains; the scenic value of the reserve including the caves, grand arches and forested valleys; and their historical overlay, make the caves of unrivalled interest to tourists. While Jenolan was not the first show cave opened to tourists in Australia, it was from here that the Australian cave tourism industry emerged (Hamilton-Smith, 2003: 160).

Growing pressure from tourism and development at Jenolan Caves reveals unreconciled imperatives of conservation and tourism and raises the question of whether current management practices are environmentally sustainable. Five key issues have emerged at Jenolan: the administration and funding of the Jenolan Caves Karst Conservation Reserve (the Reserve); the data and knowledge informing management; long-term access and transport arrangements to the Caves; visitor management; and adequate interpretation facilities. Despite the aspirations of management at Jenolan Caves to provide a model of best practice in environmental sustainability (DEC NSW, 2006), realising these ambitions is a challenging project.

Environmental sustainability and caves

Over the last two decades, 'sustainability' has emerged as a key goal of environmental management. At its core, it recognises that current world development trends are unsustainable and exceeding the carrying capacity of natural systems, with limits to growth increasingly evident (Harding, 2006: 230-2). Defined by the 1987 Brundtland Report, sustainable development can be understood as "development that meets the needs of the present, without compromising the ability of future generations to meet their needs" (WCED, 1987: 43). In terms of cave management, environmental sustainability emphasises the interrelated nature of economic, social and environmental factors, and the need for an integrated approach that recognises their interconnection and interdependency.

A number of policy and management issues identified in environmental sustainability (Dovers, 2005:44-51) are relevant to caves. Firstly, environmentally sustainable management may involve long temporal scales. This is apparent in cave management, where the development of caves occurs on geological timescales, essentially making them a non-renewable resource. Secondly, the land tenure system overlaying the natural environment has often not reflected the spatial extent of cave systems and this has hindered their appropriate management. Thirdly, cave management, like other areas of environmental sustainability, requires policy that is long-term in scope and inter-jurisdictional.

In addition there is the issue of shared responsibility for environmental resources. Where cave systems extend across different systems of tenure, there is potential for conflicts over who benefits from a resource and who pays the cost of any resulting environmental degradation. Threats to the natural values of caves can also be traced back to deeply rooted systemic causes, such as the failure of the market to correctly value the economic advantage of environmental goods and services, or

allocate property rights for trading purposes (Dovers, 2005: 46). In addition, environmental sustainability often poses a difficult challenge for management, as change is often impeded by high associated costs (Dovers, 2005: 47, Howes, 2005: 176) and conflicting long versus short term goals.

Central to environmental sustainability is the notion of ecological thresholds, where human-induced changes can push a natural system beyond the point of recovery. Even where the explicit goal is environmental sustainability, cave management is often characterised by a degree of uncertainty. This can arise from a lack of basic information of natural systems, or of appropriate management responses to issues, and this uncertainty contributes to the potential for cumulative or irreversible environmental degradation to occur. This is evident at Jenolan Caves where there is insufficient baseline information to determine the visitor capacities of cave systems. This, in turn, presents a challenge for management. In the face of scientific uncertainty, policy responses need to minimise risk and be proactive rather than reactive (Harding, 2006: 235).

Environmental sustainability issues are also multidimensional. Environmental problems cannot be effectively treated in isolation from their wider economic and social context. Community involvement in environmental management is important to ensure land-use and resource decisions reflect the diverse range of actors, interests and values involved in managing caves (Hall, 1999: 280).

With environmental sustainability in mind, a range of practical measures are implemented in caves to rejuvenate cave systems, slow degradation, improve presentation and enhance visitor participation. At Jenolan, such measures have included high-pressure water cleaning, low-heat lighting, and tracks designed to contain and channel water run-off. The need for collaborative partnerships between stakeholders, to adequately protect the cave system and the wider water catchment and environmental system of which it is a part, has also been recognised. Forums for each of the scientific, speleological, historical and staff interests at Jenolan are well established.

The unique challenges of caves

Caves have some unique management considerations that make them a particularly important case study for environmental management (Gillieson, 1996). Firstly, due to their subterranean nature and complex three-dimensional structure, caves are often difficult to see and conceptualise. Secondly, caves are subject to direct impacts from sub-surface human activity, and vulnerable to surface impact and activity in the wider catchment and surrounding land (Watson et al., 1997). Thirdly, cave management is about protecting both non-living and living elements of a cave system.

Current approaches to conservation are mainly based on protecting biodiversity, with geological natural heritage, like caves, traditionally protected under legislation primarily for their value as habitat for species (Osborne, 1989). Tourism in protected areas often includes some appreciation of wildlife (Burns, 2006, 2009); however, the focus of cave tourism is very rarely inclusive of cave fauna. Opportunities for viewing some of the more specialised cave fauna, such as troglobites, is probably reduced by their retreat from show caves, and the less sensitive fauna of caves, such as bats, spiders and crickets have only limited appeal to tourists. The non-living elements of the cave, their chambers and speleothems, are the main attractions for cave tourism (Gillieson, 1996).

Management issues at Jenolan Caves

Early records indicate that the Jenolan Caves were first known to Europeans around the 1840s and by the 1860s improved access and increased information about the Caves saw a substantial increase in visitors (Horne, 1994: 8-25). The Fish River Caves (as the Jenolan Caves were then known) became a public reserve in 1866 when increasing land alienation was recognised as a potential threat to public access to the caves. Access was considered important because of the caves' scenic and potential scientific value (Horne, 2005: 245-7). The gazetting of the caves as a reserve marked an early move towards nature conservation, occurring six years before the world's first national park was proclaimed. It also made Jenolan Caves the first government-owned tourist attraction in Australia (Environment Australia, 1998: 156). The caves became a model for other developing tourist caves and management still aspires to provide a best-practice model of cave tourism and development (DEC NSW, 2006: 20; Horne, 2005: 250). Increasing tourism and development has placed growing pressure on the show caves at Jenolan that currently operate within a rapidly changing management environment. Five key management issues that have emerged are discussed below.

Management Issue One: Administration and Funding

One of the most crucial issues at Jenolan Caves is the administration and funding model for the Reserve. The Reserve, like other public-owned protected areas, has been subject to persistent under-resourcing and under-funding. A number of administrative arrangements have been implemented since the establishment of the Reserve in 1866 in an ongoing search for a model that is financially self-sustaining and profitable, but also environmentally sustainable; protecting the resource upon which tourism to the Reserve is dependent and for which the area was initially protected. These models can be divided into four main time periods: (a) prior to 1989, (b) during the 1990s, (c) during the 2000s, and (d) the current model.

(a) Models prior to 1989

A traditional public service model dominated prior to 1989 when the Jenolan Caves were managed by a succession of NSW Government departments (Austen and Griffin, 2007: 37). This changed in 1989 when the Greiner government established the Jenolan Caves Reserve Trust (JCRT), a statutory government authority, to manage Jenolan Caves as well as the Abercrombie and Wombeyan cave systems. The Reserve's first management plan was released in the same year (Cameron McNamara Consultants, 1989) and the last of various increases to the area of the Reserve was made. This alteration to the reserve boundary was determined by the need to protect the catchment area of the Jenolan Underground River.

(b) Models in the 1990s

In 1990 Silkbard Pty Ltd (an entity of the Peppers Group) took up a 99 year lease of the hospitality services, including Caves House and other accommodation, food outlets, and the souvenir shop (Clennell, 2006; DEC NSW, 2006: 26) Responsibility for administration of the lease was shifted to the NSW Government and separated from that of cave operations managed by the Trust (Austen and Griffin, 2007: 36). Silkbard Pty Ltd was purchased by the Field family in 1995, and the administration of the lease and cave tourism operations were brought back together to be managed centrally by the Trust.

The Trust's responsibilities were expanded in 1997. A fourth cave system, Borenore, was added to the management responsibilities of the JCRT without additional funding from the State Government. Consequently the limited revenue from visitor charges and lease payments at Jenolan Caves subsidised management of Abercrombie and Borenore and, to a lesser extent, Wombeyan Reserve (Austen and Griffin, 2007: 37; Jenkins (MLC) in NSW LC, 2005). As a result, the Trust had difficulty recovering enough financial resources to fund conservation initiatives and infrastructure development and improvements needed at Jenolan Caves. Additionally, a regional decline in tourism in the Blue Mountains, amongst other factors, placed further financial strain on the Trust. Visitor numbers dropped significantly over a ten-year period, from over 250 000 in 1994 to 214 000 in the 2002 to 2003 financial year (DEC NSW, 2006: 55; JCRT, 2003: 3).

(c) Models in the 2000s

A review by the Council on the Cost and Quality of Government was commissioned in January 2004 (Austen and Griffin, 2007: 38; Beeby, 2006: 4) after the Trust experienced a financial loss of approximately $380 000 (AUD). This led to a series of changes to administration of the Reserve. In October 2005, an amendment to the National Parks and Wildlife Act 1974 was passed that included provision for the transfer of Abercrombie, Borenore and Wombeyan to the National Parks and Wildlife Service (under the New South Wales Department of Environment and Conservation (DEC)), with the intention that the Jenolan Caves Reserve would follow. The Act also established a specialised State Karst Advisory Unit, located within DEC, to provide expert guidance on management of NSW's significant karst areas.

In December 2005, the 99-year lease for Caves House was placed in receivership. This followed conflict between the lessee of Caves House and the Government over provision and responsibility for infrastructure upgrades in the Reserve (Frew, 2007; Harwin (MLC) in NSW LC, 2005; Trute, 2005). Caves House returned to government control in 2006, but not before the number of guests staying at Caves House dropped significantly reflecting visitor dissatisfaction, as evidenced by over thirty letters of complaint sent to the Minister, and the hotel business being likened by the media to the notorious 'Fawlty Towers' (Cohen (MLC) in NSW LC, 2005; Gibbs, 2006; Silmalis, 2005).

The NSW Government once again reconsidered the management model for the Reserve and its assets, deciding that an administrative model based on a public-private partnership (PPP) would be most appropriate. The main problem with the PPP model in place until 2006 was the tensions arising from the Trust being both a commercial operator (of the caves) and a regulator (of the Caves House lease), and from its inability (as a self-funding model) to directly access Treasury funding for capital improvements.

In August 2006, the Jenolan Karst Conservation Reserve Draft Plan of Management was released for public comment. Shortly afterwards, a tender was released, calling for expressions of interest for private sector participation in the management and operation of activities within the Visitor Use and Service Zone (VU&SZ) of the Reserve. Specifically, it called for private sector "operation, management, protection, maintenance and marketing" of Caves House (under a much shorter lease of 21 years), and also the show caves and adventure caves (under a 7-year license) (JCRT, 2006: 5-10). It was hoped that these changes would see reduced cost and increased efficiency with the integration of services under one operator, with the government in a regulatory role (Austen and Griffin, 2007: 38). The tender received a poor response from the private sector and, as a result, the Caves remained managed by the Trust with input from the Karst Management Advisory Committee while long-term arrangements were finalised (Grant Commins, Manager of Cave Operations at Jenolan Caves, pers comm., 15 July 2007). The conflict between the government and the ex-lessee of Caves House was played out in the Industrial Court of NSW in 2007 (Frew, 2007), and a final version of the management plan is yet to be released.

(d) The current model

The changes of administration at Jenolan Caves raise a number of important issues. Concerns were raised that the outsourcing and commercialisation of operations at Jenolan Caves would see the caves' natural and heritage values compromised in the pursuit of profit. This reflects tensions between values of stewardship and commodification in cave management (Davidson, 2004: 170). However, significant effort was made in both the current management plan and the tender to outline the environmental standards required, as well as performance indicators and monitoring requirements for the lease and license arrangement. The second reading of the National Parks and Wildlife Amendment Bill shows that the proposed changes in administration at Jenolan Caves were intended to provide an opportunity "to get commercial operations right", as a new model of best practice PPP in the management of protected areas (Cohen (MLC) in NSW LC, 2005).

Management of the caves under a private operator would be subject to the same environmental, heritage and planning legislation that protects the caves at present. However, there was concern from speleologists that existing legislation did not provide enough protection to the caves in the face of commercial over-exploitation (Osborne quoted in Beeby, 2006: 5). On the other hand, the lack of private sector response to the tender may reflect the extent of environmental conditions imposed on the lease and license that was offered. While the environmental conditions were important for environmentally sustainable management of the caves as a tourist destination, a highly regulated scenario may have been less attractive for private enterprise due to the additional complexity imposed on the operator. This raises the question of the relevance of a PPP in management of the caves, when the regulations required to protect them potentially deter the private sector, with fewer regulations being more attractive for private interest.

The model currently in place sees government control reasserted. Caves House and the caves have been retained by the Trust while the Department of Environment, Climate Change and Water (DECCW, formerly DEC) has taken responsibility for the non-karst areas of the Reserve (Austen, 2009:4).

The question of who is best placed to manage the caves – the government or the private sector – is both political and ideological. Public authorities have traditionally managed protected areas (Worboys, et al., 2005). However, increasing pressure on government resources and perceived efficiency of the private sector has seen a growing role of private sector involvement in protected area management (Fowke, 2005: 120-123). Jenolan Caves offers an ideal case study for an on-going inquiry into the implications of public and private management models of protected areas. Speleologist Andy Spate commented on the recent events at Jenolan Caves, saying: "You'd be surprised how political the Jenolan Caves, and caves in general, can be…There's a doctoral thesis in there somewhere, but mind you, whoever tried to write it would probably be lynched" (Spate quoted in Beeby, 2006: 4). Austen and Griffin (2007, 2009) provide insights into the recent events at Jenolan, but so far there has been little other scholarly analysis.

Management Issue Two: Insufficient baseline and applied data

Management of the Jenolan Caves is hindered by a lack of baseline data on environmental conditions of the caves, as well as applied data on the impact of tourism on the Caves or their carrying capacity. In part, this may reflect a management policy that actively discouraged scientific investigations in the show caves (Kiernan, 1988: 7). The management model in place for over 50 years, prior to the first management plan in 1989, operated during a period when innovation was not embraced, and scientific research and evidence-based policy development was not encouraged. Lack of baseline data also reflects inadequate funding of the Reserve. Without this essential information it is difficult to manage for environmental sustainability.

Changes post-1989 go some way toward addressing this problem. For example, a Scientific and Environmental Advisory Committee was established in 1990, and in its 1993/1994 Annual Report the Trust noted concern "about the lack of coordinated monitoring of the increasing visitation". An $80 000 grant was obtained toward a consultant report, and a survey of fauna and human impacts was undertaken in 1993. In 1995 a resource data bank was established to assist management decisions, the same year a Visitor Impact Monitoring (VIM) process was implemented (Hill and Pickering, 2008). A Social and Environmental Monitoring (SEM) committee was established in 1996 and replaced by the DECCW Karst Management Advisory Committee in 2006. In 1998 a consultant report was commissioned on in-service and other training needs for guides. More recently, with funding from the NSW state government, the JCRT has embarked on an Environmental Monitoring Program that focuses on air and water quality in the show caves (Meehan, 2009).

Despite an increase in involvement of universities, publication of site-specific research papers and theses (for example, Michie, 1997; Campbell, 1998; McArthur, 2000 and Davidson, 2004), as well as extended professional education of staff (Cove, 2009), more research is required. The current draft management plan identifies many research and management gaps. It also discusses prospects for establishing institutional research partnerships with universities to increase research on the caves (DEC NSW, 2006: 112). Whether future research at the caves will be tourism focused or directed towards conservation of the caves, in terms of understanding these karst environments and the upper limits on tourism, remains to be seen.

Management Issue Three: Access and transport

Access and transport arrangements to Jenolan Caves present another set of environmental issues. Most people visit the caves as part of a coach tour of the Blue Mountains, or by private vehicle travelling along the Two-Mile Road from Oberon, or the more commonly used Five-Mile road from Hampton. Following safety concerns and closure of the 5-Mile Road, the NSW Roads and Traffic Authority spent a considerable sum of money on its upgrade (DEC NSW, 2006: 62). However, the road passes through the Grand Arch, in which several entrances to show caves are located, raising concerns of the effects of vehicle emissions on the Caves and their inhabitants (Manidis Roberts Consultants, 1995: 8). A study by Hose, et al. (2002) indicated that a recorded decline in a species of spider common to the Grand Arch was likely a result of increased dust from the passing vehicles. Despite indicators that the road and the increasing number of vehicles may be compromising the environment of the caves, management has not as yet responded with mitigating action. This raises questions about their ability to effectively apply the 'precautionary principle' stated as a key commitment in the caves' management philosophy and which is fundamental to environmentally sustainable management (DEC NSW, 2006: 2).

Increased vehicle traffic has also placed considerable strain on the Reserve's existing infrastructure. As a result of traffic congestion in peak season, the 5-Mile Road has been made one-way at certain times of the day. At present, the number of car park spaces limits the number of visitors to the Reserve, and there is little prospect of easily increasing parking spaces given the location of the caves in a narrow valley surrounded by steep sides (Manidis Roberts Consultants, 1995:18). Management has attempted to accommodate more vehicles by placing additional parking bays further up the hill, and running shuttle buses to transfer people to the caves. This has the flow-on effect of dispersing human impact and development in the Reserve. Multiple car parks are also visually intrusive and detract from the scenic amenity of the Reserve, a key listed management value. The development of car parks alters natural drainage patterns in the valley, affecting karst landforms in the Reserve. Given the physical limitations of space in the valley, it seems inappropriate to give such priority to car parking when space is crucial for the development of a visitor interpretation centre. In some ways, this places revenue above education. Provision of public transport access (of which there is currently none) would address some of these issues and is critical to the long-term sustainability of the caves as a tourist destination.

A study was commissioned in 1994 by the Trust to examine future transport options for the Reserve (Colston, Budd, Hunt & Twiney Pty Ltd, 1994). Options explored included road upgrades, and the provision of shuttle-buses, a light rail system, or a novelty aerial cable-car transport system (which attracted considerable media attention). A tender was released for the cable-car option, but it was not developed due to concerns about its initial environmental impact, and significant development and user costs. Some of the transport issues discussed above can be identified in the literature as far back as 1988 (Cameron McNamara Consultants, 1989: 25-35; Kiernan, 1989), indicating the scale of the challenge for resolving transport arrangements for Jenolan Caves. Sustainable transport is currently listed in the 2006 draft management plan as a high priority management issue (DEC NSW, 2006: 95).

Management Issue Four: Visitor management

The presence of visitors, and the infrastructure provided for them, both have potentially negative impacts on the cave environment. However, tourists also provide much-needed revenue to manage the caves for their long-term conservation, as well as justifying their protection in the face of competing interests in limestone landscapes (such as mining, agriculture and forestry, water exploitation, and urban development). In the light of this competition, visitor numbers to the caves need to be delicately balanced with the conservation values of the Reserve to avoid short term over-use of the caves and degradation of the environmental resource on which the cave tourism industry is financially dependent.

In addition to degrading or destroying the caves, tourism has the potential to cause other unintended environmental, social, and economic problems. Recent marketing initiatives have seen visitor numbers increase by 1.45%, from 221 864 people in 2007/2008 to 225 076 in 2008/2009 (Austen, 2009:3). The tension between conservation and tourism interests at Jenolan Caves has been described as the 'paradox of conservation' (McArthur, 2000: 12; O'Brien and Watson, 1977). While varying visitor management models have been developed in an attempt to institutionalise environmentally sustainable tourism in show caves, the practical application of any model is difficult to put in place because of competing financial and environmental tension.

Management Issue Five: Interpretation

Interpretation is important for promoting, understanding and appreciating a protected area, as well as enhancing visitor experience (Worboys et al., 2005: 484-492). Site interpretation can significantly influence behaviour through increased awareness of the conservation values of caves, and the threats to them (Davidson and Black, 2007). As stated in the 2006 Draft Management Plan (DEC NSW, 2006), the caves are recognised as a significant educational asset for the community and their interpretation is essential for promoting values of environmentally sustainable tourism.

Several layers of interpretation, both on-site and off-site, are needed to cater for potentially diverse audiences.

At Jenolan Caves, these include the use of print and broadcast media, a newly upgraded website, the use of signage within the VU&SZ and guided tours of the caves. Building on the initiatives between 1989 and 2006 and on a consultant report in 1998, the current management has improved the calibre of guides employed and improved their morale and professional development opportunities. On-site interpretation of the caves, however, is heavily reliant on the guides who, although providing a quality service, do not replace the need for an upgraded visitor centre and improvements to signage within the Reserve.

Despite the high visitor numbers to the Reserve and its World Heritage status, the existing visitor centre and museum is arguably well below the standard expected. Figure 1 illustrates some of the information displays provided in the visitor centre. Refurbishment of the existing visitor centre and museum facilities, described as a "dowdy old-fashioned tourist attraction that had seen better days" (Beeby, 2006: 4), may assist rejuvenation of the caves as a tourist destination. Such rejuvenation occurred at the Naracoorte Cave system in South Australia where an impressive interpretation centre was developed that included, for example, animatronic life-size models of the prehistoric megafauna found as fossils in these Caves. At Naracoorte, the new facilities prompted visitor numbers to increase by eighty percent in the year of its opening. Some of the unrealised potential at Jenolan is evident here: despite having much better facilities, Naracoorte receives substantially fewer visitors than Jenolan (DEH SA, 2001: 15).

Interpretive signage could easily be improved at Jenolan Caves. Many visitors congregate in the same area while waiting for tours to commence, where facilities include a paved and covered area with picnic tables (Figure 2). While signage exists (Figures 3 and 4), the opportunity to provide basic interpretive material about the caves and karst features of the Reserve has been missed. Such simple measures may see the information of the natural values of caves and karst landscapes communicated to more people, and add to the visitor experience of the Reserve.

Figure 2: Main waiting area for cave tours

Figure 3: Cave tour timetabling board for visitors

Figure 1 (above): Information display in the Jenolan Caves Visitor Centre in 2007

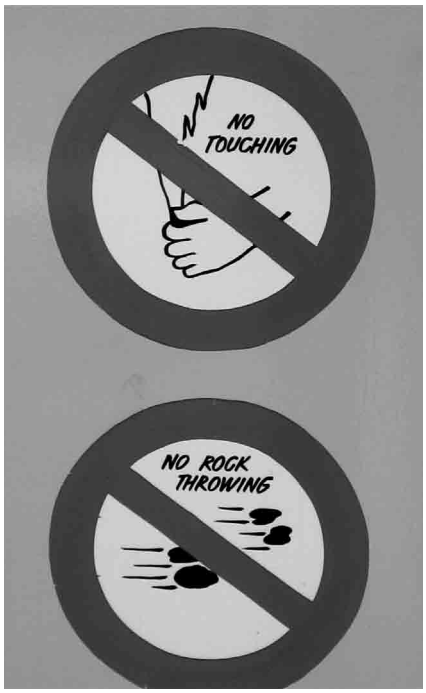

Figure 4 (right): Signs displayed for visitors indicating appropriate behaviour on cave tours

Conclusion

Management at Jenolan Caves has a complex history, and in 1989 Kiernan wrote that the scope of management initiatives needed for the caves was "daunting" (Kiernan, 1989: 130). Over the past 20 years many management issues have been addressed, but many more still remain. Encouragingly, Austen and Griffin (2009) recently claimed that "extensive work examining management options to best ensure the commercial and environmental sustainability at Jenolan has been undertaken". The current management model is in its infancy; its ability to deliver best practice in environmental sustainability has not yet been demonstrated but it has the potential to offer a positive way forward.

This overview of management issues in one of Australia's largest tourist cave systems can inform decision making for the management of less complex sites both within and outside Australia. The long-standing nature of the issues discussed above at Jenolan Caves reflects their complexity, and the practical difficulty of managing the competing values and interests represented by conservation, commercialisation and tourism. It is hoped that the new direction of management outlined by recent events will see some of these issues resolved, and the caves better managed for environmental sustainability as a model for other cave systems, and more generally, other protected areas.

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