Ecosystem Services 18 (2016) 33–44

Contents lists available at ScienceDirect

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser

Community-based groundwater and ecosystem restoration in semi-arid north Rajasthan (2): Reviving cultural meaning and value

Mark Everard

University of the West of England (UWE), Frenchay Campus, Coldharbour Lane, Bristol BS16 1QY, UK

ARTICLE INFO

Article history:
Received 1 July 2015
Received in revised form
22 January 2016
Accepted 27 January 2016

Keywords:
Ecosystem services
Community-based management
Water
Regeneration
Cultural
Aquatic ecosystems

ABSTRACT

Cultural and other less directly exploited ecosystem services tend to be excluded from decision-making, yet may underlie strong ties between people and their surroundings providing significant incentives for engagement with ecosystem conservation. Overlooking non-marketed services leads to non-systemic, utilitarian understandings and narrow solutions. Aquatic species were recorded in eleven ponded sections of three sub-catchments in semi-arid north-east Rajasthan that had been regenerated through community-based management activities, along with local associated medicinal, spiritual and other cultural values. Local religious and traditional beliefs reinforce awareness of the co-dependence of people with nature. Socially held values may be incommensurable with quantification and monetisation methods applied to marketed services, other than by rough proxies, but can be significant in engendering engagement in landscape regeneration. Pervasive global declines in habitat quantity and quality, with their implications for human wellbeing through loss of ecosystem services, raise questions about the adequacy of interpretations of sustainable development that fail to recognise the need not merely to reduce pressures upon but to actively regenerate the supportive capacities of damaged ecosystems. Lessons from the study region can inform this global need for practical action and policy reform to restore ecosystems as fundamental resources underpinning continuing human security and opportunity.

1. Introduction

The essence of the Ecosystem Approach is to fundamentally reframe human relationships with ecosystems through recognition of the diverse roles they play in underpinning multiple dimensions of wellbeing. Through twelve principles defined by the Convention on Biological Diversity, the Ecosystem Approach recognises interdependencies between humanity and ecosystems with which we co-evolved and co-exist (Convention on Biological Diversity, 2000, 2010). The ecosystem services framework advanced by the Millennium Ecosystem Assessment (2005a) spans a broad range of often non-substitutable economic and non-economic values flowing to humanity from nature.

Some of the more directly exploited services – provisioning services of food, fuel, fresh water and, increasingly, regulatory service of natural flood regulation – are recognised to different extents in established markets. However, externalities associated with their full production costs distort allocation of resources (Ayres and Kneese, 1969). Values for other less directly exploited services, including those associated with production of marketed services, are harder to quantify. This perpetuates their exclusion from decision-making at all scales, particularly supporting and some regulatory ecosystem services. It is commonly assumed that to value them is to double-count, as they constitute 'primary' and 'intermediate' services contributing to the production of more directly consumed and readily valued services (UK NEA, 2011). This view would be justified were supporting services (soil formation, nutrient cycling and habitat for wildlife) and regulatory services (climate (primarily carbon flux), flooding, disease transmission and soil erosion) fully internalised in market prices, for example for food and other farmed commodities. However, key messages of the Millennium Ecosystem Assessment (2005a), TEEB (2010a, 2010b), and national studies such as the UK National Ecosystem Assessment (UK NEA, 2011) highlight the substantial degradation of broad habitat types and their services through narrow exploitation for limited provisioning services. Agriculture is a principal driver of this globally declining trend (Millennium Ecosystem Assessment, 2005a, 2005b), highlighting the scale at which many services are excluded from markets with seriousness potential consequences.

Cultural benefits derived from nature have fared mixed fortunes. Exploitation of some habitats for recreation and tourism is highly valued financially (Sen et al., 2014), though exploitation of these benefits can also exert pressure on service-providing ecosystems (Halvorson and Davis, 1996). Some sites of spiritual and/or heritage value receive explicit protection, such as informal taboos surrounding Hindu temples

E-mail address: mark.everard@uwe.ac.uk

http://dx.doi.org/10.1016/j.ecoser.2016.01.007
2212-0416/

and more formal designations such as qualifying features within World Heritage Sites and Biosphere Reserves. However, landscapes constantly change in response to shifting environmental conditions, land uses and policy priorities, such as the food sufficiency and associated land drainage agenda of post-Second World War Europe that substantially influenced landscape and service simplification. The diverse meanings attributed by different stakeholder groups are often poorly represented in decision-making, with immediate utilitarian values often dominating perceptions and ensuing decisions. A pervasive global example is the inundation of culturally meaningful sites through the filling of large dams, the resultant displacement of communities who do not share the benefits of dam development, and the sizeable constituencies whose livelihoods are affected by the changing character and services of host river systems (World Commission on Dams, 2000; Everard and Kataria, 2010; Everard, 2013). Where cultural and supporting services are overlooked or otherwise undervalued, degradation of ecosystems through narrow utilitarian uses undermines the physical health and socio-economic wellbeing of communities, their cultural identity and their long-term viability.

Nevertheless, there are examples around the world of community engagement in decision-making to revitalise formerly degraded ecosystems, with associated regeneration of linked ecological and socio-economic benefits. Everard (2015) analyses factors behind linked environmental and socio-economic regeneration across three catchments – the Arvari, Sarsa and Baghani – in a rural, semi-arid region in Alwar District, north-east Rajasthan (India). Here, community-led rehabilitation of catchment hydrology through reinstatement of locally adapted governance and physical monsoon run-off harvesting structures has promoted recharge of groundwater. This has in turn restored ecosystem services promoting socio-economic progress, reversing a history of socio-environmental degradation. Sinha et al. (2013) and Everard (2015) review changes in groundwater status, farmland productivity, characteristics of water harvesting structures (WHSs), re-emergence of permanent surface water in rivers formerly dry outside of monsoon rainfall, and changes in landscape management in this region. These authors also address political factors behind the prior decline and how NGO community-level activism has driven the multi-decade recovery and rejuvenation of the linked socio-ecological system.

This paper, a partner to Everard (2015), extends consideration of the regeneration of these three catchments in Alwar District beyond restoration of the more utilitarian services supporting the recovery of rural livelihoods. This is important as 'cultural landscapes' – landscapes deliberately managed by humans (Schaich et al., 2010) – are characterised by biodiversity and ecosystem services shaped by a complex, extended history of settlement and land use (Antrop, 1997, 2005; Jones-Walters, 2008). The multiple culturally and socially rooted benefits provided by cultural landscapes create strong ties between humans and their natural surroundings, constituting amongst the strongest incentives for people to engage with environmental conservation yet often marginalised relative to more quantitatively assessed services (Schaich et al., 2010). Many ecosystem service studies fail to address cultural services as significant contributors to scheme success and net societal benefit, adding cultural and time depth to more spatially and quantitatively focused assessments (Tengberg et al., 2012). This study records findings from rapid ecological assessments of ponded sections within the three rejuvenated sub-catchments in summer – the driest time of year – exploring medicinal, spiritual and other non-marketed aspects (as well as some domestic utilitarian uses that may be external to conventional markets) of restored aquatic taxa as a contribution to societal rejuvenation. Conclusions and transferrable lessons are derived.

2. Methods

Field research for this study was undertaken in March 2015, a hot and dry period with monsoon rains generally arriving in July. Rapid ecological assessments were undertaken in water bodies retained behind the eleven water management structures of different types and locations in the Arvari, Sarsa and Baghani catchments of Alwar District, Rajasthan (India), described by Everard (2015) with summary details of each water body in Annex 1 of this paper.

Rapid ecological assessments comprised recording of observations throughout a period of approximately 15 minutes of biota visible immersed, on the surface, emergent from or on the drawdown zone of the water body. Observations were made from the bankside or, where the water was not excessively deep or the banks too steep or friable, wading up to knee depth. All of the selected WHSs were constructed to promote retention and infiltration to groundwater of monsoon rainfall with associated wider environmental regeneration supporting and expanding human livelihoods, not primarily for nature conservation reasons. Nevertheless, the return of perennial water and soil moisture enabled colonisation by a range of wetland organisms, many of them obligate aquatic taxa.

For aquatic plants, no keys for the vicinity were available. However, the case study catchments drain into the Gangetic plain and, as re-colonisation of regenerated water bodies was more likely from the adjacent and damper District of Bharatpur than from the more desert-dominated districts to the west of Alwar, the *Illustrated Flora of Keoladeo National Park, Bharatpur, Rajasthan: A general guide to the wetland flora of the Gangetic plains* (Prasad et al., 1996) was perceived as the most relevant available guide, albeit not a recent publication. The *Flora of Rajasthan* (Sharma, 1989) served as an additional source. Only plants immersed or rooted in the water, including those in adjacent drawdown zones, were recorded at each site in order to maintain a distinction between aquatic flora and that encroaching from surrounding terrestrial habitats. For fauna, *Faunal Heritage of Rajasthan, India* (Sharma et al., 2013) provided limited taxonomic guidance, with other species identified with the aid of the author's experience, local knowledge, online databases such as www.fishbase.org and, in the case of birds, corroboration with the Avibase bird checklist for Keoladeo National Park, Bharatpur (Lepage, 2015). Dr Rachna Chandra (Gujarat Institute of Desert Ecology) and Dr Damendra Kandal (Tigerwatch) also corroborated and helped with some species identifications.

Bias in selection of WHSs is acknowledged in terms of accessibility, the guidance of the NGO Tarun Bharat Sangh which had been instrumental in their creation, and limitations on time available to make visits. Taxonomic identification was also limited by the availability of keys, the mobility of species (small fish, frogs) evading sampling for identification using very basic equipment (observations, hand net, portable angling equipment where fish were evident), and also a bias towards species visible in daylight.

The cultural significance of species and taxonomic groups recorded in water-harvesting structures was deduced primarily by discussion with local people. Key correspondents included Rajendra Singh (founder of the NGO Tarun Bharat Sangh and qualified in Ayurvedic medicine), the headman of a local village (Rudhmalmena, headman of Harmeerpur), other members of Tarun Bharat Sangh, and experts in local NGOs (including Dr Dharmendra Kandal, Tigerwatch). Observations in Sharma et al. (2013) and other relevant literature in addition to internet searches linking taxa to medicinal uses and Hindu mythology and traditions were consulted to determine further meanings to local people.

3. Results

Annex 1 contains brief descriptions of the eleven WHSs, with lists of aquatic taxa observed at each during rapid ecological assessments. Further details of locations, uses and history of each site can be found in Everard (2015). Singh (pers. comm.) and Rudhmalmena (pers. comm.) report that these organisms have all naturally colonised the restored open surface water bodies.