

Exploring Methods for Sharing Wetland Knowledge and Identifying Future Needs and Solutions

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INTRODUCTION

Successful management of wetlands is increasingly making more use of traditional and contemporary community knowledge of wetlands in addition to the knowledge obtained from scientific investigations (Ens et al. 2012; Pyke et al. 2018). For this to happen, wetland managers need ways to tap into such knowledge, including respecting protocols around ownership of and access to such knowledge, and appreciating its value. However, at the same time the rapid advancement of science and technology and changes in societal values has led to the loss of valuable traditional knowledge, or such knowledge being ignored in favor of an over-reliance on modern scientific techniques.

Mechanisms available through wetland centres (Finlayson 2018; Gevers et al. 2018), education outreach initiatives (Finlayson et al. 2013) and engagement with schools (M. Bartlett 2019, pers. comm.) go some way towards tapping into the value of these knowledge sources. However, much more is needed if the mutual benefits that can come from sharing knowledge are to be realized. This is more the case with the intensification of the threats to wetlands from climate change and sea level rise, invasive non-native species, and pollution. Given the difficulties associated with managing wetlands and ensuring there are sufficient funds to both collect and make use of contemporary scientific information, having access to knowledge provided by local communities may prove invaluable when addressing the harmful outcomes from these phenomena, in addition to assisting with efforts to ensure local communities are effectively engaged in wetland management.

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There have been many successful cases where traditional and community knowledge have been used alongside contemporary scientific practices for managing wetlands (Carbonell et al. 2001; Ens et al. 2012; Pyke et al. 2018), but unless these are extended and expanded in time and space we fear that current high rates of wetland loss and degradation (Darrah et al. 2019; McInnes et al. 2020; Simpson et al. 2021) will continue. One way of contributing to the effort to ensure that these approaches are extended and expanded is to explore and develop effective methods for sharing knowledge between local communities, wetland researchers, and managers. This could start with the increasing sources of knowledge about the values and benefits derived from wetlands as well as that about management responses to the pressing problems for wetland management. The latter are well known, and yet, continue, with steps to stop and reverse wetland loss and degradation being acknowledged as insufficient (Ramsar Convention on Wetlands 2018).

As part of ongoing programs run through organizations such as the Sydney Olympic Park Authority in Australia and the Wildfowl and Wetlands Trust in the United Kingdom (UK) a symposium on *Methods for Sharing Wetland Knowledge and Exploring Future Needs and Solutions* was held at the INTECOL International Wetland Conference in Christchurch, New Zealand in October 2021. The symposium had three objectives, namely to: 1) explore the wealth and usefulness of traditional and community knowledge about wetlands; 2) identify gaps in knowledge-sharing tools, techniques and mechanism; and 3) explore ways forward. The symposium was intended to revisit the effectiveness of current approaches and programs in wetland awareness, education and training, and suggest measures for future improvements. It was further expected that in the future there would also be an emphasis on newer communication approaches, such as webinars and twitter conferences, alongside traditional and local community knowledge, which in themselves are based on having participatory approaches to ensure knowledge is shared in an open way.

Provided below is an overview of the key issues that were included in the presentations in the symposium.

WWT – ENGAGING LOCAL PEOPLE FOR SUSTAINABLE WETLAND CONSERVATION

The Wildfowl and Wetlands Trust (WWT) is a UK-based non-governmental organization that works globally to deliver conservation outcomes for wetlands, wildlife and people (Spray 2018). Its work focuses on engaging with people (Figure 1) as the primary method to deliver effective outcomes for wetlands, linked to a strong scientific approach to demonstrate what works, share results, and inform future work.



Figure 1. Engaging with people through a learning session at WWT Slimbridge, UK. (Photo by Deb Pinniger / WWT)

WWT has 10 wetland centres in the UK that now welcome over one million visitors a year (Table 1, Figure 2). As many visitors have little or no knowledge or experience of wetlands formal and informal techniques are used to raise awareness and support learning. Examples include the following. Structured schools program at WWT centres that are linked to the national education curriculum, and is delivered on site by trained learning managers, using an

inquiry-based approach. Online materials are also available for use by [schools](https://www.wwt.org.uk/discover-wetlands/fun-and-learning) and individuals (<https://www.wwt.org.uk/discover-wetlands/fun-and-learning> accessed March 1, 2021).

- Self-guided visits at WWT sites for families and casual visitors with accessible materials and guided walks, talks and events.
- A wide range of internal and external exhibits, which are changed regularly, themed around wetlands and the species that depend on them.
- Work with universities and colleges to give structured lectures and onsite experience, for example our program working with the [Durrell Institute of Conservation and Ecology](https://research.kent.ac.uk/dice/) (<https://research.kent.ac.uk/dice/> accessed 1 March 2021) offering students hands-on experience of wildlife health work.

An example of the way in which WWT works is shown by a major wetland creation project in Steart Marshes, UK (Figure 3) that created nearly 500 ha of salt marsh from existing arable land to mitigate for sea level rise (<https://www.wwt.org.uk/wetland-centres/steart-marshes#> accessed March 1, 2021). WWT employed staff with the skills to engage and consult with local people, spending a lot of time contacting relevant people and holding structured events in

Wetland Centre	Location	Special Features	Number of Visitors 2019/20
Arundel	Sussex, England	Lowland coastal site on the busy south coast with environmentally friendly centre, boat trips and extensive board walks	85,362
Caerlaverock	Dumfries, Scotland	Smaller centre famous for its barnacle goose and pink-footed goose migration	14,388
Castle Espie	County Down, Northern Ireland	On the banks of Strangford Lough, an eco-buildnig, known for light-bellied brent goose	52,343
Llanelli	Carmarthenshire, Wales	450-acre site on the Burry Estuary, with a mosaic of wetland habitats	66,002
London	England	Opened in 2000, this 45-hectare constructed wetland site provides a wetland sanctuary for Londoners to visit	163,657
Martin Mere	Lancashire, England	Based on the site of a historic lake, the site welcomes wintering whooper swans	170,674
Slimbridge	Gloucestershire, England	WWT's HQ, and first site, set up in 1946. Famous for white-fronted geese and Bewick's swans	235,162
Washington	Northumberland, England	Highly urban site, offering an oasis to built-up communities	73,089
Welney	Norfolk, England	Modern eco-building, with a winter spectacle of Bewick's swans as well as abundant year-round waterfowl	27,154
Total			887,831

Table 1. Wetland centres operated by the Wildfowl and Wetlands Trust.



Figure 2. Slimbridge Wetland Centre, UK. (Photo by Richard Taylor-Jones)



Figure 3. Steart marsh, UK (Photo by Sacha Dench / WWF)



Figure 4. Slough Urban Wetlands Project. (Photo by Harley Todd / WWT)

local venues. An initially hostile response was converted into overall support, and the benefits it brings, such as increased tourism and use of local services, better access to wetlands, and increased pride in the local area have been welcomed by local communities.

In urban areas, WWT employs consultative techniques such as training days for teachers, in-school sessions, citizen science, and community planning, to raise awareness of wetlands and SuDS (Sustainable Drainage Systems) as positive elements of the urban environment. Work with schools, community groups, local authorities and park managers has resulted in positive local action and led to the restoration and creation of wetlands in urban areas (Figure 4). These are generally smaller existing wetlands, such as local streams and rivers, or creating of swales, ponds and other wetlands capable of absorbing water during heavy rain events. Activities included a community bioblitz, encouraging a joint running and litter picking group to improve health and well-being,

and a ‘yellow fish’ system of signage to show where waste water enters wetlands.

WWT has also used Citizen Science for decades, with its members and the public sending in reports of sightings of wetland birds to inform our long-term reporting on numbers and distribution of key species such as the Bewick’s and Whooper swan (<https://www.wwt.org.uk/our-work/projects/swan-champions/> accessed March 1, 2021), and Greenland white-fronted goose (Fox et al. 2019). More details can be found through the web site of the Swan Specialist Group (<https://swansg.org/> accessed April 26, 2021).

WWT believes that a wide range of techniques should be used to engage local stakeholder, leading to positive acceptance of change and proactive support for wetland creation and conservation. These efforts are supported by an active conservation program, sound scientific and monitoring approaches and a link to delivery of national and international commitments to wetland conservation.

REVIVAL OF THE THEORY OF “UNITY BETWEEN HEAVEN AND MAN”: FITTING TRADITIONAL KNOWLEDGE INTO CONTEMPORARY WETLAND CONSERVATION IN CHINA

The revival in China of the theory of the “Unity between Heaven and Man” represents an opportunity to integrate ancient wisdom into contemporary wetland conservation activities and policy in China. This provides many challenges in terms of identifying future needs and solutions for wetland management and for sharing wetland knowledge in support of the fundamental principles associated with traditional knowledge and contemporary conservation of wetlands.

In Chinese history the theory of “Unity between Heaven and Man” is the core value in understanding the relationship between humans and nature. “Heaven” literally means sky, while more broadly it means non-human nature or even the ultimate rule of the universe. “Man” refers to humankind or human society. “Unity” comprises meanings of fitness, fusion and harmony. Man is a part of nature and should follow the law of universe. This theory supports the harmony and development of human society through the harmonious coexistence between humans and nature, humans and society, and human beings themselves (Chen 2016).

The famous philosophy work, the “Book of Chang”, documented the early perceptions of wetlands – wetland is the best to amuse all and water is the best to moisten all. Wetlands were also associated with the stability of the nation and welfare of people in Chinese political thought. For example, it was believed that the demise of the Xia Dynasty was due to the draining of the Yi and Luo Rivers, and the demise of the Shang Dynasty was due to the draining of the Yellow River. According to the ancient book “Guo

Yu”, able and virtuous monarchs do not destroy mountains, do not fill swamps, do not block rivers, and do not excavate lakes. Instead, they should maintain the smooth flow of water and keep the soil moist in order to bring benefit to the people. The importance of wetlands was highlighted as a strategic resource for national survival.

Ancient Chinese generalized, generation by generation, how to utilize and protect precious wetland resources based on their production practice. Table 2 lists some ancient books, government decrees and folk laws that recorded Chinese traditional knowledge of wetlands. It can be seen that our ancestors understood the law of nature, and extracted resources seasonally and abstemiously to balance the short-term and long-term benefits. Their methods are consistent with the modern concepts of “wise use” and “sustainable use” that emphasize the importance of equalizing the benefits to humankind and the natural properties of the ecosystem, as well as the maintenance of intergenerational equity (Finlayson et al. 2011).

Since 2012, China has highlighted ‘ecological civilization’ as a long-term national strategy for promoting sustainable development (Lü et al. 2017). Now ecological civilization has been written into China’s constitution as the ideological framework for the country’s environmental policies, laws and education (Hansen et al. 2018). Its key tenets include “the need to respect, protect and adapt to nature; a commitment to resource conservation; environmental restoration and protection; recycling; low-carbon use; and sustainable development” (Wu et al. 2019). With the renaissance of “Unity between Heaven and Man”, it is a challenge, but also an opportunity to integrate ancient wisdom into contemporary wetland conservation schemes and policy in China.

Main Ideas	Detailed Clauses or Practices	Sources
Use wetland resources according to their seasonal characteristic	“do farm work in the right season, so the food is inexhaustible; do not use small hole fishing net, so fish and turtles are inexhaustible”	The Book of Mencius
	“strictly prohibit fishing in ponds, rivers and lakes during breeding season”	Xunzi
	“close fishing during at the end of winter and the beginning of spring when the fish lay eggs”	Tang Code
Extract wetland resources in moderation	“it is wrong to drain the pond to get all the fish or born the wetland for farmland”	The Spring and Autumn Annals
	Use one fish hood rather than many and shoot birds in sky rather than in nest	The Analects of Confucius
Restore wetlands in certain area	Set apart hills for forestry, set apart rivers for fish, and set apart land for wildlife	The prohibition policy of Qing dynasty

Table 2. Concepts and practices of ancient Chinese on wetland utilization and protection.

MEKONG UNIVERSITY NETWORK AS A PREMIERE TRAINING AND RESEARCH NETWORK FOR WETLAND MANAGEMENT IN THE MEKONG REGION

The Mekong River is one of the great rivers of the world. Wetlands of the Mekong maintain and support vital ecological functions, as well as provide valuable products and services for human activities, nourishing a population of more than 60 million people in 6 countries: China, Myanmar, Lao PDR, Thailand, Cambodia and Viet Nam. The biodiversity of the Mekong wetlands is of international significance, including many unique ecosystems and a wide range of globally threatened species such as Giant catfish, Siamese crocodile, Eastern Sarus Crane, Giant ibis, and Irrawaddy dolphin. Conserving wetland ecosystems and their resources through a better understanding of wetland ecology and the application of ecologically-sound management is urgently needed. To implement this task, the riparian countries within the Mekong River basin need a sufficient number

of experts and technical staff who are able to work productively in the field of wetland conservation.

With the primary purpose of advancing wetland ecology and management in the Mekong Region through teacher training and curriculum development, in 2002, eight large public universities from Cambodia, Lao PDR, Thailand and Vietnam, with facilitation from the International Crane Foundation-USA, joined to create a network of universities, named the “University Network for Wetland Research and Training in the Mekong Region” (Tran et al. 2003). By 2015 the Network had grown to include 24 major universities from all six Mekong countries and Malaysia (Table 3). The Network facilitated academic cooperation in wetland education and communication, wetland research, regional wetland conferences and consultations, construction and implementation of regional training courses focusing on field-biology aspects of wetland ecology and conservation (Figure 5). The longer-term goal of the Network is to assist member universities to develop academic MSc and PhD programs in wetland ecology and conservation.



Figure 5. Field training exercise in a wetland training course, U Minh Thuong National Park, Vietnam, 2007. (Photo by Triet Tran / ICF)

The main objectives of the Network are to:

- Build the capacity of university lecturers and researchers of the Mekong region in teaching wetland-related courses, conducting scientific research in wetland-related fields, and assisting wetland conservation practices;
- Enhance public understandings in wetland values as well as threats to wetland ecosystems of the Mekong river basin;
- Enhance the knowledge and understanding in wetland ecology and management for staff of protected areas, grassroots and community-based organizations of the Mekong riparian countries and to improve their capacity in wetland conservation and management.

Organizing training courses is an annual activity of the Network. By end of 2021, the Network has organized 16 regional and 4 country-level training workshops for more than 500 university lecturers and wetland managers in Southeast Asia. The Network's training activities require minimal expertise from outside. Trainers are selected and drawn from member universities within the region. Training is provided using available expertise, experience, as well as teaching facilities of member universities. The Network operates regional training activities, using key wetland ecosystems of the Mekong region as natural laboratories for the trainings. Course contents are field-orientated and emphasize in-situ training and hands-on exercises. Trainees have opportunities to gain a holistic view of wetland ecosystems within the Mekong region. They also have opportunities to share their knowledge and experience with colleagues from other riparian countries and learn from each other.

In addition to training, the Network facilitated regional research projects on subjects related to wetland ecology and biodiversity. The largest study—which involved ten Southeast Asian and three US universities and research institutes, with the participation of 120 researchers and technicians—sampled more than 450 wetlands across five countries of the Mekong River basin to evaluate the state of contamination by persistent organic pollutants in natural wetland ecosystems (Tran et al. 2014). The most recent regional research project was on wetlands of dry, deciduous Dipterocarp forests of the Lower Mekong basin (Barzen et al. 2019). Other research projects include:

- SUMERNET-funded research project on the roles of natural wetlands in water security in Cambodia, Lao PDR, Thailand and Vietnam;
- IUCN-funded regional research project on invasive

alien species in wetlands of Cambodia, Lao PDR, Thailand and Vietnam;

- Bamboos of Cambodia, Lao PDR and Vietnam, involving the Museum of Natural History Paris, France;
- Botanical study of the family Zingiberaceae, involving the Royal Botanic Garden-Edinburgh, and Singapore Botanic Garden.

In conclusion, after almost two decades of continuous operation, the University Network for Wetland Research and Training in the Mekong Region has proven a good conduit for connecting wetland research and academic communities of the Mekong region with the world and may provide a model for advancing wetland training in other parts of the world.

INDIGENOUS AND TRADITIONAL KNOWLEDGE CAN BE THE FOUNDATION FOR THE 'WISE USE' OF WETLANDS

The points raised in this article are based on information provided in the published literature and from observations about the pattern of engagement of traditional knowledge in wetland conservation. They are not based on a formal academic investigation, but have benefitted from 20 years of interactive wetland training delivered through the Wetland Education and Training (WET) initiative run by the Sydney Olympic Park Authority, Australia (Paul 2015; SOPA 2021).

Despite the Ramsar Convention recognizing in 2015 (through Resolution XII.2) that the wise and customary use of wetlands by indigenous peoples and local communities could play an important role in their conservation and wise use (Ramsar Convention 2015), there is ample evidence and a developing consensus that in recent decades the participation of traditional and indigenous people in wetland management has not been as much as it could be (e.g., Middleton 2016). Similarly, there is a widening realization that there is a large amount of indigenous knowledge pertinent to the wise use of wetlands. With the increasing impacts that global wetlands are set to face under climate change and sea level rise scenarios, modern scientific knowledge is needed to manage wetlands. However, it is also increasingly evident that the effectiveness and efficiency of modern science-based approaches can be improved if combined with traditional knowledge. It is even plausible that some problems may only be overcome with traditional knowledge (Rundle 2019; Davidson 2005). It is expected that much valuable traditional knowledge would have to be either retrieved from various sources and/or their origins, and their existence explored in an appropri-

University	Country
Build Bright University	Cambodia
Pannasastra University	Cambodia
Royal University of Agriculture	Cambodia
Royal University of Phnom Penh	Cambodia
Southwest Forestry University	China
Yunnan University	China
National University of Laos	Lao PDR
Champasak University	Lao PDR
University Sains Malaysia	Malaysia
Mandalay University	Myanmar
University of Forestry	Myanmar
Yadanabon University	Myanmar
Yangon University	Myanmar
Yezin Agricultural University	Myanmar
Chulalongkorn University	Thailand
Kasetsart University	Thailand
Khon Kaen University	Thailand
Maharakham University	Thailand
Mahidol University	Thailand
An Giang University	Vietnam
Can Tho University	Vietnam
Nong Lam University	Vietnam
University of Science – Ho Chi Minh City	Vietnam
Tay Nguyen University	Vietnam

Table 3. List of member universities of the Mekong University Network

ate manner so that legal and intellectual property rights are respected. It is encouraging to note that there have been global initiatives to document traditional knowledge for the benefit of conserving biodiversity (WIPO 2016; WIPO 2017). Increased and regular participation of traditional knowledge-keepers requires their willingness, but most importantly, a need for creating a favorable environment so that they feel welcome, valued and involved, and have the right to withdraw if they so choose.

There is also the possibility of mismatches between the format of traditional knowledge and that of modern technologies that increasingly rely on “big data” sets and complex analyses, including statistical manipulation and modelling, to inform management scenarios and decision-making, and gain their credibility through peer reviewed publication in journals adorned with impact factors that likely mean next to nothing to the wider public. At the same time, the

education and training initiative at Sydney Olympic Park Authority (nowadays presented under the banner of the Sydney Wetland Institute) has a demonstrated history of drawing on a mix of knowledge from wetland practitioners, researchers, and urban communities and cooperation with other organizations such as the Society of Wetland Scientists (Oceania Chapter) to present regular webinars (<https://www.sydneyolympicpark.com.au/Education/Sydney-Wetland-Institute/Events>, accessed on January 3, 2022) and a virtual symposium addressing the importance of fire in wetland management (<https://members.sws.org/oceania-chapter>, accessed on January 3, 2022). In this way they have been able to draw on local knowledge sources and share this with a wider audience directly, and through virtual means, as part of the ongoing processes of identifying future needs and solutions to ensure the sustainability of our wetlands.

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