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Role of Indigenous Knowledge in Climate Change Adaptation Strategies: A Study with Special Reference to North-Western India

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Abstract

Climate change has become most critical issue at the global level, regional and local level to such an extent that climate change is considered as a gravest challenge for the mankind in the present century. No person, no country or no region of the world is immune to climatic changes. Past global efforts at dealing with the problem of global warming (which is most evident form of climate change) concentrated on mitigation, with the aim of reducing and possibly stabilizing greenhouse gas (GHG) concentrations in the atmosphere. As stabilisation of GHG's primarily depend upon changes in technology, discovery of new and less polluting fuels and with awareness in human behaviour towards mother earth. And all these changes are slow in nature, that's why adaptation is seen as viable option in reducing the vulnerability to anticipated negative impacts of global warming.

Now, at the global level it is increasingly realised that mitigation and adaptation should be perused complement to each other. However, increasing integrating mitigation and adaptation strategies in terms of climate changes are not completely new idea in India and especially in north-western India. This region is characterised by severe and frequent droughts from centuries. And given the rich cultural values of north-western region, local population through their indigenous knowledge systems, have developed a unique from of skills to reduce their vulnerability to variability in local climate. However, this knowledge is rarely taken into consideration in the design and adaptation of modern mitigation and adaptation strategies. This paper is an attempt to highlight some indigenous mitigation and adaptation skills that have been praticesed in North-western India. Paper also attempts to put forward arguments for integrating indigenous knowledge into formal climate change and mitigation strategies.

Keywords: Aridity; Adaptation; Indigenous knowledge; Mitigation; Sustainable development; Climate change; River basin management; Coping strategies; Trial and error method

Introduction

It is now widely accepted that earth's climate tends to change over time due to natural causes and also partly by human activities. As per the current usage, especially the expression 'Climate change' often refers only to changes in modern climate. It also includes the rise in the average surface air temperature which is also known as 'Global Warming' [1]. This very phenomenon of climate change is bound to have serious catastrophic consequences. These consequences include melting of glaciers, rising sea level and rise in the amount and intensity of climatic extremes. These consequences would be so severe that many studies believe that climate change is going to endanger the very existence of human being on the planet.

Adaptation to global warming is a response to climate change that seeks to reduce the vulnerability of social and biological systems to climate change effects. Even if emissions are stabilized relatively soon, climate change and its effects will last many years, and adaptation will be necessary. Climate change adaptation is especially important in developing countries since those countries are predicted to bear the brunt of the effects of climate change. That is, the capacity and potential for humans to adapt (called adaptive capacity) is unevenly distributed across different regions and populations, and developing countries generally have less capacity to adapt. Adaptive capacity is closely linked to social and economic development. The economic costs of adaptation to climate change are likely to cost billions of dollars annually for the next several decades, though the amount of money needed is unknown. Donor countries promised an annual $100 billion by 2020 through the Green Climate Fund for developing countries to adapt to climate change.

Increase in green house gases emissions through human activities has resulted in additional warming of the earth's surface, with several anticipated negative impacts. So, far in the past global Initial efforts at dealing with the problems related to global warming seems to be concentrated on mitigations with the aim of reducing and possibly stabilising [1]. Keeping checks on emissions in the industrial world is hard nut to crack, that also in a time when global economy is on the path of robust growth. And it is expected that global energy consumption would go upwards. With slow progress and unfavourable conditions in achieving reduction of GHG's from atmosphere it is now realised that adaptation is more viable option to reduce the vulnerability to anticipated negative impacts of global warming. Moreover, after the failure of Copenhagen climate negotiations it is realised that we can not entirely depend upon mitigation alone. But, to safeguard our common future we must integrate the process of mitigation and adaptation to fight climate change. However, integrating adaptation and mitigation is not a completely new idea in the world. There are many regions of the world where people are still living in the lap of nature without causing any harm to nature. They have developed special skills to cope with the occasional natural flurries. And these skills of creating harmony between power of nature and human greed are known as 'Traditional Knowledge' or 'Ingenious knowledge'.

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According to World Intellectual Property Organisation, traditional knowledge systems are "Knowledge that is generated, preserved and transmitted in a traditional and intergenerational context, which preserves and transmits it between generations and is an integral to the cultural identity of the community which recognised as holding the knowledge." In this way indigenous knowledge is tied to a single culture or society gained through many years of community experience by trial and error method.

In general it is widely accepted that indigenous knowledge represents an alternative way of thinking, which has evolved through times keeping in the mind the requirement to safeguard themselves and their families from variations in the local climate. In today's society, where science is playing pivot role, many people believes that orally transmitted knowledge is non-scientific [2], which is totally false. Indigenous knowledge is also as scientific as any other form of present knowledge as it evolved on the same principles of experiments and trial and error methods which are widely followed in sciences (Particularly in physical sciences). Historically, indigenous people are conspicuously amongst identified as particularly vulnerable to climate changes. Many indigenous territories are located in areas where impacts from global warming are anticipated to be both early and severe [2]. But, indigenous people have learnt the art of adapting to any changes in their climate and this knowledge or skill can help present generation to fight present form of climatic variability. So, given the urgency to cope with climate changes present study is an attempt to discover the traditional skills prevalent among communities of north-western India that can help to built future course of actions for present generation.

The environment of North-western India

North-western India which is known as the cradle land of Indus-valley civilization always remained cultural hearth of India. In other words, north-western India can be seen as the heart land of Indian culture from social and cultural interaction between different parts of the world taking place from time immemorial. It includes Rajasthan, south-western Haryana, Southern Punjab, and north-western parts of Gujarat. These states are different political identities but they have same cultural and climatic conditions. This whole north-western region is known for its aridity as here rainfall is less than 500 mm. At, the same time this region is known for its prolonged droughts (i.e. 2002 and 2009) and occasional severe floods (i.e. Barmer district flood of 2006) which causes heavy toll. The climate of north-western India is characterised by extremely high range of temperatures and aridity throughout year. It is the hottest region of India and annual range of temperature is always 14°C- 15°C. The diurnal range of temperature is almost as much as the annual range of temperature. Apart from temperature, the other determining factor here is the variability of rainfall, which normally tends to vary between 50% to 70%. Given the historical experience to cope with harsh climatic events communities of this region has evolved a specific kind of traditional knowledge and skill that helped people to mitigate and adapt with local climatic variability. As scientific community accept that with the climate change, climate variables such as rainfall, wind, wind pattern and climatic extremes are bound to move towards both extreme ends. In such critical stage knowledge acquired by this region can play a leading role in protecting lives of millions of Indian from climate change.

Traditional coping strategies of north-western India

Arid ecosystem of in north-western India is extremely fragile and although there is tremendous diversity within this region but three basic characteristics are common throughout- long dry season, inadequate and unpredictable rainfall, and infertile soils. People in this region are physically, mentally and culturally well adapted to meet the challenges of the nature. Aridity is the biggest hurdle in the development of this region frequent droughts and occasional floods causes huge destructions and bring catastrophe in this arid ecosystem that have far reaching consequences. Communities of north-western region have evolved many coping strategies that are helping local population to face the brunt of climate change. Traditional skills are visible in every day to day activity such as agriculture, livestock rearing, housing and clothing etc. Some of the traditional water conservation techniques are given in Table 1 that are being practised among various communities in India. Apart from water conservation techniques housing, life style, agriculture also follows the same vigour to meet the challenges posed by aridity and its variability.

Objectives of the Study:

Present study has following set of objectives:

(i) To explore some of the ways in which traditional society cope with vulnerability of climate.

(ii) To contribute the integration of indigenous knowledge with formal climate change strategies.

(iii) To generate literary source for facilitating further studies.

Database and Methodology

Present study is based on information collected from varied sources. As it is well know that no government agency collects any information about various traditional practices and most of the information is transmitted through oral means and practical applications. There are some documents of legal and administrative aspects of the ancient literary sources such as Kautilya's Arthashastra which provides valuable in sight in the practice of traditional knowledge. It is believed by most social scientists that Indian traditional knowledge was transmitted through practical work under gurus. Hence, in order to obtain that very information a series of interviews were conducted from January- April 2010 in selected villages of study area to have first hand information

Traditional form of skills	Region of India	State
Zings / *churpun* , Kuls, Naula, Khatri, Kuhl	North	Jammu and Kashmir, Himachal Pradesh, Uttaranchal,
Zabo/ the ruza system, Cheo-ozihi, Dongs, Bamboo Drip Irrigation, Apatani	North-east	Nagaland, Assam, Meghalaya, Arunachal Pradesh
Virdas, Vav / vavdi / Baoli / Bavadi, Khadin /dhora, Tankas	North-western	Gujarat, Rajasthan, Haryana, Punjab
Eri, Ooranis, Korambus / chira, Jackwells	South	Tamil Nadu, Kerala, Great Nicobar Island
Cheruvu, Kere	Central	Andhra Pradesh, Karnataka
Bengal's Inundation Channel, Dungs or Jampois, Katas / Mundas / Bandhas, Ahar Pynes	East	West Bengal, Orissa , Madhya Pradesh, Bihar
Kohli, Bhanadaras, Phad, The Ramtek model	Western	Maharashtra

Table 1: Traditional Water Conservation Techniques in India.

Source: http://www.rainwaterharvesting.org/rural/traditional2.htm

for the research paper about traditional practices. In general, present study is based on information collected through primary as well as secondary data sources. In primary data sources, data was collected from a series of interviews. Whereas, secondary sources such as books and travel accounts of different writers have served as main source of information. Study is descriptive in nature which explains various forms of traditional knowledge and skills of the north-western India.

Results and Discussions

In north-western India over time, human relationship with nature has produced complex knowledge systems, which are responsive to change, self regenerating as well as being multidimensional in nature. The close knit association between this knowledge systems and ecosystems offers us the greatest opportunity to understand how humans respond to change. These human responses includes coping with water related stresses, agricultural and other practices, housing pattern and its density, conservation skills etc. Here in this segment of present paper an attempt has been made to assess the various dimensions related to traditional knowledge and climate change.

Traditional knowledge and water related stresses

Arid climate and frequent droughts made community of north-western region of India to evolve such skills which make effective utilization of scars water resources. Such skills includes development and protection of Ponds, Johad, Nadi etc. which holds water when rain and provide year round at the same time these structure help in replenishing water table. All these structure prevents rain water from running off, allowing water to percolate in to the ground, recharging water aquifers and improve water balance of the earth. These all water collection structures of traditional India. These have stood the test of time and admirably withstood the ravage in rainfall. As it is well known that north-western arid India is also vulnerable to sudden floods which causes sever destruction to water stresses arid eco-system. In these conditions also Johad and other traditional water bodies can play a specific role in collecting surplus water which can cause flood (Figure 1).

Apart from water bodies every traditional household in north-western India (especially in Rajasthan and Gujarat) have a mechanism for 'roof-water harvesting' which works on the philosophy of capturing water where it falls. Water in the times of rain is collected in a water structure which is locally known as 'Hooad' in most part of this region. As today's science also accepts that roof water harvesting is the most scientific way to tackle water related stress. And the traditional water harvesting system in the region can be modified using appropriate techniques [3].

Association of agriculture and animal rearing

As it is well know fact that entire north-western India has a agricultural based economy and 80% of area of this region is under rain fed agriculture. Due to continental location north-western region receives rainfall less than 500 mm or at some place even less than that. This rainfall is very erratic, uncertain and unevenly distributed. Therefore, the agriculture in these areas has become a sort of gamble with the nature and very often the crops have to face severe climatic harshness. Thus, water scarcity has become a serious bottleneck in dry land agriculture. This kind of climate variability and uncertainty has made local communities to learn skills to minimise the waste of water and cultivate that kind of crops which requires less water (or Dry farming). In such cases it is relatively more difficult to have a good agriculture without definite coping strategies in climate change. Local communities with their historical experience have managed to judiciously use the available flora and fauna. Cultivation of less water intensive crops and use of all available bio-diversity of this region has proved that this region is traditionally well equipped and well adapted to meet the challenge of local climatic variations. Total use of 'Khejri' (a local plant verity) 'Bare' plant can be seen as the fine example to this adaptation.

In terms of animal rearing, rearing of camel, goat and sheep's instead of buffalo shows fine tuned nature of human skills with the local climatic conditions. As this is well established fact that animals of dark colour would not survive in hot and dry climate of this region. Hence, it is evident that this kind of knowledge was also present in ancient knowledge system. Although this region has very poor agriculture but what ever agriculture is praticesed is totally because of fine tuned with local climatic condition.

Adaptation to extreme climatic events:

While facing severe climatic variability indigenous skills to cope with severe heat and prolonged droughts have developed. Most of the villages in the north-western India are situated on the eastern side of mountain barrier protecting villages from severe dust storms. Apart from location of houses, shape and housing material also resembles the climatic demand for the region. Most of the houses in this region are directed in such a way that they face towards east. This kind of direction allows morning cool sunlight into the house but at the same time it protects intense heat of afternoon. In general, it is well established that houses are richest source of cultural heritage and traditional adaptation skills of our country. They are generally designed and build by the villager themselves according to their requirement and climatic compulsions. In terms of material of building most of houses are built by using sand stones and lime stones which are bad conductor of heat. Hence provide coolness to dwellers.

Conservation of plants and animals of local ecosystem

Due to harsh climate people in this region have learned the importance of conservation of plants and animals of local ecosystem. There are many communities (i.e. Bishnoi 2) that are world famous for protecting and conserving local plants and animals from ancient times. Many historian and social scientist have recorded that importance of these conservation techniques. This conservation of animals and plants have totally harmonised the nature and local living of traditional society in this region.

Challenges in integration of indigenous and formal form of knowledge

Above description is well supportive that north-western India has a rich source of indigenous knowledge that has evolved due to long historical experiences of communities residing in this arid-region. As most of scientist concludes that due to present climate change climatic variability would take place causing an increase in amount and intensity of climate extremes events such as prolonged severe droughts and occasional floods. This variability of climate would be serious catastrophic consequences and this would call for prompt mitigation and adaptation strategies. Scientists also believe that destruction due to climate change would depend upon the pace of climate change and human adaptation strategies. It is very crucial moment for entire mankind and at this very stage traditional knowledge can come up as a saviour. Skills and experiences gained over time to adapt to climate variability can help in chocking out future course of mitigation and adaptation strategies. But the need of hour is to integrate traditional

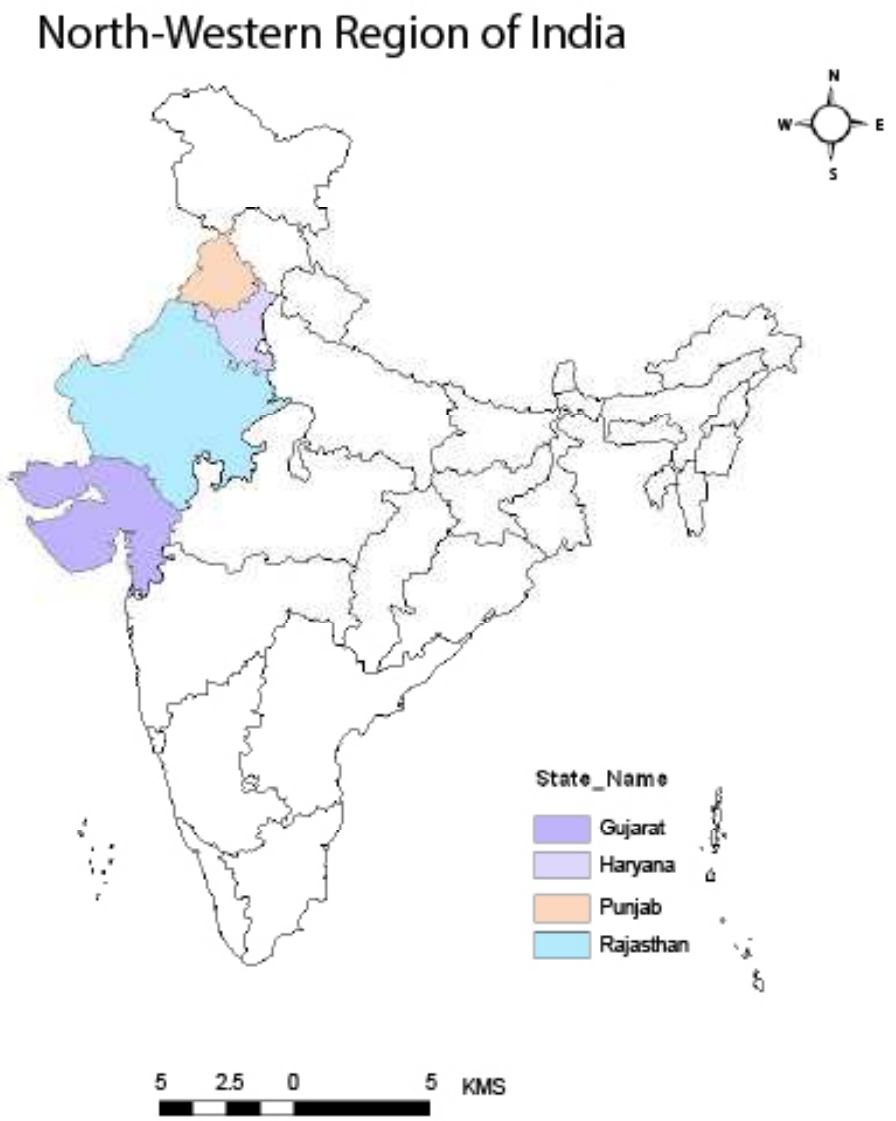

Figure 1: Study Area: North-Western Region of India.

as well as formal forms of mitigation strategies. This is widely accepted that climate change would bring severe droughts and flood and traditional coping strategies can be handy in tackling them. Incorporating indigenous knowledge into climate change policies can lead to the development of effective adaptation strategies that are cost-effective, participatory and sustainable. But, there is an emerging trend on how the role of indigenous or local knowledge systems has been systematically marginalised through developmental interventions over time in at the global level, especially by rapid urbanisation [4].

Key findings and way forward

After going through all the discussions it is quite evident that traditional societies are well equipped to cope with variations in climate or few of climatic variables. Key findings of present study are as follows

- Given the historical expertise of local communities to cope with variability of local climate these communities can provide various tools and means to tackle present climate change.
- There is vast scope in merging modern and traditional form of indigenous knowledge to cope with climate change. In the traditional skills, skills related to water conservation is of utmost importance (as most of scientists believe that due to global warming water related stress would go up) [5].
- Indigenous knowledge is dying due to intense pressure from western way of living and rapid urbanisation.

The success of human endeavour to fight climate change will depend upon numerous things ranging from technological change, change in his attitude towards mother earth but the most crucial thing would be that how man has learned from his past. The integration of indigenous and modern form of skills would be yard stick of his learning from past glorious history. Apart from this role of mass communication and media is also important in spreading knowledge among general masses. The way forward in the fight against climate change lies in

- Preservation and expansion of indigenous knowledge and skills.

- Integration of formal and indigenous forms of knowledge.
- Training in traditional skills and generation of 'knowledge banks' of these skills [6].
- Active participation of NGO's and general public in policy formulation regarding environment.

Conclusion

From the above description it is very clear that north-western India has a rich collection of traditional knowledge and if this knowledge is purposefully and logically applied with modern skills and technology can save the life of millions on the earth. North-western India and other places where societies can play pivot role in fighting towards the vulnerabilities of climate changes. It is very pathetic that under the pressure of modern science and technology traditional knowledge is dying without due recognition from community and government. And at the same time absence of literary sources about traditional skills is hindering the dissemination of traditional knowledge.

Notes

1. Climate change is a change in the statistical distribution of weather over periods of time that range from decades to millions of years. It can be a change in the average weather or a change in the distribution of weather events around an average (for example, greater or fewer extreme weather events). Climate change may be limited to a specific region, or may occur across the whole Earth. But we must think that global warming is only form of climate change, global warming also includes Ozone depletion, acidity of soil, Acid rain etc.
2. The Bishnoi are a community of nature worshippers in the state of Rajasthan, India. They also have a sizeable presence in the neighboring states of Uttarakhand, Uttar Pradesh, Madhya Pradesh, Maharashtra, Gujarat, and Haryana.

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