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Discussions with villagers about environmental and climatic changes, causes and consequences in Tibetan areas in south-west China.

Local ecological knowledge and its relevance for management and research

In recent decades, the usefulness of local knowledge of environmental resources and processes as a tool for conservation and sustainable resource management has been debated. Here, we give a brief overview of the perceived advantages and disadvantages of management and research approaches based on local knowledge. We use the term »local ecological knowledge« to refer to knowledge generated and reproduced through management practices and other human-environment interactions in specific locations by local inhabitants. Other terms that are often found in the literature are »traditional ecological knowledge« (TEK) or »indigenous knowledge« (IK). For all these terms it is important to stress that the knowledge referred to is neither uniform nor static. On the contrary, local knowledge is constantly changing, unevenly distributed among people and may not be well-defined. Only some parts exist in a verbalised form, while other parts take the form of »embodied« knowledge that cannot easily be put into words or separated from the context of practice and the lived-in landscape.

Policy Recommendations

- Local knowledge has much to offer with regard to natural resource management and research as it can help to empower local people and improve management outcomes and provide insights that complement those of science.
- Policy makers and managers should be aware of issues such as differences in knowledge and goals within and among groups and stakeholders (including local people as well as outside experts).
- Caution should be exercised with regard to attempting to extract local knowledge from the context of the social practice, world view and value systems in which it has been generated and sustained.

The interest in (and subsequent controversies about) local ecological knowledge can be traced back to the increasing focus on the many problems associated with top-down development projects, such as fortress conservation. The disillusionment with these approaches gave rise to calls for greater participation of local people in both development and conservation and for the integration of these two fields. Allowing communities more freedom to apply their local knowledge and express their preferences through participatory approaches to management is seen as a way to provide opportunities for more effective and efficient conservation and sustainable management of natural resources. Others have focused on the potential of local knowledge as a supplement to information generated through scientific studies. Proponents of the use of local ecological knowledge point to several advantages, some of which are political or ethical while others are of a practical kind:

1. Can help to empower disadvantaged minorities such as indigenous peoples (*Berkes and Davidson-Hunt, 2006; Nazarea, 2006; Berkes, 2008*) and to challenge dominating interests served by scientific knowledge (*Gadgil et al. 2003; Eden, 1998*).
2. Can ensure greater local legitimacy and relevance of the management/conservation system, e.g. by identifying important resources and main users (*Theilade et al. 2007; Byg and Balslev, 2006*) and by building on local concepts and terminology.
3. Can generate new hypotheses for further investigation (*Huntington et al. 2004*).
4. Can supplement scientific knowledge by providing place-specific detailed knowledge based on long-term interaction & observation (*Gadgil et al. 2003; Huntington et al. 2004; Berkes and Berkes, 2009*).
5. May better reflect the complex, dynamic and unpredictable nature of social-ecological systems as it is often process oriented and has arisen from activities which have helped maintain biodiversity and shape the landscape (*Kendrick, 2003; Berkes and Davidson-Hunt, 2006; Berkes, 2008; Berkes and Berkes, 2009*).
6. Can be faster (Hellier et al. 1999) and more cost-effective (*Danielsen et al. 2005*) relative to science based systems.
7. Can build on local capacity and relations between local people and authorities, and can result in timely management interventions (*Danielsen et al. 2005; Danielsen et al. 2010*).

However, there have also been critical voices pointing to difficulties in »getting at« local ecological knowledge and using it in management and research:

1. Local knowledge tends to be qualitative rather than quantitative (*Berkes and Berkes, 2009; Gadgil et al. 1993*).
2. It may be difficult to get a »true picture« of people's knowledge as not all knowledge is verbalised (*Palmer 2007, Ingold 2000, Nazarea 2006*), local concepts may be difficult to translate (*Kendrick 2002*), and people may give strategic answers (*Palmer 2007*).
3. Usually there is variation among people (within and between communities) with regard to their knowledge as well as to their management goals and interests depending on factors such as gender, social position, etc., and often it is the knowledge and interests of certain groups which come to dominate while others are not heard (*Nazarea, 1999b*).
4. Local knowledge is constantly changing and is intimately connected to specific practices and cosmologies. Trying to transform local management systems into fixed, codified management rules (preferred by state bureaucracies) may undermine the flexibility and innovation that makes local knowledge »work« (*Ingold and Kurttila, 2000*). Likewise, trying to separate the »empirical part« of local knowledge from belief parts may undermine the way in which local knowledge is practiced and may de-contextualise it (*Gadgil et al. 2003; Berkes, 2008*).
5. Due to the place specific nature of local knowledge it is difficult to extrapolate to larger spatial scales (*Hellier et al. 1999*).
6. Local knowledge often focuses on plants and animals of importance/use while other components of an ecosystem may be less important from a local perspective, but equally important from a national or international conservation perspective (*Hellier et al. 1999*).

7. The eliciting of local ecological knowledge to inform scientific assessments of ecosystem condition and development is widespread, but there is very little documentation for the validity and reliability of the methods used to extract and translate local knowledge into scientific formats (*Lund et al. 2010, but see e.g. Danielsen et al. 2005; Danielsen et al. 2010; Huntington, 2000; Hellier et al. 1999 for examples of cases where local knowledge has been compared positively with science*).

It should be kept in mind that some of these points of caution or critique do not apply to local ecological knowledge alone but more generally to all community based or participatory management forms, whether based on local or scientific ecological knowledge. In community based forest management it has, for example, often been noted that certain groups manage to promote their own interests to the detriment of others (*Saito-Jensen et al. 2010*) and often scientific knowledge is used as one means to achieve this (*Gadgil et al. 2003; Kendrick, 2003; Nightingale, 2005*). Science and technology studies have also demonstrated that scientific knowledge just like local knowledge is situated and produced in a specific context (*Eden, 1998*).

Several approaches have been proposed to overcome the challenges in working with local ecological knowledge. Here, these are mentioned in relation to each of the points listed above:

1. Often there will be aspects of local knowledge with a more quantitative focus. Furthermore, local knowledge can be seen as complementary to the more quantitatively oriented sciences. Even within science there are now approaches such as fuzzy logic which stress the importance of qualitative information when dealing with complex systems and which offer methods for dealing with this kind of information from a scientific perspective (*Berkes and Berkes, 2009*).
2. Differences among people and people's own criticism of other's knowledge can be used as a source of insight (*Palmer and Wadley, 2007*) as can methods such as triangulation and calculation of »cultural consensus« (*Romney et al. 1986*). In addition, interview derived information can be supplemented with (participant) observation and by consulting information sources such as myths, stories, songs, and metaphors (*Kendrick, 2003*).
3. Informants can be selected to ensure that the knowledge of different groups is being heard and to include those which are considered experts within a community (*Huntington, 2000; Nazarea, 1999a*). In addition, democratic institutions, conflict resolution, participation of all stakeholders, transparency and accountability are important means to ensure that the benefits of local ecological knowledge and, more generally, participatory management approaches materialise (*e.g. Saito-Jensen et al. 2010*).
4. An »adaptive management framework« can be used instead of more conventional management systems relying on fixed, specified rules (Gadgil et al. 2003). In adaptive management learning and flexibility are explicitly build into the system. In addition, it is important to respect that there are different ways of knowing and that local as well as scientific knowledge is always situated in specific contexts (*Eden, 1998; Brook and McLachlan, 2005; Kendrick, 2003*).
5. By arranging meetings and knowledge exchange between people from different communities and different knowledge traditions knowledge pertaining to larger spatial areas may be produced (*Gadgil et al. 2003*).
6. Management efforts should proceed from awareness of the differences in knowledge about and importance given to different resources by local people and national or international conservation interests.
7. The use of local ecological knowledge in the specific context of providing research-based evidence of ecosystem condition and development should proceed with careful testing of the degree to which different approaches to extract and translate this knowledge into standard scientific formats provide valid and reliable information (*Lund et al. 2010*).

Although local knowledge may not offer a panacea it can still be a means for making environmental management and conservation systems more inclusive and just, and, hence, potentially more sustainable in the long run.

Local guides provide information to Khmer foresters on species' habitats, flowering and fruiting seasons, and traditional uses. Central lowlands, Cambodia.

PHOTO: IDA THEILADE

PHOTO: ANJA BYG

Map produced by villagers showing the spatial distribution of natural resources, activities and changes in Tibetan areas in south-west China.

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