Indian J. Applied & Pure Bio. Vol. 40(1), 279-285 (2025). **ISSN: 0970-2091**
A Web of Science Journal

Climate Change Adaptation: The Role of Traditional Ecological Knowledge (TEK)

Nilakshi Deka

Senior Research Fellow, Department of MIL & LS, Gauhati University, Guwahati - 781014 (India)

Abstract

Climate change is a global issue which have varying degrees of impact on the world's population. It is necessary to develop adaptation measures to counteract the negative effects of climate change. Traditional ecological knowledge systems are one tactic that various local people utilize to adapt to climate change. Thus, this article's main goal is to evaluate the contribution of conventional ecological knowledge to climate change adaptation. In order to accomplish this goal, various articles from various sources were gathered, meticulously compiled, summarized, and structured. Knowledge that has been passed down orally from one generation to the next and via cultural expressions including ceremonies, arts, and crafts is known as TEK. It plays a significant part in the management of natural resources, which improves the ability of the local population to adapt to the negative effects of climate change. However, it is also crucial to forecast both short- and long-term climate change using various methods that are accessible in their immediate environment. It is critical to integrate scientific and traditional ecological knowledge in order to adapt to the effects of climate change. As a result, it is critical to acknowledge traditional ecological knowledge at the local, national, and international levels in order to promote its application globally.

Key words : Traditional ecological knowledge, adaptation, local people, climate forecasting, scientific knowledge.

Climate change is a worldwide issue, different people experience its effects in different ways[20]. The earth's surface experiences periodic changes in climate as a result of both natural and human-caused factors. The extent of climate change's effects is quantified and monitored on a local to global scale, impacting environmental sustainability globally and primarily upsetting indigenous cultures and their means of subsistence[15]. One sign of climate change is the rise in air temperature that leads to global warming. There is no doubt that climate change will have significant, perhaps catastrophic effects, such

as melting glaciers, rising sea levels, and an increase in the frequency and severity of climatic extremes[10].

The goal of adaptation is to lessen the impact of climate change on biological and social systems in order to lessen vulnerability to global warming. Since developing nations are expected to be able to withstand the effects of climate change, adaptation is particularly crucial for them to deal with its negative effects[10]. Differing regions have differing levels of human and population adaptation, and emerging nations are less able to adapt than industrialized nations because of factors including poverty, bad policy, a lack of cutting-edge technology, and a weak institutional framework. The adaptive ability of a nation is determined by its social and economic development because adaptation to climate change is likely to be expensive[10].

Rural communities have traditional ecological knowledge to cope up and predict the impact of climate change. Among the most heavily impacted communities' Indigenous groups are projected to come with solution[16]. World Intellectual Property Organization defined traditional knowledge systems as "Knowledge that is generated, well-maintained and transmitted in a traditional and intergenerational context, and is an integral to the cultural identity of the community knowledge. (TEK) as a subset of indigenous knowledge, that has been preserved and transferred orally from generation to generation and through cultural expressions such as arts, crafts, and ceremonies[7].

Rural communities realized that some animals, birds, insects and plants had the capacity to detect and respond to changes in the atmospheric conditions before the beginning of modern scientific method[10]. The degree of human cultural development is corresponding to the impact of disaster occurrence. The indigenous people understood the positions of stars, the sun and associated shadows and the moon, the wind strength and direction and the cloud position and movement and the lightning patterns, animal and vegetation physiological changes. Even though the attention given for TEK is not sufficient, different researches were done on importance of traditional ecological knowledge in climate change adaptation. Therefore, the overall objective of this article is to asses' different articles on the role of traditional ecological knowledge for the climate change adaptation.

The importance of Traditional ecological knowledge in Climate change adaptation :

TEK is the knowledge acquired by indigenous and local peoples over many hundreds of years through direct or indirect contact with the environment. The detailed knowledge of plants, animals, and natural phenomena, the development and use of appropriate technologies for hunting, fishing, trapping, agriculture, forestry and a holistic knowledge are included. TEK represents the information necessary for cultural survival which accumulated over many years and site specific[6].

Traditional ecological knowledge is the potential instrument in climate change assessment and adaptation efforts[19]. Indigenous communities have historically a potential to live within the area and adapted to environmental changes. In many regions of the United States,

Climate change is likely to bring rapid environmental changes and require broad-scale adaptation strategies. Therefore, TEK is important for detecting environmental changes, the development of strategies to adapt to these changes, and the implementation of sustainable land-management principles[16]. Researchers and scholars have already begun to identify and classify a means in which TEK and Western science can be used together in climate change-related research. As confirmed above with international and national frameworks, this effort can be upgraded.

TEK in a climate change context :

Climate change is a global issue which has an adverse effect on social, political, economic and ecological impact across the world. In order to cope up with climate change different stakeholders across the world came together and discuss on the issues to set the adaptation strategies. Among adaptation strategies the most familiar and economically visible is Traditional Ecological Knowledge (TEK). TEK is crucial for indigenous groups in order to adapt an adverse climate change impacts and has also confirmed invaluable to non-indigenous communities as a way of knowing that offers a renewed perspective[20].

TEK can also play a significant role in short- and medium-term weather forecasting[16]. In order to understand the impacts from climate change and strategies for adaptation, the applicability of TEK should be linked with socioeconomic and adaptive human responses to environmental change can make an important contribution. There is also an increasing a recognition of the value of TEK as indigenous and non-indigenous communities are similarly benefitted from the application of it in the natural and cultural resource management, and it's applied to climate change assessment and adaptation efforts. It is also important to improve an understanding of climate change impacts on ecological processes and phenomena across spatial and temporal scales for different organisms, habitats, and various ecosystems[14]. Indigenous people who live in arid and semi-arid area cope up with drought for periods by store and harvest water using Traditional water-related knowledge[8].

Indigenous groups are expected to be among the most susceptible in the face of climate change, because of their close ties with and reliance on ecosystem goods and services. Therefore, it is important that climate change impacts and adaptation strategies be examined through an understanding of Western science and place-based TEK. Internationally, organizations are progressively recognizing this need but continue to face challenges when attempting to incorporate TEK in their climate change initiatives[20].

Traditional ecological knowledge and Natural Resource Management :

Traditional Ecological Knowledge plays a significant role in natural resource management. TEK has the potential to forecast the near long-term climate condition which affect the local communities. This potential of TEK enables us to conserve the natural resources which are important for the survival of indigenous people. For instance, TEK has contribution in water harvesting, watershed management, forest resource management,

wetland protection and other natural resource that are important for the persistence of human across the world. The interaction of natural resource with Indigenous groups have historically depend on TEK resources[3]. Some of the practices that reflect the importance of TEK in natural resource management include the protection of wildlife habitat and ecologically valuable forest components[21]. However, during the last few decades, these practices and traditions have become a source of wisdom about sustainable resource use and environmental conservation. Traditional ecological knowledge is basis for developing adaptation and natural resource management strategies in response to environmental and other forms of change. In the United States, there are examples of indigenous groups that have included TEK guidelines in contemporary resource management plans for their tribes and communities[20].

Charles R. Menzies claims that the need to preserve biodiversity by assessing the overall health of ecosystems has resulted in a new TEK valuation. This focus on TEK is grounded on the knowledge that traditional Indigenous economies, as opposed to the isolated or single resource use that defines industrial capitalist economies, have a tendency to incorporate the proximal use of numerous resources on an existence basis. To put it another way, indigenous people are interested in learning about the environment in which they live, how various plants and animals interact with one another, how the ecosystem functions, and how they might make use of this system to survive[12].

The Use of TEK in Seasonal Forecasting :

TEK play a significant role in predicting or forecasting of climate condition in the future. Traditional people use different techniques found in their surrounding for seasonal forecasting. The techniques that local people used for prediction is change in behaviors including mating, movements, sounds and reproduction patterns for animals[15]. Plants have a potential in forecasting weather patterns mainly the levels of rainfall by observing flowering patterns. The unfortunate part is that the flowering and mating patterns are confined to specific geographical locations. Some of these observable and predicted behaviors are described to demonstrate that it is possible to on an integration framework for climate change. Modern scholars have also reported that many animal species undergo movements of varying distances depending on the prevailing rainfall patterns. In paleoclimatic studies it has been established that organisms of a specific generations were associated to the prevailing type of climate and that changes in their composition could have been driven by changes in temperatures and rainfall patterns.

The local people have learned from rains and winds pattern that occur in their areas. The extends of winter coldness into spring makes the farmers expect prolonged dry, and This weather pattern is often characterized by hurricanes that increases a lot of dust[15]. The dust causes the redness of the sky at sunrise and sunset and the redness of the sky is regarded as predictor of long dry spell. Similar explanation is assumed in Britain where a red sunset also proposes that dry weather is coming[5]. The most common traditional ecological knowledge in forecasting is the size and direction of the moon. The position and the changing size of the moon have long been

understood to be an indicator of changing weather patterns in various parts of the world. changes in the Moon's movement can form changes in our weather[9].

Integrating TEK with Scientific Knowledge:

TEK is similar to Western science in that both are dynamic and evolve over time. Further, TEK and Western science emphasize feedback learning, and both have developed methods for dealing with the uncertainty and unpredictability intrinsic to all ecosystems. Traditional ecological knowledge that represents centuries of wisdom is increasingly recognized the capacity to deal with complex systems[3]. A TEK approach to understanding the complex workings of ecosystems and carefully gathered longitudinal observations and useful knowledge that can contribute significantly to scientific investigations. TEK is also simply an assistant to Western quantitative approaches or as an element to be "integrated" into Western scientific studies. Scientific knowledge is depending on separation of the knower from the known, whereas traditional knowledge is based on attachment. The international community wants to protect Indigenous traditional knowledge,[17] since 1980.

Traditional science and western science have both similarities and differences. Both kinds of knowledge are eventually based on observations of the environment, and both result from the same intellectual process of creating order. However, they are different in several practical ways. Traditional Ecological Knowledge is often a fundamental part of a culture and tends to have a large social context. Despite of different kinds of traditional knowledge have their own rules, they are different from science regarding rules of evidence and repeatability. The way TEK is produced and disseminated is different from the Western science, and sometimes Western scientists do not have viewed TEK as science, but as folklore[2].

The conflict that sometimes happens between science and traditional knowledge is related to claims of authority over knowledge. In the modern tradition, Western science is taken as having a monopoly on truth. Western science is not easily accepted the Knowledge and insights that originated outside institution. Scientists tend to dismiss understandings that do not fit their own which affect the development of TEK. Scientists incline to be unconvinced, demanding evidence when confronted with traditional knowledge that may not easily lend itself to scientific verification. Based on research carried out in the Arctic, five areas are identified in which science and TEK can communicate and collaborate, using TEK [3]. The identified area includes: - Local-scale expertise; As a source of climate history and baseline data; In formulating research questions and hypotheses; As insight into impacts and adaptation in communities; For long-term community-based monitoring Traditional ecological knowledge can make significant contributions in assessing the impacts of climate change and in identifying strategies for climate change adaptation.

National and International Interest in TEK:

Many disciplines and technologies in western science now recognize the value of TEK. Various forms of TEK are commonly accepted in disciplines such as the social

sciences, agriculture, soil and water conservation (Mustonen and Huusari, 2020). TEK is also get national and international recognition for the contributions it can make to resource management. Resource managers have gradually begun to understand the importance of applying TEK to current stewardship issues in various parts of the world[13].

Government and non-government organizations across the world are beginning to incorporate TEK in climate change, planning, policies, education and research. TEK project has funded by the National Science Foundation in order to incorporating in the study of climate change[18]. The United Nations University (the academic arm of the United Nations), Convention on biodiversity conservation and other related institution have also addressed the importance of TEK by creating the Traditional Knowledge Initiative. The initiative is important to build up and facilitate awareness of traditional knowledge to apprise action by indigenous peoples, local communities, and domestic and international policy makers. To facilitate the inclusion of TEK into international endeavors and The Convention on Biological Diversity (CBD), partnerships with other organizations is also acknowledging the role of TEK and encouraging its responsible use[11,20].

Global attention must be paid to the subject of climate change in order to reduce any negative effects that may result. Nearly every nation on the planet is attempting to reduce emissions from various sources. It is necessary to implement adaptation and mitigation strategies in order to lessen the effects of climate change. The majority of developed nations combat climate change by utilizing cutting edge technology and scientific understanding. However, because it is freely accessible, technology is not as advanced, policies are bad, and poverty is a factor, underdeveloped nations have used traditional ecological knowledge. Even if TEK has several drawbacks, it is crucial for adapting to climate change. Particularly in rural areas, TEK is used to anticipate future climate change and manage unfavorable conditions that have arisen as a result of it.

There is no denying the value of traditional ecological knowledge in helping communities adapt to climate change, but awareness of this issue is still mostly restricted to the scientific community and certain local populations. Promoting TEK, conducting adequate study on its significance, combining it with scientific knowledge, raising awareness, and including it into adaptation strategy plans are some ways to prevent this kind of perspective. In order to manage resources and lessen the effects of climate change, it is crucial to scale up traditional ecological knowledge. providing local communities with training on the management, transmission, and use of their traditional ecological knowledge in the context of coping with climate change from generation to generation.

References :

1. Alexander, C *et al*. (2011). *Bio Science. 61*(6): 477-484.
2. Andrew, L, *et al*. (2012). *Journal of Forestry. 110*(4): 187-193.
3. Berkes, F. (2008). *Sacred Ecology*. New York: Routledge, USA.
4. Berkes, F. and MK. Berkes (2009). *Futures 41*(1): 6-12.
5. British Broadcasting Corporation Weather

Center (2006). Weather Basics - Fog.
6. Drew, A. (2005). *Conserve Biol 19*(4): 1286-1293.
7. Finn, S, Mose Herne, and D. Castille (2017). *Environ Health Perspect 125*(8): 085006.
8. Johnston, BR (2012). Water, cultural diversity, and global environmental change: Emerging trends, sustainable futures? United Nations Educational, Scientific and Cultural Organization (UNESCO), *Paris Knowledge for the Environmental Health Sciences and Biomedical Research.*
9. King, K. (2005). A Case for the Moon.
10. Kuma, V. (2014). *J Geogr Nat Disast 4:* 131.
11. Lertzman, D.A. (2010). *B*C *Journal of Ecosystems and Management 10*(3): 104-126.
12. Menzies, Charles R. (2006). *Traditional Ecological Knowledge and Natural Resource Management.* Lincoln, Nebraska: University of Nebraska Press.
13. Mustonen,T. and N. Huusari (2020). *Rev Fish Biol Fisheries 30:* 699-718. https://doi.org/10.1007/s11160-020-09619-7
14. Nabhan, G.P. (2010). *Journal of Ethnobiology 30*(1): 1-4.
15. Offat I M, and C. Miriam (2015). *Greener Journal of Educational Research 5*(2): 027-036.
16. Parrotta, J.A. and M. Agnoletti (2012). Traditional Forest-Related Knowledge and Climate Change. Traditional Forest-Related Knowledge: Sustaining Communities, Ecosystems and Biocultural Diversity. World Forests 12. In: Parrotta JA, Trosper RL (Eds.), *Springer Science Business Media* B.V., USA.
17. Popova, U. (2014). *American Behavioral Scientist 58*(1): 197-214.
18. Ray, B, and A.O. Kawagley (2005). *Anthropology and Education Quarterl 36*(1): 8-23.
19. Salick, J. and N. Ross (2009). *Global Environmental Change 19*(2): 137-139.
20. Vinyeta, K. (2012). *A Synthesis of Literature on Traditional Ecological Knowledge and Climate Change.* Pacific Northwest Tribal Climate Change Project. Oregon: University of Oregon.
21. Wells, G. (2011). *Solutions 2:* 107-114.