Adaptation Strategies for Indian Sub-Continent: Towards an Ethical and a Resilient Future

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Abstract
India being a vast country, experience varied impacts of climate change. The drought and heat wave in the north to flooding in the south. The impact of climate change is magnifying as it is being felt more severely. The adverse effects are further aggravated exponentially where there are no adaptation strategies and coping strategies. These sequences are further worsening due to the social differences and inequality. The paper considers the role of ethics in policy formulation and their implementation. The paper addresses different types of adaptation strategies for different strata of vulnerable sections across India. It takes into account mainly the problems of water and focuses on ethical solutions and adaptation strategies for them. Some of the major challenges which the system will face will be drawn in defining the problem and framing the answer.

Keywords
Vulnerabilities, Adaptation Strategies, Policy, Climate Change, Ethics, India

I. Introduction

We are way beyond the point where we can afford to deny the event of climate change. India is a land of extreme climatic conditions, and coupled with other factors such as global warming, a skewed demography, and an ineffective and inadequate legislative environment, the impact of climate change on the people is further aggravated. With approximately 300 million people still living in extreme poverty and deprived of the basic necessities like food, water, sanitation, shelter, electricity [1], the additional onus of dramatic climate change is also unjustly borne by them. Unjust, because despite having almost negligible carbon footprint owing to their deprived conditions, they are the primary target of the onslaught of mishaps brought about by the climate change. In the paper, the ways in which water can be managed and the problem of water shortage has been addressed and different strategies of water management has been advocated for different parts of India. These strategies are very easy to apply and can fulfill the problem of shortage of water. The focus is on the ethical strategies as India being a developing country having a booming one billion population cannot practically single-handedly solve all the problems simultaneously. The ethical solution means that the vulnerable people are taken care of and not allowed to suffer further, with their needs kept in mind [2]. But the problem of corruption and the lack of willpower act as a hindrance in achieving the ethical outcome.

II. Vulnerabilities

Around 68% of Indian population is rural and out of that, half of the households are landless laborers who live in deprivation [3]. Add to it, the fact that almost half of the labor force in India is dependent on agriculture, which in turn for the most part is still dependent on monsoon. Large swathes of agricultural lands (around 60% of total agricultural area) are irrigated at the mercy of erratic rainfalls, thus maximizing the risks of people working on such lands, followed by hampering of food security of the country as well [4]. In case of severe droughts, the farmers and agricultural laborers are rendered helpless and destitute. Such droughts have unfortunately risen in frequency and intensity over a period of time. There have been 3 major droughts since 2002 till 2012 along with other innumerable cases of water scarcity. Almost 1/6th of India is defined as Drought Prone Area (DPA) (Indian Meteorological Department, 2014) with recurring and ever frequent droughts due to unpredictable monsoon cycles. Thus, the extent of desperation of farmers is quiet apparent in a country like India. However this is just the tip of the iceberg. Such droughts are soon followed by an acute food scarcity, rising food prices, water crisis, economic hardships and even social privations. The fact that the lower and the depraved classes are the ones worst hit, makes this situation more unfair and unjust.

Another factor that agriculture shapes is the use of ground water resources for irrigation. The areas which are not rain-fed, blindingly extract underground water via bore wells or pumps, thus reducing the water table without taking any steps for its renewal. Besides agriculture, water table is being depleted because of the relentless use by various industries. The ever increasing demands of industrialization are met with unsustainable over-extraction of ground water, especially in arid or semi-arid areas, where poor people are dependent on ground water through wells. Since the deeper the water table recedes, more expensive it becomes to extract the water from it, only the financially sturdy industries are able to afford such costs (they are responsible for lowering the table in the first place). Again it's the locals and natives who suffer the most [5].

There are some highly eco-sensitive areas in India which are more susceptible to the climate change than others owing to their geographic location, climate and the amount of population it sustains. On this pretext, one of the most endangered ecosystems in today's times is Sundarbans, which lies in West Bengal in India and in Bangladesh. The area is one of the most densely populated parts of India where people live in deplorable conditions. About 44% of people in this region live below the poverty line, around 87% living with food shortage, and about 60% without access to clean water [1]. And this is just the demographic burden on the Sundarbans. Besides sustaining a whopping 4.37 million population in such deplorable conditions, the region has to face the onslaught of an ever rising sea level and increasing acidity of the oceans brought on by the global warming and the toxification of sea respectively. The precious mangrove swamps are either being exploited by the local population or are being submerged permanently by a substantial degree. The local population relies on the Sundarbans for its precious resources such as honey, fish, fuel wood, fodder etc. Agriculture is also the main activity here which has resulted in rampant deforestation. As there are no facilities and infrastructure for the people due to the areas being inaccessible, the people lead almost a primitive and basic life which is as susceptible to the climate change as are the Sundarbans. The natural advantages of

mangroves, such as, being a barrier to the cyclones, storms and tides, generation and maintenance of nutrients in soil, harboring a rich marine and ecosystem and acting as a carbon sink; are all reducing day by day due to its inability to sustain pressures of climate change and population [6].

The people living in the Northern regions of India, particularly Ladakh and Leh, receive very less rainfall and face shortage of water, not only for sustaining themselves but also for irrigation and other general use. Similarly, in the western parts of India, the states receive scanty rainfall and therefore, suffer much, as they too are dependent on agriculture for their livelihoods.

In all such cases, people that are vulnerable are more than often uneducated or have low levels of education and have very limited economic means, and therefore, lack the proper means to generate and implement better options that will benefit them and their environment. Hence, in such cases, the role of the government and various civil societies as well as the NGOs becomes crucial for mobilizing the effort at the community level [7].

In order to reduce the vulnerabilities of these people, we have to adopt certain strategies, as the resources are finite and will extinguish in near future. We have to make sure the adaptation is ethical and just. Whatever decisions we make today, it will not only impact the present generation, but also the future generation. The decision makers and policy makers have to be ethical and just as they have the power and the responsibility to act ethically and be fair towards the vulnerable sections.

III. Adaptation Strategies

We will now look at various ways to find solutions which will protect the vulnerable population from the effects of climate change.

The role of the government is primarily to formulate and implement policies, to check the exploitation, and simultaneously, ensure the protection of the vulnerable section via food security and providing other necessary services [8]. In case of agriculture, the government's main focus should be to invest in new and innovative methods of irrigation in order to remove the excess dependency on the unpredictable monsoons. By providing sustainable means of irrigation, the government can ensure that the poor farmers are not susceptible to any risks from droughts or untimely showers. New techniques of irrigation such as drip irrigation or sprinklers should be subsidized and promoted amongst farmers which will compensate the lack of rainfall or the loss from the droughts. These methods of drip irrigation and sprinklers use less water as compared to the traditional methods of flooding the fields with water. Sufficient attention should also be given to provide training for the new techniques. Such methods would prove to be beneficial for the poor farmers as well as will aid in the replenishment of the water table.

In addition to providing the assistance to the farmers, the government should on the other hand implement strict regulations to check the over-use of ground water and pollution of the environment by the industries, as they are the main cause of pollution. Any dissident organization must be severely penalized in order to check any such violation in future. This will ensure that no harmful effect of pollution by industries is borne by the poor and vulnerable sections.

At the regional level, there are many active agencies and organizations that are working in tandem with the local populace in formulating new strategies to improve and revive their local natural resources. Such regeneration will be beneficial mostly to the local communities; therefore their active involvement is crucial for their own benefit.

Some have found innovative ways to replenish ground water and have actually increased the water table in arid/semi-arid lands of Jodhpur in the state of Rajasthan. The people have found a way to replenish the Stepwells or Bawris of the place. This is very important since such stepwells have been historically used to conserve water for a long time, which in turn could be used for different purposes. This is a traditional way of a water harvesting system, which had been forgotten by the people and government [9]. With the recharging of these Stepwells, there will be a lesser dependency on the canals and other water sources.

Ladakh, being a cold and arid mountain desert in the Northern part of India, sees a low average rainfall of 50 mm, and hence people rely on the glaciers to meet their basic water needs. Here one man has found an ingenious way to preserve glacial water for use during the droughts. The run down water from the melting glacier can be stored in summer and autumn, so that it can form a glacier in winter, then this artificial glacier would melt in spring and provide water to the villagers in the month of April when the villagers need it the most. Canals are made to divert the water from the main stream to small catchment areas located a couple of kilometers away from the village. The stored water is kept in a shaded area to keep the water frozen during winters [10]. As the dependency on monsoons is reduced, more will be the food security and the economic benefits consolidated for these vulnerable sections.

In case of preserving fragile ecosystems like the Sundarbans along with its native tribes, the government needs to maintain a balance between utilization of the natural resources by the natives for their sustenance and their exploitation. Indian government has demarcated the forested area of Sundarbans as the Sundarbans Tiger Reserve to restrict the activities of man and avoid any dangerous conflict with the indigenous animals, especially the Bengal Tiger. By minimizing and regulating the human intervention in certain sensitive areas of the region, the mangroves are given a better chance at regeneration along with its flourishing flora and fauna. In this way there is harmony amongst humans and the nature, where both are able sustain each other. Further, by investment in infrastructure according to the requirement of the people, many new opportunities can be created which does not require dependence on nature and also provides a better and more prosperous opportunity to the people without harming the mangroves [11].

IV. Conclusion

For a just, fair and equitable development of the people and the environment, it is imperative that all these aspects are taken into consideration while forming policies and solutions. Exclusive focus on human needs would lead to inevitable environment degradation; whereas sole focus on the protection of the ecosystems would lead to the unjust exclusion and deprivation of its native population. Thus, new solutions would require increased collusion of all the machineries of govt., civil societies, NGOs and local communities.

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