Integrating indigenous knowledge in the modern era for sustainable living

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Abstract

Indigenous Knowledge (IK) comprises the accumulated wisdom, skills, and practices developed by indigenous communities through sustained interaction with their natural surroundings over generations. In the context of increasing environmental degradation, climate change, and unsustainable patterns of development, the relevance of indigenous knowledge in the modern era has gained considerable academic and policy significance. This paper explores the role of indigenous knowledge systems in supporting sustainable living within contemporary societies. Adopting a qualitative and conceptual approach, the study draws upon existing literature, policy reports, to examine how traditional ecological practices, local resource management methods, and community-based value systems can meaningfully complement modern scientific and technological approaches to sustainability. The paper identifies key areas where indigenous knowledge continues to play an important role, including agriculture, biodiversity conservation, water management, health practices, and education. It also discusses the major challenges in integrating indigenous knowledge into mainstream development processes, such as the marginalization of indigenous communities, erosion of traditional practices, inadequate documentation, and limited institutional recognition. The analysis suggests that long-term sustainability cannot be achieved solely through technological solutions and must incorporate culturally grounded and ecologically responsive knowledge systems. The paper concludes by emphasizing the importance of supportive policies, educational inclusion, community participation, and interdisciplinary research to safeguard indigenous knowledge and apply it effectively toward achieving sustainable living goals.

Keywords: Indigenous knowledge, Sustainable living, Traditional ecological knowledge, Environmental stewardship, Modern paradigm

Introduction

The Indigenous Knowledge System (IKS) often referred to as Traditional Ecological Knowledge (TEK) represents one of the world's oldest and most sophisticated frameworks of scientific, intellectual and spiritual traditions. Indigenous knowledge serves as a cumulative body of beliefs and practices transmitted through generations, detailing the intricate relationships between living beings, with one another and their environment (Gadgil *et al*., 1993) [14]. For millennia, India has nurtured a body of wisdom that integrates logic, spirituality and empirical observation into disciplines like Yoga, Ayurveda, astronomy, linguistics, ethics and architecture. Unlike compartmentalized modern education, IKS utilizes a holistic vision which links human consciousness, nature, and society in a harmonious framework (Agarwal, 2019) [1]. It helps specifically by empowering marginalized and poor populations to maintain control over their own destinies. Therefore, indigenous knowledge is an important component for any cost-effective, participatory, and sustainable development process (Warren, 1991) [43]. Integrating these ancient methodologies strengthens the three pillars of sustainability: environmental protection, social equity, and economic viability.

The modern world faces complex crises such as environmental degradation, mental health challenges and social alienation which arises from mechanistic and consumerist paradigms. IKS offers vital solutions through its core principles of balance (*samatva*), interconnectedness (*bandhutva*), and duty (*dharma*). These values cultivate ecological sensitivity and moral responsibility when integrated into modern education (Mukherjee, 2022) [25]. Moreover, the ancient Indian approach to sustainability such as emphasis on moderation, respect for all life forms, and recycling of natural resources aligns perfectly with the global sustainability goals of the United Nations (UNESCO, 2021) [40]

Today, India's educational landscape is undergoing a paradigm shift. With National Education Policy (NEP) 2020, prioritizing "knowledge rooted in Indian ethos," there is a revived national interest in learning and integrating traditional knowledge with modern education. Reclaiming IKS is now viewed as essential for encouraging creativity, ethical reasoning, and sustainable

lifestyles among individuals (Sharma, 2021) [34, 35]. Therefore, it is imperative to incorporate IKS in the modern frameworks for India's cultural continuity and its contribution to a sustainable global future.

Methodology

This study employs a conceptual, literature-review–based methodology to explore the integration of Indigenous Knowledge (IK) into modern sustainability frameworks. The review focuses on five major domains of IKS i.e. agricultural practices, biodiversity conservation, water management, health practices, and education. These domains were selected because they are the primary basis to understand the integration of IKS. The study integrates findings across these research streams to build a theoretically grounded explanation of how IKS is integrated into the modern framework for sustainable living. The research is solely based on secondary data from the year 1993 to 2025. It was collected from high quality peer-reviewed research paper, journal articles, policy paper, institutional reports, and news articles.

Results and discussion

Integration of IKS and agricultural practices

Agriculture in the Himalayan region is a sophisticated system of environmental stewardship shaped by generations of observation. Here, high-altitude farmers have developed resource management strategies inherently attuned to their fragile ecosystems (Kumar & Kumari, 2025) [22]. The integration of this indigenous knowledge with modern agricultural science provides a robust pathway for addressing climate variability and soil degradation through methods like terracing and polyculture, which minimize erosion and pest outbreaks (Kumar & Kumari, 2025) [22]. For instance, the *Baranaja* a traditional intercropping method helps to ensure sustainable farming practices and biodiversity conservation (Chamoli *et al*., 2024) [10]. Another instance is the practice of *Agnihotra*, or fire-based rituals, which not only had spiritual significance but also contributes to environmental purification and soil enrichment (Ali, 2025) [2]. The future of Himalayan farming lies in collaboration, with indigenous communities working with modern researchers to document and utilize these traditional practices with modern science.

Integration of IKS and biodiversity conservation

As global ecosystems face escalating threats from pollution, habitat loss and climate change, the integration of Indigenous practices with modern conservation strategies has become essential for effective environmental stewardship (VijayKumar, 2019) [41]. For example, many Indigenous communities have developed sophisticated systems of resource management that align with the natural rhythms of their ecosystems, such as seasonal harvesting practices that ensure the sustainability of species (Parrotta *et al*., 2016) [27]. This integration bridges the gap between conventional scientific data and the contextual, experiential knowledge of Indigenous peoples. Thus, fostering a more holistic understanding of ecological processes, enhancing conservation initiatives, empowering local communities and preserving cultural diversity (Wilder *et al*., 2016; Ens *et al*., 2016) [12].

Integration of IKS and water management

The Indian Himalayan region, often called as the "Water Tower of Asia," has 33,000s sq km of glaciers. The Traditional water harvesting structure is defined as the "glorious profusion" of indigenous engineering that blends architectural beauty with functional ingenuity. For example: *Naulas* (shallow stone-lined wells) and *Dharas* (mountain springs), alongside systems like *Gadheras* (tributaries), *Guls* or *Kuhls* (irrigation canals), *Baoris,* and *Panihars, Chal* and *Khal* (artificial ponds on hilltops) still persists to collect and supply water. These structures are relevant examples of sustainable practices as they are used by the local people even after hundreds of years of construction (Joshi, 2018 [16]; Rautela, 2015). Despite their proven sustainability over centuries, these traditional water resources are losing ground due to modernization, loss of traditional knowledge, out-migration, and environmental degradation (Joshi, 2018 [16]; Indian Himalayan Central Universities Consortium [IHCUC], 2022) [15]. Hence, there is an urgent need to combine these conventional practices with modern scientific knowledge to ensure long-term sustainable utilization of water resources.

Fig.1. Naula Fig.2. Dhara Fig.3. Chal and Khal

Integration of IKS and health practices

The Himalayan region is a vital repository of ethnomedicinal knowledge, where distinctive ethnic communities and traditional healers utilize age-old techniques to manage human well-being (Bhatt *et al*., 2024; Negi *et al*., 2023) [26]. This indigenous knowledge system (IKS) is globally essential for healthcare and food security. According to the World Health Organization, 80% of the world's population and approximately 65% of people in India rely on traditional practices to meet primary healthcare needs (Singh *et al*., 2017) [37]. In Uttarakhand, often called *"the herbal state of India,"* major tribes such as the *Tharu, Jaunsari, Buksa, Bhotiya, and Raji* possess extensive knowledge of medicinal plants. These plants are used to treat diverse ailments, including cardiac diseases, skin disorders, diabetes, cancer, and mental illnesses etc. (Balodi *et al*., 2018 [5]; Bargali *et al*., 2022) [6]. Despite their importance, this traditional knowledge of medicinal plants is facing rapid erosion. It remains largely restricted to elder members as younger generations either lack attention or shift toward modern lifestyles (Bisht & Adhikari, 2018; Kumar *et al*., 2015) [21]. Therefore, documenting this traditional knowledge and practices is essential not only for preserving tribal heritage but also for the scientific development of new pharmaceutical drugs and conservation strategies (Phondani *et al*., 2010) [28].

Table 1: Traditional Bhotiya knowledge and utilization of medicinal herbs

Ailement/Purpose	*Name of the Herb*	*Useful Part*	*Processing*
Antiseptic application	Dolu (*Rheum australe)*	Root	— Boiled in water- Grinded before
Antibiotic wounds	Pangar (*Aesculus indica)*	Seed	- Used as antibiotic on external
Appetiser soup	Jambu (*Allium sp.)*	Full plant except root	- Sun dried- Used as condiments in
Arthritis its consumption	Jatamanshi (*Nardostachys grandiflora)*	Flower	- Sun dried- Boiled in water before
Asthma Asthma patients	Dhatura kala (*Datura-alba metal)*	Seed	- Sun dried-Its smoke used for
Blood purifier	Majethi or Majistha (*Rubia cordifolia)*	Root	- Air dried
Constipation its consumption	Kins or Kinjadi (*Dioscorea deltoidea)*	Root	- Air dried- Boiled in milk before
Cough and cold	Vantulsi (*Origanum vulgare)*	Leaves Seed	- Air dried
Diarrhoea	Hansraj (*Adiantum venustum)*	Full plant except root	- Sun dried
Digestive system	Goochi (*Morchella esculenta)*	Fruiting body	- Air dried
Fever grinding	Gurjar Gudchi (*Tinospora cordifolia)*	Stem	- Sun dried- Boiled in water before
Gastric	Satuwa (*Paris polyphylla)*	Root	- Sun dried
Insect repellant	Samewa Sugandh (*Valeriana* wallichii)	Full plant	- Air dried
Jaundice	Mamira (*Thalictrum sp.)*	Root	- Air dried
Kidney stone	Paashan Bhed (*Bergenia ligulata)*	Root	- Sun dried
Leukederma	Chirayata (*Swertia chirata)*	Full plant	- Air dried
Liver disorder	Mamira (*Thalictrum sp.)*	Root	- Air dried
Malaria	Kutki (*Picrorhiza kurrooa)*	Root	- Sun dried
Piles	Dhavephul (*Woodfordia fruticosa)*	Flower	- Sun dried
Skin diseases application	Dolu (*Rheum australe)*	Root	- Boiled in water- Grinded before
Sprain	Gurbach or Gurbaj (*Acorus calamus)*	Root	- Sun dried
Urinary tract infection	Solam Mishri (*Eulophia compestris)*	Root	- Sun dried
Vigour & Vitality use	Salampanja (*Dactylorhiza hatagirea)*	Root	- Boiled with salt — Grinded before
Wound	Kalihari (*Gloriosa superba)*	Root	- Sun dried

Table 2: Various food requirements from wild plants

Botanical name	*Local name*	*Utility*
Pleurospermun angelicoides	Choru	Condiment
Carum carvi	Thoya	Condiment
Allium humile	Pharan	Condiment
Angelica glauca	Chhipi	Condiment
Gaultheria nummularioides	Bantimla	Fruit
Grewia oppositifolia	Bhimal	Fruit
Rosa macrophylla	Sedum	Fruit
Viburnum cotinifolium	Ghenu	Fruit
Fagopyrum cymosum	Jhangar	Vegetable
Megacarpaea polyandra	Rukee	Vegetable
Allium stracheyi	Jambu	Vegetable
Chenopodium botrys	Bathuwa	Vegetable
Smilacina purpurea	Puran	Vegetable
Paeonia emodi	Chamla	Vegetable
Diplazium esculentum	Ligura	Vegetable
Phytolacca acinosa	Jagra	Vegetable
Prinsepia utilis	Jhatalu	Oilseed
Prunus armeniaca	Chulu	Oilseed
Prunus persica	Aru	Oilseed

Table 3: Lesser known and other domesticated plants of high altitude

Botanical name	*Local name*	*Utility*
Amaranthus paniculatus	Chuwa	Cereal
Fagopyrum esculentum	Ogal	Cereal
Fagopyrum tataricum	Phaphar	Cereal
Hordeum himalayens	Uwa	Cereal
Panicum miliaceum	Chenna	Cereal
Triticum aestivum	Nappal	Cereal
Eleusine coracana	Mandua	Cereal
Zea mays	Makka	Cereal
Phaseolus vulgaris	Rajma	Pulses
Macrotyloma uniflorum	Gahat	Pulses
Glysine max	Bhatt	Pulses
Pisum sativum	Matar	Pulses
Brassica compestris	Sarso	oilseed
Solanum tuberosum	Aloo	Vegetable
Chenopodium album	Bathuwa	Vegetable
Rhaphanus sativus	Mula	Vegetable
Vicia faba	Bakla	Vegetable

Integration of IKS and education

The National Education Policy (NEP) 2020 represents a transformative shift by mandating the integration of the Indian Knowledge System (IKS) into modern pedagogy asserting that "education must build character and enable learners to be ethical, rational, compassionate, and caring, while at the same time preparing them for gainful employment" (Kour, 2024; Rani, 2024) [30]. The policy seeks to enhance interdisciplinary and transdisciplinary understanding, integrate modern knowledge with traditional wisdom, and address current societal challenges by incorporating IKS into the curriculum (Asagar, 2025). However, there exist many implementation barriers such as lack of community awareness, the oral nature of traditional knowledge, scarcity of qualified educators, and the absence of a standardized curriculum. Furthermore, linguistic barriers and deep-seated colonial prejudices continue to prioritize Western knowledge systems over indigenous systems (Mandavkar, 2023). Despite these challenges, Amani (2024) [3] asserts that IKS integrated education can help to strengthen and transform the nation.

Challenges in the integration of IKS

- **Inadequate documentation**

There persists a significant documentation gap, since traditional knowledge is usually passed down orally. As a result, many foundational manuscripts remain untranslated or inaccessible to the entire global community. This lack of a digitalized or standardized record hinders in the seamless transfer of traditional wisdom into modern academic and practical frameworks.

- **Policy gaps and limited institutional recognition**

Our academic system and conservation policies still favor Western scientific models over traditional systems. This creates a systemic lack of support for Indigenous knowledge and practices. Thus, making it difficult to implement and integrate traditional practices into modern institutions. Therefore, there is an urgent need for policy reform to formally integrate IKS into research institutions, national curricula, and industrial collaborations.

- **Erosion of traditional practices and generational disconnect**

The out-migration of youth from rural and tribal regions to urban cities in search of education and employment has created a significant cultural divide. Migration often leaves the youth bereft of the ancestral knowledge traditionally passed down through oral and experiential learning.

- **Lack of representation**

Indigenous communities are usually excluded from the decision-making processes. Without the active participation of empowered community members, IKS is at risk of being "extracted" or misappropriated.

Strategies for integrating and preserving indigenous knowledge

- **Implementation of supportive policies**

Government must create strong institutional frameworks and policies, backed by funding and training, to mainstream IKS in education, agriculture, healthcare, and environmental management etc.

- **Curricular reform**

The development of standardized, interdisciplinary curriculum that integrates IKS with contemporary disciplines will equip students with ethical and ecological consciousness. Also, educational institutions can incorporate traditional principles of medicine, sustainability, and ethics into academic curricula, so that learners perceive this heritage as a vital asset for both professional and personal growth.

- **Empowering community participation and leadership**

Indigenous community members should be placed as primary stakeholders and decision-makers in current research and development projects. Empowering community members ensures that knowledge remains rooted in its true cultural context and the community.

- **Advancing interdisciplinary research frameworks**

Fostering collaboration between traditional scholars (Vaidyas, farmers, and artisans) and modern scientists can help in validating and expanding the application of IKS knowledge and interdisciplinary research.

- **Digital preservation and global accessibility**

There is a need to digitalize, translate, and archive ancient manuscripts and oral histories to reduce the documentation gap. Creating open-access digital repositories will make IKS knowledge accessible to the global scientific community for collaboration and ensure its preservation for future generations.

Conclusion

The Indigenous Knowledge System (IKS) embodies a timeless dialogue between tradition and transformation, science and spirituality, and theory and practice. It encourages the modern world to rediscover a philosophy of harmony that ancient India envisioned as the foundational pillar of all progress. The exploration of Indigenous Knowledge Systems (IKS) reveals that traditional knowledge is not a remnant of the past but a current blueprint for a sustainable future. This research has revealed that integration of traditional ecological practices with modern scientific frameworks provide viable solutions to modern crises, such as climate change, resource depletion, and environmental degradation etc. However, the path to complete integration still faces various barriers. To secure a sustainable legacy, the shift must move from an "extractive" model of knowledge to one of mutual respect and collaborative partnership. This requires strong policy reform, like the National Education Policy (NEP) 2020, protections for intellectual property and the creation of interdisciplinary research platforms. It is imperative to empower indigenous communities and preserves cultural heritage so that modern society can transition toward a sustainable lifestyle. The survival of our future depends on the balanced synthesis of indigenous knowledge into modern paradigms. This will ensure holistic progress, ecological harmony and cultural continuity for future generation.

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