

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



Tamiru Lemi*

Department of Natural Resource Management, Ethiopia

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***Corresponding author:** Tamiru Lemi, Natural Resource Management Specialized in Forest and Nature Management, Ethiopia

Abstract

Climate change is global issue, that affect the world's population in various degree. Adaptation strategies have to be established to combat an adverse impact of climate change. Among the adaptation strategies which is used by different local communities to adapt climate change is traditional ecological knowledge system. Therefore, the overall objective of this review is to assess the role of traditional ecological knowledge in climate change adaptation. To achieve this objective different article were collected from different sources, organized and summarized and compile it carefully. TEK is a knowledge, that has been preserved and transferred orally from generation to generation and through cultural expressions such as arts, crafts, and ceremonies. It has a great role in natural resource management which enhance the adaptation capacity of local people to adverse impact of climate change. On other hand, it is also important in forecasting the near and long-term climate change by using different techniques that are available in their surroundings. Integrating traditional ecological knowledge and scientific knowledge is very important to adapt climate change impact. Therefore, it is important to give a recognition for traditional ecological knowledge at local, national and international level as to practice all over the world.

Keywords: Adaptation capacity; Scientific knowledge; Climate Forecasting; Indigenous people

Introduction

Despite of Climate change is a global phenomenon, the impacts are varied among the world's population [1]. Climate on the earth surface tends to change from time to time due to natural causes and anthropogenic activities. The scale of climate change impacts is measured and observed from local to global which affect global environmental sustainability and mainly disrupt indigenous communities and their forms of livelihoods [2]. The increment of temperature in the air which cause the global warming is one of climate change indicator. Climate change is assured to have thoughtful catastrophic significances like melting of glaciers, rising sea level and rise in the amount and intensity of climatic extremes [3].

Adaptation is a response to reduce vulnerability to global warming due to climate change that seeks to reduce the social and biological systems to climate change effects. Especially, adaptation is very important in developing countries to cope up with adverse impact of Climate change since those countries are predicted to tolerate the outcome of the effects of climate change [3]. Adaptation capacity is varied to human and population across different regions, and developing countries have less adaptive capacity than developed countries due to poverty, poor policy, lack of advanced technology and weak institutional frame work. Social and economic development determine the adaptive capacity of one country, because of, the costs of adaptation to climate change are likely to high [3].

Rural community 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 [4]. 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. Finn S et al. [5] defined (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.

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 [3]. 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 review 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 [7]. 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 [4]. 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 [1].

TEK can also play a significant role in short- and medium-term weather forecasting [4]. 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 [8]. 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 [9].

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 [1].

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 enable us to conserve the natural resources which is 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 [10]. 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 [11]. 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 [1].

According to Charles R. Menzies [12], health condition of entire ecosystems to conserve biodiversity have led to the new valuation of TEK. This emphasis on TEK is based on the understanding of traditional Indigenous economies that have tended to involve proximal use of multiple resources on an existence basis, rather than the isolated or single resource use that characterizes industrial capitalist economies. In other words, Indigenous people want to understand the area where they live off and the way that the different plants and animals interrelate, how the ecosystem works, and how they can use that system to sustain themselves.

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 [2]. 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 genera 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 [2]. 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 [13]. 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 [14].

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 [15]. 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 want to protect Indigenous traditional knowledge, Since 1980 [16].

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 [17].

The conflict that sometimes happen 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 [10]. 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 [18]. 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 [18].

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 [19]. 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 [1,20].

Conclusion

Climate change is a global issue which need attention to minimize an adverse impact caused by its change. All most all countries of the worlds are trying to minimize the emission from different sources. Adaptation and mitigation measure should have

to take to reduce the impact of climate change. Most of developed countries use advanced technology, scientific knowledge in order to mitigate or adapt climate change. However, developing countries has been used Traditional Ecological Knowledge due to easily access able, less advancement of technology, poor policy and poverty. Despite of TEK has a its own limitation, it plays a significant role in climate change adaptation. Especially rural community use TEK to cope up with adverse condition appeared due to change and forecasting climate change in the future.

Recommendation

The importance of Traditional Ecological Knowledge in climate change adaptation is not in doubt, but still there is a limitation of awareness beside the scientific and some local communities. In order to avoid such kind of perception, promoting TEK, carry out enough research on the its importance, integrating it with scientific knowledge, creating awareness and including it in adaptation strategic plan. Scaling up of Traditional Ecological Knowledge is very important in resource management as well as in minimizing the effect of climate change. Giving training to local communities on how they manage and transfer their Traditional Ecological Knowledge and its applicability in climate change adaptation to generation.

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