

Traditional Knowledge for Sustainable Development: A Case from the Health Sector in Kerala, India

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Abstract

The United Nations' Decade of Education for Sustainable Development (DESD) aims, among other objectives, to foster and promote the mainstreaming of intercultural approaches within a social learning process through multi-sectoral, collaborative and interdisciplinary methods. Biological as well as cultural diversity are inherently linked and form an important part of the sustainable development education process. Traditional knowledge (TK), a central dimension of bio-cultural diversity, is also receiving increased attention in this context. However there are several socio-political and methodological challenges of integrating TK in Education for Sustainable Development (ESD) programs. Using the case of traditional medicine from Kerala state, India, this paper attempts to highlight the importance of and the issues pertinent to such integration in a local context. It also highlights the role of endogenous development processes to achieve different objectives, including specifically those related to ESD processes. Appropriate learning methods need to be designed with sensitivity to epistemological and contextual dimensions of traditional knowledge. For education programs to be effective they need to be addressed at various levels of social integration such as communities, civil society groups, nongovernmental organizations, formal and informal learning institutions, local administrative structures, and national, international, multilateral and policy forums.

Key words: bio-cultural diversity, health, sustainable development, traditional knowledge (TK), traditional medicine, wellbeing

1. Bio-cultural Knowledge and Diverse Perspectives

Diversity of choice is becoming ever more important and appreciated in the present era. Academics and increasingly the public concur that a single system of knowledge cannot solve the mounting problems of humanity. In this perspective a fresh look at bio-cultural diversity, related traditional knowledge and their relevance in the Education for Sustainable Development (ESD) process is vital.

The term bio-cultural diversity denotes an inseparable relationship between the diversity of life forms, their ecosystems and environments and the array of associated cultural expressions. This encompasses genes, species, ecosystems, landscapes and seascapes as well as world-views, belief systems, knowledge, morals, values, norms, languages, rules, artistic expressions, artifacts and institutions (CBD & UNESCO, 2010) that have generally been passed on through an intergenerational transmission process and are shared by a group. Cultural diversity also

indicates how such expressions are transferred within the communities and among outside groups, societies or regions (UNESCO, 2005). The ecosystem approach takes into account the innate, dynamic relationship between nature and humankind and hence biological diversity and cultural diversity (CBD & UNESCO, 2010). They mutually and constantly evolve in response to a changing natural and social-economic environment while at the same time affecting this environment.

While cultural diversity involves a range of elements, an important dimension is TK, which is embedded in local systems of value, meaning and learning. According to the World Intellectual Property Organization this extends to "literary, artistic or scientific works; performances; inventions; scientific discoveries; designs; marks, names and symbols; undisclosed information; and all other tradition-based innovations and creations resulting from intellectual activity in the industrial, scientific, literary or artistic fields." (WIPO, 2001) The term traditional knowledge is synonymous with 'indigenous knowledge,' 'cultural knowledge' or 'local knowledge.'

It plays a vital role in defining the identity of a community or a particular group. These terms have varied interpretations and may not fully represent the exact characterization. The term 'traditional' may obscure the dynamic nature of TK and its ability to adapt and change according to context and time. At the same time 'indigenous' may refer to community centricity while the term 'local' may lack specificity (ICSU, 2002). As all knowledge is presumed to be embedded in cultural roots, the term 'cultural' may not capture a process of inter-generational continuity.

Diversity, collective ownership guided by customary laws, adaptability to changing contexts, largely undocumented and orally transmitted, and relationships among biodiversity, ecosystems and ethnic groups are some of the key characteristics of TK. Due to its dynamic nature it does not pertain to a period in time. Though there may be variation in the modes of knowledge production and diffusion among communities, there are numerous parallels in the value systems and worldviews among communities (Suneetha, 2008). Often mainstream science does not recognize TK as valid knowledge as it is considered to have no universal methodology and is combined with beliefs and values (Couze & Featherstone, 2006, p.458 & 460). This may lead to conflicts between the mainstream and traditional knowledge systems.

TK plays a significant role in the social and economic dimensions of countries. Acknowledging and upholding TK-related practices is an important instrument for 'promoting a sense of cohesion and identity' (WIPO, 2001). It impacts human well-being through its contributions to health, agriculture, food security, environmental and natural resource management, land use, livelihoods, disaster management, arts and culture among many others. Consider the case of TK in the realm of medicine: the World Health Organization estimates that traditional medical practices cater to a major percentage (in some regions up to 70%-80%) of the world population's health requirements, especially in developing countries (WHO, 2002a; Bodeker *et al.*, 2005). These practices use components of ecosystems (plants, animal and mineral/metal derivatives) that are primarily locally available, easily accessible and often cost-effective in treating illnesses.

For the last few decades TK has been acknowledged as a worthy aspect of development. In 1957 the International Labour Organisation (ILO) highlighted the rights of indigenous peoples by adopting the Indigenous and Tribal Peoples Convention affirming the importance of cultural diversity. TK got a major boost after the Earth Summit and the adoption of the Convention on Biological Diversity at Rio de Janeiro in 1992. Other landmark policies related to traditional knowledge are UNESCO conventions such as the Convention for the Safeguarding of the Intangible Cultural Heritage (2003) and the Convention on Protection and Promotion of the Diversity of Cultural Expressions (2005). These avow the importance of cultural diversity and the link between culture and development. Affirming the relationship between cultural and biological diversity, efforts for strengthening

the link between the conventions of CBD and UNESCO have been reiterated (CBD & UNESCO, 2010). It is noteworthy that the approach of ESD is also characterized by a diversity of knowledge (including traditional knowledge systems), and as a corollary, TK addresses the requirement of ESD to carefully consider local context in all learning processes and enables testing of new knowledge in a participatory social learning process.

Some of the common challenges facing TK and the people who "hold" TK are related to: lack of recognition of TK practices and TK practitioners; rights to resources; traditional lands; ownership of knowledge and benefits from use of resources and knowledge; sustenance of practices; lack of successors; incompatibility with mainstream knowledge systems and learning processes; and peaceful existence and preservation of diversity (Payyappalli, 2010). It is noteworthy that in the realm of environmental and biological diversity TK is better recognized or acknowledged than in any other sector. Furthermore, although TK might have state patronage as a national heritage, practitioners of TK often remain unrecognized, and are certainly not an integral part in the design or content of educational curricula. Despite this, they continue to thrive primarily due to community legitimacy, support and intergenerational learning.

2. Cultural Diversity and Traditional Knowledge Vital to Sustainable Development

Traditional knowledge and practices can be seen as a pivot between natural or ecological resources on the one hand and human intervention and social and economic development on the other hand (Berkes & Folke, 1994; Cochrane, 2006). According to Breidlid (2009), however, the dominant discourse has fallen short of exploring the potential of alternative knowledge systems, while considering it an impediment to development. A key challenge therefore is to find appropriate tools to convey the spearheading roles that traditional knowledge, norms and values can play in achieving SD. While ESD calls for pluralism, there is insufficient discussion on how diverse knowledge systems could co-exist. Within the ESD discourse social learning is an approach which appreciates such diversity and acknowledges legitimacy of divergent perspectives.

The United Nation's Decade of Education for Sustainable Development (DESD) aims, among other objectives, to foster and promote the mainstreaming of intercultural approaches within a social learning process through multi-sectoral, collaborative and interdisciplinary methods. The UNESCO Convention on Cultural Diversity recognizes the significance of cultural knowledge "as a source of intangible and material wealth," especially in indigenous communities. While affirming its positive role in SD, it asserts that "cultural diversity widens the range of options open to everyone; it is one of the roots of development, understood not simply in terms of economic growth, but also as a means to achieve a

more satisfactory intellectual, emotional, moral and spiritual existence” (UNESCO, 2001). Stressing their catalytic role in development and the need for appropriate policies, the convention says that while making certain that there is “free circulation of ideas and works,” there is a need to create a conducive environment for production and propagation of varied cultural goods and services that have the strength to exert influence at the local and global level (UNESCO, 2005).

The UNESCO convention also underlines the importance of the relationship between culture and development in all countries, specifically in developing regions, and to promote strategies both nationally and internationally to acquire recognition for this. While emphasizing the central role of culture and the complementary nature of economic and cultural dimensions of development it says that individuals and communities have the “fundamental right to participate and enjoy.” As a core principle, protection, maintenance and promotion of cultural diversity are vital requirements of SD for present and future generations. Besides, equitable access to varied expressions and the principle of openness and balance towards other cultures are equally important.

3. Integration of Traditional Knowledge in Sustainable Development

The UNESCO convention calls upon parties to “endeavour to integrate culture in their development policies at all levels for the creation of conditions conducive to SD and, within this framework, foster aspects relating to the protection and promotion of the diversity of cultural expressions” (UNESCO, 2005).

However there are different views and perspectives on the ways traditional knowledge should be integrated into development programs. These range from a romantic view to a utilitarian and to a pluralistic perspective (Haverkort, 2006). The ‘romantic advocates’ often take a position that all TK practitioners are knowledgeable and logical and all elements of tradition are sound and relevant. While the ‘utilitarians’ are of the view that there are certain relevant elements in TK and such aspects have to be selectively studied in response to modern needs. Those of ‘pluralistic’ view believe that different knowledge systems should be allowed to co-exist and play a complementary role. The pluralistic approach is a central tenet of the DESD perspective.

The utilitarian view which dominates the development discourse today focuses on TK as a commodity that is amenable to modern protection tools such as patents or other property rights, and does not emphasize community rights or customary laws. Equitable access and benefit sharing mechanisms are still evolving. In this context, it is not surprising that national policies to integrate TK into development processes are not defined. However, progress is visible in certain sectors such as health and nutrition, agriculture, enterprise development and, to some extent, in education. This has been chiefly led by civil society initiatives.

3.1 Challenges of integration

There are certain socio-political and methodological challenges in integrating or mainstreaming TK.

1. An important issue is the hegemonic relationship between knowledge systems that puts TK in a position of having to prove itself through a positivist epistemology (Haverkort, 2010; Shankar & Unnikrishnan, 2004). Jenkins (2000) says that modernization has dramatically devalued traditions by universalizing norms of action, value generation and individualized patterns of socialization. In the process, tradition in general and TK in particular have been relegated to the sidelines as a scarce, non-renewable resource and an impediment to progress (Jenkins, 2000). The modernist attitude towards TK has been one of ‘either modernize or disappear’ in a context where the strongest comes to be identified with the best rationale. They further point out that alternate world-views get marginalized, especially due to modernity’s characterization of history as being linear and evolutionary. This leads to a ‘critical and skeptical judgment’ of older knowledge (Couze & Featherstone, 2006). Even though the International Council for Science policy document (ICSU, 2002) points to the challenges of differing epistemological premises of traditional knowledge systems, it is noteworthy that in the UNESCO conventions there is no explicit mention of this.

2. In the efforts to achieve ‘development,’ emphasis has been placed on economic growth and related activities. In the same vein, the role of culture or TK in contemporary societies has been examined through the lens of relevance to commercial activity. According to Jenkins (2000) “Social analysis has been largely driven by rational behaviour models, which abstract economic action from its historical contexts.” For example, cultural knowledge, artifacts or art forms are seen as vehicles for economic empowerment with less focus on their contextual nature and relevance to the communities. Often there is also emphasis on aggregate growth rather than distributional effects or equity.

3. Another issue is the prevailing view of TK as antiquated and non-dynamic, thus relegating it to a status of a commodity that should be documented and preserved. The discourse has been dominated by the protection of intellectual property rights while neglecting efforts to strengthen the social and cultural processes of continuity and contemporary utility of such knowledge. Whereas documentation and preservation of TK (being on the verge of extinction) are needs of the hour, promotion of contemporarily relevant TK and encouraging continued creativity and dynamism are vital as well. There are also related discourses on TK where it is considered exotic and confined to indigenous communities. While presence of TK might be obvious in such communities, sociological analysis amply reveals that such knowledge and related practices are embedded in all sections of society. However there may be a dominant influence of social

classes or castes or ethnic groups on such knowledge within the communities. There is also a contested idea that promotion of TK is only of relevance in certain sections of society where benefits from modern science and technology are not available or accessible. This creates double standards within a society and further deepens inequity, especially in less-developed countries.

4. Lack of sufficient theoretical approaches for understanding and assessing TK is also a concern (Jenkins, 2000). From the indigenous epistemological point of view there are certain unique features of TK such as its non-dualistic, dynamic, informal, secret and sacred, spiritual, time-related and non-linear nature. Methods are also intuitive and meditative, with an emphasis on reciprocity (Haverkort, 2010, p.20). Modern methods of validation cannot capture these elements. The same holds true in the case of institutionalization of TK, wherein several inter-related experience-based elements may not be secured. For example, the institutionalized learning process of university-based traditional medical education in India fails to capture experiential knowledge such as pulse diagnosis or traditional diagnostic or management techniques related to health and healing.

3.2 Challenges in the context of ESD

The dominant education and research systems tend to enhance knowledge and technologies with universal standards, rather than support the needs of specific regions or populations (Haverkort *et al.*, 2003). A dearth of comprehensive theoretical approaches to assessing the role, economic potential and policy implications of traditional knowledge is a key reason for disregarding traditional cultures (Jenkins, 2000). TK and TK practitioners are selectively utilized to suit such universal requirements, while neglecting the local needs and holistic dimensions of local knowledge. For instance, in many countries today traditional healers are trained to impart centrally designed health messages among communities on issues such as HIV/AIDS or tuberculosis to the neglect of their own practices and cultural context.

There are some pertinent questions with respect to protecting and promoting TK and education. What is an epistemologically sensitive method to identify such appropriate traditional practices? What mechanisms can drive effective social as well as institutional learning processes that integrate traditional knowledge and practices? Can traditional knowledge holders participate in formal educational systems? Is it possible to introduce such an intercultural approach in the current education system? What challenges are encountered in the institutionalization process of such knowledge systems? To what extent can local experiences and models be universalized and thus replicated?

It is easier to speculate about an ideal approach to integration than to make such a model sustainable in the institutional, political, economic realities in the local, regional and global arena (Cole, 1995). The western dominant model and values have influenced education in

the last several decades. Whereas this has had tremendous positive impact on development globally, the education model has raised questions on pluralistic existence of knowledge systems and certain dilemmas in the minds of learners. A student from a traditional community with its own values, rules and mores, and especially with an inclination and certain level of learning in his/her tradition, is constantly shuttling between traditional and modern worldviews, which may lead to certain conflicting psychological states. The person must synergize the divergent positions for containing a fresh experience within the “intra/intersubjective life worlds, which provide him/her a sense of social identity” (Ogunnyi, 2003, p.27-28). Often this tends to result in the neglect or sidelining of traditional worldviews, logic and practices by the individual or in a public-private dichotomy in his/her day-to-day behaviour. Even though ESD stresses the importance of pluralistic learning, this issue is not yet sufficiently addressed in practice which stresses the need for creating a platform for sensitive intercultural learning.

For promoting the role of traditional knowledge in ESD it is essential to integrate such perspectives from the early stages of formal education. In Japan, for instance, many schools have introduced food education (*shokuiku*) in their curricula. However, it does not focus enough on the value of diverse traditional foods. It is important to integrate local knowledge on food consumption along with modern nutritional knowledge. A dialogue process and collective learning with mutual respect should be the basis for such an approach. The principle of mutual regard between institutions of higher learning and the communities is essential. Formal and informal educational programs have to be developed for a systematic study of local worldviews, perceptions and practices in the wider frame of ESD. The formal learning could have a sectoral approach to TK in areas such as in medicine, agriculture, veterinary sciences and so on. Informal learning should also focus on means of intergenerational transmission. Various pedagogical approaches can be integrated in the school curriculum. These could include methods such as a self-reflective analysis of TK and practice or a historical analysis of TK development and an intercultural understanding of TK and its linkages with wider intersectoral issues (Payyappallimana, 2008).

Of crucial significance is to ensure that issues related to the integration of traditional knowledge are addressed at different social levels such as communities, civil society groups, non-governmental organizations, formal and informal education institutions, local administrative structures, and national, international, multilateral and policy forums.

4. Endogenous Development through Social Learning

Endogenous development (ED) starts from the idea that local communities have their own worldview, reasoning methods, values and norms and there is mutual

respect and dialogue among stakeholders (Haverkort *et al.*, 2003). It is close to the Gandhian concept of *swadeshi* of self-reliant local communities and cooperatives, while emphasizing the idea that the world has enough for needs but not for greed. Thus ED is also based on a value of shared or inclusive learning processes and development (Sillitoe, 1998, p.224; Jenkins, 2000; Breidlid, 2009). A key principle of an ED approach is that communities have specific local and diverse needs that can be primarily met from locally available knowledge and other natural, man-made, social, cultural and economic resources (Table 1) while maintaining an open view towards the global context. It also allows for retention and rejection of positive and negative aspects of TK or practices, respectively, through a participatory dialogue, social learning and an assessment process. Another key element in the ED approach is that the decision making regarding development options and processes is locally controlled; this can lead to retention of benefits in the local area. ED promotes TK in its own right, not as something to be prospected by the outside world. A dynamic, albeit cautious, interaction with

external knowledge systems, mutual exchange among cultures and building of strategic partnerships at regional, national and international levels is central to such an approach (Fig. 1).

Social learning here refers to “learning that takes place when divergent interests, norms, values and constructions of reality meet in an environment that is conducive to learning.” (Wals, 2007, p.18). This learning could occur at various levels from an individual to a collective or a network of stakeholders. Keen *et al.* (2005) also reflect the same sense by defining social learning as a “collective action and reflection that occurs among different individuals and groups as they work to improve management of human and environmental relationships” (Keen *et al.*, 2005, p.4). Thus inherent in a social learning process is a call for reflective action by relevant stakeholders. Co-evolution and complementarity are its basic foundations. Social learning is especially important in the context of sustainable development where no single knowledge system has sufficient conceptual, theoretical or practical authority in addressing the challenges of sustainability (Fadeeva, 2007, p.256).

This is the basic premise of endogenous development processes. ED processes facilitate intra and inter-cultural dialogue as a basic instrument for development through a social learning approach. This facilitates collective reflection and action among different stakeholders for addressing a locally significant development objective. This also offers a unique reflexive platform for social actors to relate and recognize strengths and weaknesses. This contrasts with development tools being prescribed in a top down approach by ‘outside experts’ with insufficient experience of the complexity of local context. Thus social learning forms an important tool for integrating TK in ESD programs.

Table 1 Endogenous development elements.

Resources	Elements
Natural resources	Land, ecosystems, climate, bio-diversity
Human resources	Knowledge and skills, local concepts, ways of learning, teaching and experimenting
Produced or human-made resources	Buildings, infrastructure and equipment
Economic-financial resources	Markets, incomes, ownerships, price relations, credit
Social resources	Family, community organisations, social institutions and leadership
Cultural resources	Beliefs, norms, values, festivals and rituals, art, language, lifestyle

Source - Haverkort, B., Katrien Van't Hooft, Wim Hiemstra (2003)

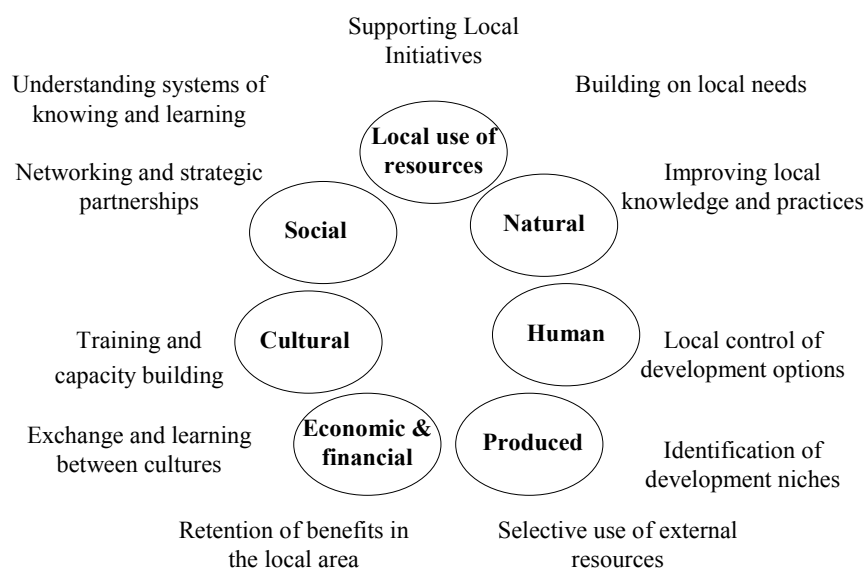


Fig. 1 Endogenous development framework. Adapted with permission from Haverkort, B., Katrien Van't Hooft, Wim Hiemstra (2003)

The health sector is one of the most representative and vital sectors where discussions about integration of traditional knowledge have already progressed, at both international and national policy levels and with several models of health system integration and community participation. To benefit from this experience, the following section will use the health sector as a case for enquiry.

5. Traditional Knowledge, Health and Well-being

According to WHO, “Health is both a resource for, as well as an outcome of, sustainable development. The goals of SD cannot be achieved when there is a high prevalence of debilitating illness and poverty, and the health of a population cannot be maintained without a responsive health system and a healthy environment. Environmental degradation, mismanagement of natural resources, and unhealthy consumption patterns and lifestyles impact health. Ill-health, in turn, hampers poverty alleviation and economic development” (WHO, 2002b).

There is increasing recognition of the social and ecological dimensions and determinants of health today. Cultural perceptions and practices also have assumed direct implications on health and well-being in a major shift from the dominant biomedical view of health. According to most traditional cultures, health equates physical, mental, social, spiritual and ecological balance. According to the traditional Ayurveda system of medicine, the outside world and the living being share all the elements in common; the being is a miniature representation of the universe; and, equilibrium is essential for health and well-being. Thus health is considered an interactive outcome of personal attributes, habitual experiences and interaction with the environment,

whereas well-being can relate to multiple factors such as material comfort, health, freedom of choice and action, social support systems and security. This may be context-specific, relating to geographical, cultural and ecological dimensions.

5.1 Traditional health knowledge systems

Traditional medicine forms a central health seeking arena for a large part of the world population in developing countries (WHO, 2002a). Traditional medicine is highly dependent on ecosystems for providing services, such as natural medicinal resources and nutritional sources. It also depends on cultural or recreational services insofar as nature, the environment and their attributes have cultural, religious and symbolic value in determining health and promoting healing. The following section attempts to highlight the relevance of traditional medicine in also providing public health care using the case of health interventions through a traditional knowledge process from Kerala state in India (Fig.2).

5.2 A Kerala health sector case

Kerala, a southern Indian state with 31.8 million inhabitants, is at par with the developed countries in its health indices (Fig.2). In the international context Kerala has a unique health care model of high health status at low per capita expenditure. The state has also achieved a relatively high human development index. Studies on the high health status of the state suggest a strong relationship between health status and cultural knowledge traditions. In the field of health, the state provides a unique example of how cultural traditions can interact with modernity in a complex way. The system has promoted positive attitudes to healthcare, diet, personal hygiene and sanitation, which have also been conducive to the acceptance of more modern approaches. Cultural ele-

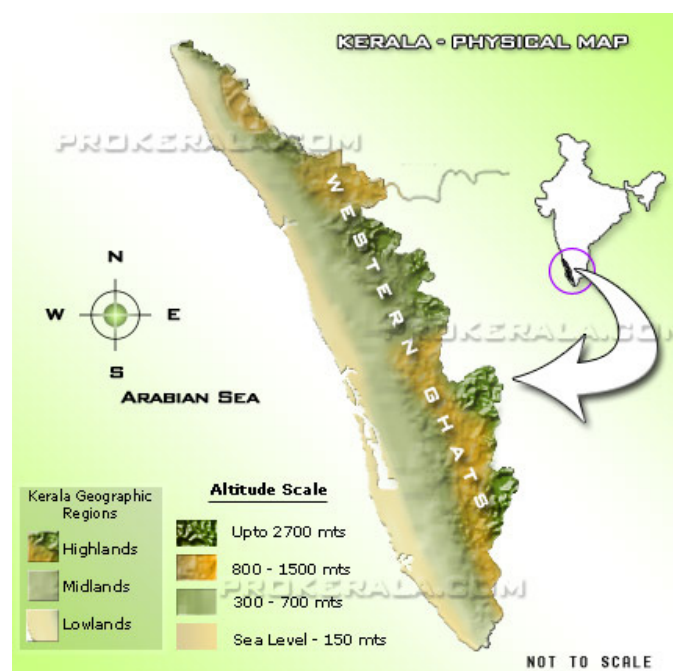


Fig. 2 Map of India and Kerala State.

Source: Maps of India (<http://www.mapsofindia.com>)

ments that perceive health as a holistic system relating to physical, emotional, mental, and spiritual dimensions and that prescribe elaborate procedures for achieving total well-being have been well integrated (Gunatilleke, 1984; Payyappallimana, 2010). To illustrate an aspect of such integration an example of contemporary medicated drinking water practice is presented here.

Water-related diseases form up to 80% of public health problems in India. Despite the formulation of a National Water Policy (Government of India, 1987) focused on improving drinking water access, the situation has not substantially changed (NSSO, 1999). According to an all-India survey on prevailing conditions of drinking water, sanitation and hygiene, Kerala has the lowest access to potable drinking water: rural – 12% and urban – 40.4% (NSSO, 1999). In 2001, the figures were 16.9% (rural) and 42.8% (urban), respectively, among Indian states (Government of India, 2009). A large percentage of households use drinking water from their own water sources such as open wells (Kunhikannan & Aravindan, 2000: p11), which are considered susceptible to contamination. In the state, latrines are made with septic tanks (26% rural, 48% urban) and pour flush pit (29.3% rural, 25.5% urban), representing the highest rates in India.

Kerala is the most densely populated state in India with 819 persons per km². The normal annual rainfall of Kerala is 3,107 mm (the India national average is 1,197 mm) with an average 120-140 rainy days in a year. The state has 44 rivers and large number of water bodies making it highly susceptible to waterborne diseases. Waterborne vector diseases like dengue fever, malaria, and chikungunya are on the rise due to urbanization and deteriorating environmental conditions. According to the National Sample Survey, the perception of an increase in mosquito population is reported high in Kerala. This shows the relatively low quality of water bodies in the state. However, the state has controlled cholera, diarrhea, hepatitis and other waterborne diseases that spread through consumption of contaminated water (Kunhikannan & Aravindan, 2000, p.14).

According to the State of Environment Report (Government of India, 2007), well water is the major source of drinking water in Kerala and around 90% of wells in Kerala are polluted by sewage. Presence of coliform bacteria was found in three out of four cases in the rural areas of Thiruvananthapuram (capital city of Kerala), though no major health problems are reported in these areas. The state environment report says that “This may be attributed to the practice of boiling water before drinking. Boiling water before drinking is a time-tested method of water purification, but this tradition is being gradually replaced by the increasing use of bottled water.”

The local population has developed some natural adaptations to an environment filled with water bodies and with a high prevalence of waterborne diseases. According to national statistics, hygienic handling of water is high in the state compared to other states. It is

reported that the state has the highest percentage of households boiling drinking water (rural – 49.3% and urban – 65.3%) (NSSO, 1999) which forms a major aspect of preventing waterborne diseases. This practice is related to the traditional culture of Kerala of consuming medicated boiled water. This traditional knowledge has continued as a popular social tradition for several generations even in the context of modernization. Such prescriptions have roots in the regional ancient Ayurvedic medical text books which recommend enhancing water quality by boiling it with several locally grown medicinal plants. There are two likely benefits of this practice: microbe-free boiled water together with the physiological and clinical benefits of medicinal substances used in the boiling process. According to the local traditional understanding most systemic diseases are caused by faulty metabolic processes: drinking water has a strong effect on mitigating such effects both in states of health and illness. Based on this, specific preparations are made for preventive and curative purposes. According to Moni Nag (1989), the “Kerala tradition of drinking water that has been boiled with cumin seeds (*jeerampani*) and the water remaining after rice has been boiled (*kanji*) may have contributed toward lower morbidity and mortality.”

Today medicated water forms an essential component even in restaurants and public functions, though there is erosion of the practice in the recent past. The practice also shows good market integration and livelihood benefits with several small enterprises producing and marketing such products supported by the Kerala Khadi and Village Industries Board and similar organizations. There are a number of herbal products for water treatment available today in the market.

This case presents the inherent linkage between cultural knowledge and environment and how biological and cultural precepts interrelate to form adaptations to the local environment. A unique public health approach based on TK, using the locally available resources, is integrated by and in the communities. The integration of several such cultural elements is likely to have had an influence on improving life expectancy in the state. The case shows how maintenance and/or revival of cultural resources can enable communities with endogenous development capabilities while integrating traditional knowledge, customs and practices in a market economy.

6. Learning Systems of TK

Both India and China, unlike other countries, have a codified literature on traditional knowledge spanning over three millennia. Such codified knowledge systems, especially related to traditional medicine, have been institutionalized over the last century through the establishment of training at universities and parastatal institutions. In the state of Kerala alone there are 14 Ayurveda university schools. Even so, there is a rich and dynamic body of knowledge at the local or informal level that effectively complements institutional knowledge. Conversely, such experience-based local knowledge and

relevant social traditions do not get sufficiently integrated into formal learning processes, the argument being that it is difficult to bring in such personalized learning experiences into a standard schooling system. Despite this disregard in mainstream education, traditional knowledge continues to be transmitted through a different cultural learning process, which is not yet sufficiently studied by planners.

Although ESD processes claim to provide a pluralistic learning arena, identifying and comprehensively documenting such informal and relevant socio-cultural traditions and validating them through a multi-stakeholder process, while integrating them into mainstream learning systems and production processes remains a challenging task. A challenge also provides an opportunity: it is vital that higher education institutions establish mechanisms to adequately bring forward such knowledge through appropriate teaching and research programs.

There is also the issue of a dichotomy between the formally trained 'experts' and the informal 'knowledge holders' (Collins & Evans, 2002, p.237). The Kerala case illustrates that this is not a truism. Within the traditional knowledge community itself there are licensed or accredited experts and informal practitioners. This shows that TK learning is more complex in countries like India and China because there are various levels of informal and formal expertise within the sector. DESD should address such multifaceted and intricate challenges within the sector.

7. Conclusion

The article has highlighted cultural diversity as a pre-requisite for endurance of humanity, and revitalization of traditional knowledge as important for sustainable development. TK is often presumed to hold the key to sustainability due to its interconnectedness with various facets of life, as well as local patterns of resource use and management. However, traditional knowledge has been marginalized in the process of modernization. In most countries, cultural or traditional knowledge comes under a ministry of culture or religion with insufficient intersectoral attention from the more politically strong and resource-rich ministries of science, technology, education or development in such countries.

TK can play a central role if contemporarily relevant elements can be strengthened through revival of the social processes of its generation, conservation and transfer. The article has also highlighted DESD processes as able to foster the preservation and revitalization of TK. A comprehensive understanding of contextual dynamics and levels of expertise in the field of TK is central in revitalization. The integration of traditional and contemporary health practices in the state of Kerala, India is used as an illustrative model in this context. An important challenge is to identify and transform such an understanding into practicable community programs. There is a critical need for culturally and locally relevant educa-

tional practices linking this to the success and appropriateness of learning for sustainability. It is essential that increasing numbers of educational institutions have sensitive approaches to understanding traditional knowledge and promoting its integration in development planning. While the development approach involving TK can be an endogenous model based on principles of social learning, exchange between various cultures is also important for the dynamic growth of such knowledge systems. Designing and implementing culturally appropriate pedagogies and their integration into formal and informal learning processes are therefore part of this process. Through such an approach, countries that are rich in biodiversity and TK can capitalize on their inherent strengths to rise to higher levels of sustainable well-being.

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