



produced with support from Duleep Matthai Nature Conservation Trust (DMNCT)

The role of LEK in governing the commons: an overview

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This module is part of a series of learning modules centred around commons, created and published for internal circulation among the researchers of Dakshin Foundation. Information contained in these modules is collated from publications of various scholars. While these are not exactly ‘commons for dummies’, we have tried our best to simplify the concepts :)

Scholars studying Common Property Resources (CPR) have highlighted the role of Local Ecological Knowledge (LEK) in the preservation of the natural resource commons. The norms governing CPR are often formed based on the knowledge that communities amassed over time about resources in their local environments. For example, ‘Sasi’, the traditional community-based coastal resource management system prevalent in the Maluku province of Indonesia prohibits catching of certain fish species in the estuarine and near-shore coastal areas, in an effort to protect their quality and population (Kurien 2003). Such norms are formed based on their observations and experiences over the years and generally enforced by the traditional institutions within the community. It must be noted that this relationship between knowledge and norms is two-way as norms and institutions also influence and shape how the knowledge is generated, transmitted, shared and used.

While local communities have always relied on their knowledge for governing their natural resources, only recently have their knowledge and contributions been formally recognised in official law and policy documents. However, such knowledge has historically been used to inform and enrich colonial knowledge and practices. For example, the comprehensive 17th century botanical

compilation, *Hortus Malabaricus* served as an important resource on asian plants for Carl Linnaeus and others working on botanical classification. This compilation, produced by Henrik Adriaan van Rheede, the Dutch governor of Malabar and published in Amsterdam, listed traditional physicians Itty Achuden, Ranga Bhat, Vinayaka Pandit and Appu Bhat as the sources of information on medical and other properties of flora in the Indian state of Kerala (Spudich 2008). In another instance from colonial India, during the famines in the Mizo hills, the British and missionary organisations worked with the tribal communities in ameliorating famines caused by exploding rat populations that were a consequence of episodic bamboo flowering. These strategies relied a great deal on local knowledge about flowering cycles, trapping patterns, etc (Sridhar & Oommen 2014: 21). To cite an example of the recognition of the value of LEK from recent times, U.S. Fish and Wildlife Service used both western scientific data and LEK to list the polar bear (*Ursus maritimus*) as a threatened species under the Endangered Species Act. The listing was justified based on the ecological knowledge provided by Chukotka, Inuit and other indigenous coastal residents regarding the habitat, density and population numbers of the polar bear (U.S. Fish & Wildlife Service 2011).

Contested definitions of LEK

The literature on commons or natural resource governance uses multiple interchangeable terms for LEK. Some of these terms are ‘Traditional Ecological Knowledge (TEK), ‘Indigenous Knowledge (IK) and ‘Traditional Knowledge (TK). While LEK is fast gaining popularity, TEK is one of the most popular terms used to refer to the knowledge created and held by local communities. Here, we examine some of these terms, their definitions and the discourse associated with them. The Convention on Biological Diversity (CBD) defines traditional knowledge as follows:

“Traditional knowledge refers to the knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Sometimes it is referred to as an oral tradition for it is practiced, sung, danced, painted, carved, chanted and performed down through millennia. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, forestry and environmental management in general” - - from The Convention on Biological Diversity, article 8(j)

This definition, associated with article 8(j) of CBD that calls for the preservation of knowledge, innovations and practices of indigenous and local communities. However, many scholars from indigenous communities believe that TEK should not be defined at all as it varies from individual to individual and from community to community and thus a universalised definition is the equivalent of separating TEK from its embedded context (McGregor 2006). They also problematise the fact that TEK has been largely defined by non-indigenous scholars. The term ‘Traditional Ecological Knowledge’ itself has been heavily critiqued by scholars from indigenous communities and those who engage in indigenous studies. They argue that the word ‘traditional’ indicates a static knowledge while this form of knowledge is continuously evolving to adapt and respond to the new challenges (McGregor 2008). Similarly, the term ‘ecological’ limits TEK to a field of study defined by western science while from a native viewpoint, TEK is a holistic form of understanding that encompasses all areas of human existence. McGregor points out that even the use of the word ‘knowledge’ is problematic as native people tend to describe TEK as more of a ‘way of life’.

Another popular definition of TEK by Berkes, Colding and Folke is given below:

“Traditional Ecological Knowledge is a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment. (Berkes, Colding & Folke 2000: 1252)”

In the above definition, TEK is described as a knowledge-practice-belief complex. This definition is based on the assumption that natural resource-dependent communities would be more inclined to use resources sustainably and prudently as their well-being is dependent on the long-term availability of the resources in their localities. Berkes, Folke and Gadgil (1994) observe that such conservation demands social restraints on resource use against short-term individual interests. The authors argue that knowledge, belief and practice tend to overlap. Subsequently, constraints based on local knowledge are often implemented on the grounds of belief or custom. This knowledge-practice-belief complex is generally accompanied by a worldview where humans are considered as part of nature.

Thus, Berkes, Folke and Gadgil (1994) argue that in many TEK systems, there is a component of local observational knowledge of species and other environmental phenomena, a component of practice in the way people carry out their



Chinese fishing nets in Kochi. According to a popular narrative, they were introduced by Portuguese from Macau, China in 16th century. The image by Brian Snelson is licensed under CC BY 2.0

resource use activities, and a component of belief regarding how people fit into or relate to ecosystems. Thus, ecological knowledge does not exist in isolation. It is embedded in social institutions and norms.

Analysing the definition given by Berkes, Colding and Folke (2000), McGregor observes that definitions by western scholars tend to view TEK as a noun, something whose boundaries can be readily delineated and packaged for consumption. She has the following observations on the abo-riginal understanding of TEK:

“Native understandings of TEK tend to focus on relationships between knowledge, people, and all of Creation (the “natural” world as well as the spiritual). TEK is viewed as the process of participating (a verb) fully and responsibly in such relationships, rather than specifically as the knowledge gained from such experiences. For Aboriginal people, TEK is not just about understanding relationships, it is the relationship with Creation. TEK is something one does” (McGregor 2008: 145-146)

As we can see, the term TEK and its definitions are heavily contested. However, the terms Local Ecological Knowledge (LEK), Indigenous Knowledge (IK), Traditional knowledge (TK), etc., have also been critiqued. It can be said that each nomenclature either highlights or hides a certain aspect of the knowledge. For example, the term ‘indigenous’ obscures the complexities of knowledge transmission among groups. Also, it would be difficult to label any type of knowledge as purely indigenous given that human civilisations have transmitted their knowledge far and wide through trade and travel and adapted and improvised on the acquired knowledge. Indigenous knowledge forms are practical, utilitarian and continuously evolving to meet the everyday demands of life incorporating elements from even non-indigenous sciences (Sridhar & Oommen 2014: 3). Thus, the knowledge of the local and indigenous communities interacts with other non-local knowledge and gives forms to new, hybrid and contextually situated knowledge. Here in this module, we will be using the term ‘local ecological knowledge’ as we believe it accommodates more concepts than the terms ‘traditional ecological knowledge’, ‘indigenous knowledge’ and ‘traditional knowledge’.

Contestations between different knowledge systems - The false dichotomy of LEK and western science

In the last section, we saw different definitions of LEK and the critiques associated with it. However, the contestations go far deeper. One thing common in most definitions is that they emphasise context-dependency, community wisdom and lack of generalisation of the LEK. This seems to place LEK in contrast with western science which is often seen as more rational, objective and favouring formation of general principles (Agarwal 1995). This raises the question of whether western science is free from being embedded in social and cultural values? Are LEK and western science inherently different? In the following section, we aim to expand on these questions.

When it comes to how knowledge is generated, local ecological knowledge holders derive their knowledge in much the same way as western scientific knowledge is produced. LEK is the result of empirical observations and interpretation. It is often accumulated incrementally, tested by trial and error and passed to future generations orally or via shared experiences. However, it must be noted that traditional knowledge holders might have different perspectives on how this knowledge is derived.

Berkes and Turner (2006) propose two models as to how local knowledge of the communities is developed. Depletion crisis model states that people discover limits by exceeding them. This is particularly true of the ecological knowledge of the communities who have limited resources at their disposal and thus find it easy to exceed the boundaries. This theory also points out that under conditions of abundance, a group

may never discover conservation values. Thus abundance and scarcity give rise to different types of knowledge.

The other model proposed by Berkes and Turner, the ecological understanding model, suggests that communities learn not just from resource depletion but through other means of ecological understanding such as

- from observing animal behaviours such as migration, population cycles and predator effects
- monitoring resources and impacts of human behaviour on them
- observing changes in ecosystems and natural disturbances
- trial and error experimentation and incremental modification of habitats and populations

The scholars opine that subsequently generated combination of conservation knowledge, beliefs and practices can lead to increasingly sophisticated ecological knowledge.

Palys (1997 as cited in Tsuji & Ho 2002) distinguishes western scientific knowledge from lay-knowledge by four characteristics. Western Science is systematic, subject to peer and public review, part of a collective process and self-reflexive. However, as Tsuji and Ho observe, LEK also possesses similar characteristics. In LEK, data collection is systematic in the sense that specific observations are collected through certain activities during specific periods throughout the year. It is also subject to peer and public review in the sense that LEK is not held by a single person but understood and accepted by many people experienced



“Land cleared for Jhum, a type of shifting cultivation practiced in North-east India” by Prashanthns is licensed under CC BY-SA 3.0

in that area. It is part of a collective process as LEK is derived from shared experiences as well as experiences of previous generations. It is self reflexive as new knowledge is continuously incorporated into it (Tsuji & Ho 2002). Thus, there are clear epistemological similarities between LEK and western science as pointed out by multiple scholars.

Scholars observe that the two are treated separately despite there being a lack of consensus about the acceptable distinctions between the two (Agarwal 1995; Tsuji and Ho 2002). This de-marcation places western science on a pedestal and reinforces hierarchies that subjugate LEK. Some scholars opine that western knowledge is simply another local knowledge that advanced due to intellectual colonialism. As per this view, western science owes its

dominance not to its superiority in terms of universal validity, but to the historical and political advantages it enjoyed due to the geopolitics of power, forged in the time of colonisation (Sridhar & Oommen 2014: 3).

These examples also show the value-laden nature of the colonial knowledge. Similarly, when it comes to water management, most traditional forms of irrigation were better suited for local food staples in most places. But due to the colonial push for increased revenues, local irrigation systems were neglected. However, despite clear instances of its value laden nature, colonial knowledge is often held as objective, value free, universal and superior while the value laden nature of the LEK is heavily emphasised.

The European experience of fire suppression as a superior

One clear example of how the colonial power was used to legitimise western scientific knowledge is seen in the approach colonial foresters adopted towards fire management practices followed by local communities in India. Local communities regularly conducted controlled burning to clear forests for shifting cultivation, improve soil fertility, facilitate the collection of non-timber forest products, and to improve regeneration and fodder production. But colonial foresters with their focus on timber despaired of the wasteful nature of setting fires, as well as difficulties in collecting taxes and controlling transient people, ownership and property rights due to shifting cultivation. Subsequently, the Indian Forest Act of 1927, pronounced the setting of fires a punishable offence (Sridhar & Oommen 2014).

practice was used out of context to justify the same in India (Sridhar & Oommen 2014: 8). Another example from independent India where local knowledge was ignored was the numerous social forestry arrangements where large scale plantations of exotic species such as Eucalyptus were planted despite local preferences for native species (Sridhar & Oommen 2014: 25).

While agreeing that the dichotomy between LEK and western science is a false one, we have to acknowledge the reality that the dominant narrative privileges western science. Thus, there is a need to reconcile these systems of knowledge for effective natural resource governance and conservation. One perspective would be to view different forms of knowledge as overlapping knowledge spaces that are not inherently different from each other, but have their

own sets of transparent elements, ontological assumptions and knowledge claims. As social anthropologist Shiv Vishwanathan argues, the need for diversity of knowledge spaces and the rights of these different forms of knowledge to co-exist must be recognised (Sridhar & Oommen 2014:110).

However, we must also be wary of romanticising pre-colonial knowledge as completely benign.

Critics have pointed out aspects of social subordination and domination in pre-colonial knowledge as in any other knowledge system. Also, communities often operate with logics other than ecological ones in deciding on matters related to natural resource management. For example, their concerns extend to community cohesion and justice as well.

Transmission of LEK

While there have been attempts to document and digitise LEK in recent times, LEK has traditionally been transmitted orally and through myriad formats. In most natural resources dependent communities, the younger generation learns from elders or from peers. The transmission also involves learning by doing either as a part of livelihood or as a part of performing household /community work.

Ruddle (1993) writes that in traditional communities, children were engaged in various age and gender specific tasks so that they could learn while doing. These tasks were taught sequentially beginning from simple to complex tasks, by relatives or community elders. The tasks were also location specific and taught at different and specific sites. The author also notes that specific periods were set aside for teaching and there were rewards and punishments to facilitate learning. However, as McGregor observes, knowledge transmission is not a linear but circular process and there can be collective learning where everyone including children and youth contributes. Similarly, knowledge transmission can occur during any event that brings people together like dance, grieving, worship, feast, celebration etc (McGregor 2006).



Members of Kadar community, Kerala on the way to collect honey and wild turmeric from the forest, image credit : Dr. K.H. Amita Bachan

It must be noted that there will be variations in knowledge between different social groups based on their pedagogy, beliefs, practical experience and political situation over a longer period. Similarly, there would be differences based on gender, age, and class as well. For example, local knowledge regarding herding as well as climate change was found to be less among women in Tibetan pastoral groups. However, women possessed greater knowledge about caring for livestock. Hoping, Yangzong and Klein (2016) also made another observation on gender differences in knowledge transmission during their interaction with the local community members.

“If you have lots of traditional customs and observations, then you must teach your sons. Daughters get married and leave the family, so the family knowledge must be passed on to the sons.” (Tibetan herder as quoted in Hoping, Yangzong & Klein 2016:7)

Modes of transmission also vary within groups and over time as well. Folklore and proverbs also serve as knowledge carriers. For example, Angchok and Singh list some proverbs from Ladakh that are indicative of their local ecological knowledge regarding water management.

*“chhu-zyig be-na gyal,
mi-zyig dum-na gyal”*

Diverted water is safe, (and) people living together are safe “ (Angchok & Singh 2006: 401)

Other inter-generational knowledge activities include group activities such as communal hunting. Rituals, ceremonies and other traditions also help with the ‘cultural internalisation’ (Berkes, Colding & Folke 2000). The norms and social sanctions legitimise the practices in the eyes of the learners and institutionalise them. However, with the new generation obtaining formal education and shifting to fewer natural resource dependent activities, they might not find local ecological knowledge as relevant to them as their elders. It is also possible that the younger generation would be more eager to take up new technologies (for example GPS mapping) and this may give rise to new and hybrid forms of ecological knowledge.

The role of LEK in conservation and natural resource governance

The role of LEK is well accepted in primary sectors of the economy including forestry, fisheries, agriculture, pastoralism and conservation. Local ecological knowledge expressed via various for-mats sets the norms for accessing, using and governing common property resources.

Angchok and Singh have the following to say about water management systems in Ladakh.

“People believe that a terrible lhu lived by the spring and guarded the water and these trees were lha-shing (God-trees) inhabited by mountain Gods. lhu-bangs, a religious structure is often seen near water points like one’s yur-go. It is believed that lhu resides in and around them. It helps to spell fortune on the villagers, their crop and animals.” (2006: 402).

In the semi-desert conditions of Ladakh, water is highly priced and managed via intricate systems by the community. As illustrated above, the belief in the water deity prevents the villagers from polluting springs and streams.

George and Yhome (2008) cite another example of governance of CPR based on local ecological knowledge, that is prevalent among Ao Naga tribe in Nagaland. In the Ao Naga communities, village council selects a particular land for shifting cultivation every year. Once a particular site is selected, the traditional religious head has to perform some rituals there. Until then, no villager is allowed to cultivate in that land. Villagers are not allowed to cultivate in lands other than the ones selected by the council either. The authors write that these decisions are taken keeping in mind the fertility of the soil in rotational cultivation and to protect the forest for future use. Also, in tribe areas where land is commonly owned and administered by the village council, firewood collection is undertaken only during specific periods and cutting trees indiscriminately is prohibited. However, the authors observe that village councils fail to enforce this in areas where land is individually owned.

When it comes to environmental conservation, another area where local knowledge is more sustainable is aquaculture. In industrial aquaculture, large quantities of fish feed and antibiotics are used to nurture fish seedlings. It is capital intensive and potentially harmful to the environment. Traditional aquaculture was practiced in low lying areas where fish seedlings got trapped after monsoon receded. Based on a study in West Bengal, Goswami, Mondal and Dana (2006), write that small fish farmers there cut banana logs into pieces and immerse these in ponds to minimise protozoan diseases and worms. The farmers may or may not be aware of the rationality that the banana’s cells help increase the pH of the pond through an alkaline secretion. The farmers also use a fishing instrument named polo that is made from locally available bamboo and thread. Such knowledge and skillsets are derived from close interactions with the ecosystem and passed on through generations.

Based on the case study on berry picking co authored with Teetl’it Gwich’in Renewable Resources Council in North Canada, Parlee and Berkes (2006) observe that ongoing knowledge generation about the ecological conditions is the key to maintaining the relevance and legitimacy of the rules-in-use. In the Teetl’it Gwich’in community,



Pokkali rice harvesting. Pokkali is a salt tolerant indigenous rice variety cultivated in naturally occurring saline coastal paddy fields of Kerala. In these fields, farmers alternate the uses between rice cultivation and traditional prawn aquaculture. Image credit: G D Martin

the berry harvesters generate knowledge of ecological variability of the berries by checking the land for changes at species or landscape scales. At the beginning of each season, young women would venture out to check how the berries are growing and share information with others in the community. However, this information is more freely shared when there is an abundance of berries. Similar rules apply for ‘giving away’ the berries too. Analysing how the enforcement of rules is dependent on the availability of berries, the authors argue that local management is very responsive to ecological variability resulting in a sort of adaptive management. When shared over space and time, this knowledge becomes embedded in social memory and also guides decisions as to when to harvest and where to harvest. Thus, there is a dynamic interaction between knowledge generation and decision-making about resources. The social memory and rules become the foundation for subsequent observations and interpretations.

LEK as adaptive management

The resilience of socio-ecological systems is critical for sustainability and stability. Their resilience is influenced not just by ecological factors like ecosystem diversity, the stability of ecosystem’s functions and protection of keystone species but also by social factors like people’s ability to plan for the future (adaptive capacity). This adaptive capacity is shaped by human agency, institutional rules and the level of exposure to the impacts of global change (Mallen & Corbera 2013).

Berkes et.al.,(2000) critique conventional resource management for being equilibrium-based or having underlying assumptions of ecological stability. They observe that rules and regulations are often formulated by a central bureaucracy and often implemented by outsiders,

where the emphasis is on maintaining steady state and predictable yields. The authors argue that management practices based on this assumption leads to the gradual loss of resilience towards ecological disturbances or surprises. They opine that this loss of resilience is masked by supporting socio economic infrastructure like bigger fishing vessels, synthetic fertilisers, etc.

The authors argue that in contrast, TEK systems are operated from a resilience point of view.

However, as Mutenje, Ortmann and Ferrer (2011) caution, increasing market integration, high population pressure, lack of economic incentives and the breakdown of traditional knowledge and beliefs can increase the likelihood of degradation of Common Property Resources (CPR) under local control. For example, exposure to market systems changes many subsistence based use systems to market oriented production systems which in turn can weaken collective action often resulting in overexploitation

TEK systems are managed through locally crafted rules enforced by users, with flexible resource use and use of diverse resources for livelihood security. These strategies came about as a consequence of historical experience of the indigenous communities with disturbances and ecological surprises and having to manage them without access to modern technology and socio-economic support structure. Thus, TEK can be viewed as a library of information on coping with dynamic change in complex systems. Berkes et.al., propose that the practices under TEK are consistent with adaptive management as adaptive management recognises the uncertainty and unpredictability in environmental management and responds by adjusting and evolving.

and biodiversity losses. Similarly undermining of community institutions and traditional ecological knowledge by government rules and regulations can also hamper conservation effectiveness.

The ethics of engaging with LEK

The question of whether LEK should be studied itself has been debated. For example, research on LEK is looked at as extracting environmentally relevant information from the larger holistic indigenous knowledge. However, with increasing awareness and acceptance of the applications of LEK, use of LEK by scientists and policymakers is increasing. This has not always brought out positive outcomes for the traditional knowledge holders. There are questions of consent, as well as the problems that arise due to extractive research methods where LEK holders are exploited. There are also concerns of LEK being decontextualised and misrepresented by outsiders (Wenzel 1999). These concerns are especially valid considering that there may be data that is held as sacred or privileged information by the community.

The Convention on Biological Diversity article 8(j) mentions the rights of LEK holders as follows:

“Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilisation of such knowledge, innovations and practices.” (United Nations 1992: 8)

However, national legislations based on CBD have been more focused on trade and commercialisation of the resources and knowledge held by the local communities and have not been community centric (Mauro & Hardison 2000). For example, the Indian Biological Diversity Act 2002 defines the role of the knowledge holding communities through Biodiversity Management Committees (BMCs). However, the communities are not treated as real custodians of knowledge, but rather as data providers for the documentation carried out by BMC. The Act has also been critiqued for focusing more on regulating and facilitating access to resources and traditional knowledge and sidelining the objectives of conservation and sustainable use and equitable benefit sharing with local communities (Kohli 2013). Bhutani (2013) further elaborates on this:



Members of Kadar community, Kerala rowing their bamboo craft, image credit: Dr. K H Amita Bachan

“While both the biodiversity and IP legislation in India claim to be about protecting TK, they do not prevent it from being placed in the bazaar. Situated there it is not only vulnerable to being (mis)appropriated, but it is also commodified and privatised. Its very treatment as if it were property remains problematic to TK-holders. The very same bazaar then sells back to these original innovators products and services derived from their biodiversity-based knowledge. The so-called free market does not give them freedoms to innovate and create as they please. Nor does it respect their relationship with the resource and knowledge as it exists.” (Bhutani 2013: 57)

In this context, it is important for researchers and scientists who engage with LEK to be familiar with the ethical concerns surrounding the LEK research. Shackeroff and Campbell (2007) highlight the some critical concerns that researchers /scientists should be aware of when working with LEK.

◆ Power and Politicisation

Due to the global legacy of colonialism, the marginalisation of alternative perspectives is so deeply embedded in western science that it is prevalent in even the basic assumptions that scientists make. These prejudices often hurt non-western

populations. The authors give the example of how indigenous pastoralists were labelled as causing deforestation in French colonial West Africa for decades until some anthropologists used oral history research and aerial and satellite imagery to prove otherwise. They observe that not only western scientists ignored how locals managed their environment but also it took western scientists, albeit social scientists, to convince them otherwise. Shackeroff and Campbell also point out that power over the research process from inception to final reporting often lies with researchers thus enabling them to harvest maximum benefit out of the process. They also critique how researchers claim ownership over data and how their voice is magnified by the power of western science as western science informs policies and has greater spread. LEK extraction can even harm communities in that it can be used to set boundaries for resource gathering, say setting up protected areas where locals are excluded or limiting access to fisheries. They caution thus:

“Because of the potential that TEK will be appropriated for purposes contrary to TEK holders’ worldview or cultural practices, or for purposes they would not support, researchers must critically evaluate their own intentions for collecting TEK.” (Shackeroff & Campbell 2007:348)

♦ Ethics

As per the Belmont report (1979), researchers should abide by three ethical principles - respect for persons, beneficence (no harm) and justice. Shackeroff and Campbell stress that researchers should pay particular attention to context to fully anticipate the potential harm to human subjects. They highlight understanding possession and transmission of knowledge within and among members in the knowledge holding community as a critical concern for researchers. For example, there could be significant reasons behind the unequal distribution of environmental knowledge within the community. If the researchers are not cognisant of these, their actions might undermine community structure and stability.

♦ Situated knowledge and the nature of LEK

The social context of LEK contains aspects such as symbolic meaning through oral history, place names; a distinct world view and relationships based on sharing and obligations towards community members and other beings. However, as the authors observe, not just LEK, all knowledge is situated in a cultural context. While the western scientist may not be able to see the cultural context in which their own knowledge is situated, they may be able to see it for LEK. Subsequently, they should pay greater attention to the knowledge contexts to facilitate wider acceptance of diverse ways of knowing and to prevent oversimplification and misrepresentation.

♦ Protocols for LEK research

Various organisations of indigenous peoples have come up with protocols that can guide research on LEK related subjects. Where such protocols exist they need to be followed and where they don't they can be used as devices to guide the development of other context-specific protocols. Research should also be participatory where the knowledge holding community is involved in all levels of decision making, management and shared authorship. It should be true collaboration and communities should not be coerced into participation. Participation should not be seen as something that promotes the implementation of the programme, but as the right of knowledge holding communities to be involved in making choices about their future (Sridhar & Oommen 2014: 37).

Threats to local ecological knowledge

As natural resource dependent communities become more marginalised and alienated from their land and resources, their ecological knowledge also undergoes erosion. Santhal

activist Rubi Hembrom observes:

“ However, as time passes, we lose more control over our time, space and self-sufficiency; not voluntarily but circumstantially. Penetration of the business class (corporations or non-tribal traders) into our territory, development and conservation projects have only led to alienation and displacement from our traditional ways of living and livelihood. The sacredness of nature, respect for elders’ knowledge, ritual contact with the ancestors, growing our own food on family land and making our own houses and tools, exchanging food with neighbours with an egalitarian spirit: these things are swept away by corporate values, which emphasise money and financial power.” (Hembrom 2018: 2)

In their review of LEK research across various biogeographical areas of India, Sridhar and Oommen (2014) write that multiple studies show that appropriation of common property resources by the state has led to a decline in traditional management and the use and access rights of many communities. They add that this decline, in turn, resulted in a drain in knowledge components related to tenure arrangements and usage rules, production and harvesting strategies related to marginal lands and drought relief, nutritional knowledge and social and cultural values. For example, in India, traditional grazing properties of pastoral communities such as Gaddis and the Van-Gujjars were jeopardised when the government enclosed forests and charged grazing fee. Protective conservation has also done its share in criminalising the traditional practices of the communities. For example, traditional hunting for subsistence by the forest dwelling communities was criminalised both by the colonial and post independent government in India (Sridhar & Oommen 2014).

Tang and Garvin (2016) classify threats to LEK broadly into direct threats and underlying threats. The direct threats to LEK as per the authors are summarised as follows:

- 1) Loss of pathways of cultural transmission: due to loss of traditional language, the influence due to formal education system, young generation's absence from traditional/local community and reduced incentive and interest in traditional/local ecological knowledge
- 2) Change of traditional livelihood practices: reduced natural resource based activities, reliance on modern products /technologies, shift to westernised primary means of production
- 3) Change of traditional religion and beliefs: conversion to dominant religions, loss of traditional beliefs
- 4) Change of environment and natural location: relocation / Migration, resource degradation

5) Loss of traditional rights: loss of traditional land /land tenure /land use, loss of access to traditional resources

6) Loss of traditional institutions: replacement of traditional resource governance, loss of other aspects of traditional institutions

The authors also identified the underlying threats to LEK as follows:

- government policy and legislation that devalues indigenous/local cultures
- contacts with other dominant cultural groups
- relocation
- marginalisation by dominant societies
- war, military occupation and population decline
- migration and economic development pressure

The authors highlight and recommend some of the actions undertaken by advocacy organisations for the conservation of LEK. Such actions include capacity building of the community members, community-based environmental conservation initiatives, education and awareness of the public regarding the importance of LEK, advocacy for policies and legislative support for the rights of indigenous communities.

Most importantly, as McGregor suggests, LEK comes as a “package deal” and it cannot function properly without its original holders (McGregor 2008:140). Even to utilise it for natural resource management, there must be an understanding of people, their philosophies, values, traditions, and knowledge. Thus, knowledge holders must be given a strong voice in decision-making if LEK is to play a meaningful role in natural resource management. McGregor (2006) writes that while there is a lot of focus on documenting local knowledge before these practices disappear, the energies might be better spent on supporting indigenous and local communities in realising their self-determination by protecting their rights. However, community-driven processes of documentation of local /traditional knowledge can serve such communities in ascertaining their claims over their commons, self-determination and enabling the continuation of their ways of life.

Acknowledgements:

Aarthi Sridhar for concept and advice; Manini Bansal for design and layout

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