

Climate Change and Climate-Induced Disasters in Odisha, Eastern India: Impacts, Adaptation and Future Policy Implications

Sangram Kishor Patel*

Senior Program Officer, Population Council, 142, Golf Links, New Delhi, India

ABSTRACT: *There is no doubt that climate change and climate induced-disasters pose a significant challenge to poverty reduction, health and development in many developing countries, including India. Odisha's geographic location on the east coast of India and its climatic condition have meant that the state has historically been highly prone to climate change and multiple hazards, mainly cyclones, droughts and floods. Its fluctuating weather conditions suggest that Odisha is stumbling under climatic chaos. The state has been declared disaster-affected for 95 years of the last 105 years: floods have occurred for 50 years, droughts for 32 years and cyclones have struck the state for 11 years. After independence less importance has been given to the state as well as the development strategies of the state have tended to overlook the climate change, health, poverty related issues. The findings of the study highlight that there is a scarcity of research which can focus on different climatic induced calamity issues. Strong political will, strengthen infrastructures, public private partnership and community involvement and better planning can go beyond risk management to look at actions that address climate change and deliver benefits for growth and development. There is an urgent need to focus on the climate change, disasters and their vulnerability, and adaptation and coping mechanisms among the people in the state. The study recommends for future research and policy advocacy for better solutions and development strategies in the state.*

Keywords: *climate change, disasters, impact, adaptation, Odisha, India*

I. Background

Climate change is now a global phenomena and its impact on population, health and poverty are not deniable. There is no doubt that climate change and climate induced-disasters pose a significant challenge to poverty reduction, health and development in many countries. However, the impacts of climate change, and the vulnerability of poor communities to climate change, vary greatly, but generally, climate change is superimposed on existing vulnerabilities. Climate change will further reduce access to drinking water, negatively affect the health of poor people, and will pose a real threat to food security in many countries in Africa, Asia, and Latin America (Sperling, 2003). It is well evident that recent climate-induced disasters have had direct impacts on poor countries and on poor people. The poverty-climate links focused on the poor as the most vulnerable to climate change is now a day's one of the emerging international attention, as they have the least human, financial, and technical resources to adapt (Sperling, 2003; Burton *et al*, 2002; Tol *et al*, 2004). According to the third assessment report of the IPCC (2014), developing countries are expected to suffer the most from the negative impacts of climate change (IPCC, 2014). This is due to the economic importance of climate-sensitive sectors (for example, agriculture, water resources and fisheries) to these countries, and to their limited human, institutional, and financial capacity to anticipate and respond to the direct and indirect effects of climate change. In general, the vulnerability is highest in least developed countries in the tropical and subtropical areas. Hence, the countries with the fewest resources are likely to bear the greatest burden of climate change in terms of loss of life and relative effect on investment and the economy (Sperling, 2003).

II. Impact of Climate Change and Climate-Induced Disasters

The adverse impacts of climate change are most striking in the developing nations because of their geographical and climatic conditions, their high dependence on natural resources, and their limited capacity to adapt to the changing climate. Within these countries, the poor, who have the least resources and the least capacity to adapt, are the most vulnerable (IPCC, 2014). Projected changes in the incidence, frequency, intensity, and duration of climate extremes (for example, heat waves, heavy precipitation, and drought), as well as more gradual changes in the average climate, will notably threaten their livelihoods – further widen the inequities between the developing and developed regions. Odisha, an eastern state of India is a prime example of this is particularly vulnerable to today's erratic climate. Odisha's geographic location on the east coast of India and its climatic condition have meant that the state has historically been highly prone to climate change and multiple hazards, such as cyclones, droughts and floods (Bhatta, 1997; GoO, 2002a; GoO, 2002b; GoO, 2002c; GoO, 2002d;

GoO, 2002e). Ray Bennett (2009) reported that Odisha is the land of multiple disasters. For over a decade now, Odisha has been teetering from one extreme weather condition to another: from heat waves to cyclones, drought to floods (Ray-Bennett, 2009). The state has been declared disaster-affected for 95 years of the last 105 years: floods have occurred for 50 years, droughts for 32 years and cyclones have struck the state for 11 years (Mohapatra, 2006). Since 1965, these calamities have not only become more frequent, they are striking areas that have never experienced such conditions before. For instance, a heat wave in 1998 killed around 2,200 people - most of the casualties were from coastal Odisha, a region known for its moderate climate. Since 1998, almost 3,000 people have died due to heat stroke. Odisha has experienced around 952 small and big cyclones and 451 tornadoes between 1891 and 1970. From 1901 to 1981 there were 380 cyclones, of which 272 resulted from depressions in the Bay of Bengal. Twenty-nine of these cyclones were devastating. A study of the effects of natural disasters reveals that between 1963 and 1999, Odisha experienced 13 major disasters, which killed 22,228 people (state government figure; non-government figure puts the toll at around 40,000), and rendered more than 34 lakhs of people homeless (Mohapatra, 2006). The state's mean daily maximum temperature is also gradually rising, as also the mean daily minimum temperature. According to data from the weather department, in the last 50 years the state's average temperature has gone up by 1 degree. The Titilagarh and Koraput belt comprising south and west Odisha has witnessed an exceptional increase in daily maximum and minimum temperatures (Hedger, 2010).

Its fluctuating weather conditions suggest that Odisha is stumbling under climatic chaos. According to the state government's Human Development Report 2004, property loss has been steadily growing every year over the past few decades due to climate change and disasters (GoO, 2004). Odisha is rainfall dependent as its irrigation network does not cover the entire state. With a water dependent crop, rice, as its main staple, the agriculture sector is vulnerable to the vagaries of climate-induced weather changes. Food security is also threatened in different parts of Odisha due to climate change induced disasters. Rise in temperature and sea level has made agriculture vulnerable as the gushing seawater combined with erratic rain often destroys the crops. Seawater is more often gushing into the agricultural land filling with saline water, which directly affecting the farmers and slowly weakening the productivity of the state. As per Global Environmental Negotiation journal, if sea level rises 1 meter from the current level, 1,70,000 hectare of cultivable land in Orissa will be submerged (Pati, 2009). Agriculture across the coast of Odisha is now facing a serious climate emergency. In terms of health impact of the climate change, the vector borne disease – Malaria is rampant in many parts of the state. At the same time, due to deviation in the pattern of rainfall, neither during heavy rainfall nor during scanty rainfall, water percolating to the ground water table. In addition, due to massive de-forestation and soil erosion, the perennial sources like streams are vanished, rivers are getting flat and ground water is no more getting recharged through those perennial sources. The Central Ground Water Board (CGWB) has clearly indicated that the ground water of 24 out of 30 districts in Orissa is depleting (Pati, 2009). The ground water aquifers in many regions of the state have already gone dry. Ground water is the last hope of a water starved population. The climatic variations could further multiply the vulnerability of poor by adversely affecting their health and livelihoods and hampering the development of the state. It is evident that climate change in Odisha has the potential to tremendously aggravate water stress, food security and health system.

III. Adaptation and Coping Mechanisms

In some way it is also useful to consider the impact of climate change and climate induced disasters on existing programmes and activities, but adding the considerations of its vulnerability to existing programmes and activities is very necessary if adaptation is to take place in a way that affects the population, poverty and development. This means that people's adaptive capacity and processes contributing to the vulnerability of the population need to be targeted by adaptation measures. Unless these linkages are not considered, the development of population cannot be addressed properly. In order to achieve a broader type of adaptation, the focus should be on vulnerability reduction, which includes the social, political and environmental conditions that make people vulnerable to climate change (Ray-Bennett, 2009). So the best way to address climate change impacts and vulnerability of the population is by integrating adaptation measures into sustainable development and poverty reduction strategies.

Various coping mechanisms and adaptive strategies have to be adopted by the people in the Odisha to reduce the impact of climate change and climate-induced disasters. More importantly, different individual measures and community based action strategies should be given priority. The coping mechanisms can be visualized as a network to maximize utility and strengthen of resources from infrastructures, transportation, health facilities and medicines to food, livestock keeping and agriculture. The adopted strategies and coping mechanisms depended on people's perception on extreme events, the problem associated with it and geographical location. The problems included crop failure, concomitant decline in income and employment opportunities, jeopardize infrastructures, low yields, escalation of food prices, hunger and malnutrition, decrease in grazing land and fodder availability, and loss of properties and life. However, the coping mechanisms vary according to the

nature of disasters or extreme events. Accordingly, the strategies practiced to reduce vulnerability are classified into four groups, namely common strategies for any extreme events in general, specific strategies to reduce drought, flood, and cyclone impacts.

IV. Way Forward and Future Policy Implications

It has been highlighted the adverse impacts of climate change and climate induced disasters are most striking in the state of Odisha, because of its geographical and climatic conditions, their high dependence on natural resources, their limited capacity to adapt to the changing climate and weak climate and disaster policy. Although Odisha is one of the first state to have its draft on Climate Change Action Plan and Disaster Preparedness Action Plan, however, its implementation at ground level still a far way and needs concrete action on this. Further, this is a state, which is not only cursed by climate, but also out sided by the central government, funding agencies, planners and policy makers. Over the years, after independence less importance has been given to the state as well as the development strategies of the state have tended to overlook the climate change, health, poverty related issues. Further, there is a scarcity of research which can focus on different climatic and climatic induced calamity issues. Considering all the above points, there is an urgent need to focus on the climate change, disasters and their vulnerability, and adaptation and coping mechanisms among the people in the state. So that better solutions and developmental strategies can be emerged from the third world state. This study suggest for some immediate action plan and future policy recommendations as follows:

- Strong political willingness, engagement and leadership on priority for institutional arrangements for Climate Change Action Plan and Disaster Preparedness Action Plan preparation; Ease administrative coordination and interdepartmental planning, consultations and budgetary processes.
- Addressing climate change and disasters are about interacting with complex systems, so broad stakeholder engagement is required to maximise perspectives and increase robustness of analysis with public private partnership (PPP) model approach.
- An established plan can go beyond risk management to look at actions that address climate change and deliver benefits for growth and development.
- Using a detailed sector by sector approach, it is possible to search for adaptations and mitigation options that offer substantial development benefits- e.g. health, energy security, energy efficiency, growth, jobs and income generation at all levels (state, district, block and panchayat).
- Strengthen the state infrastructures, transport systems, communications, health facilities and disaster emergency services, so that in case of climate induced disasters, services can be provided without delay.
- A key challenge is to tackle specific sub-national priority issues, whilst creating the appropriate enabling environment for the implementation of national planning priorities at the state level.
- Accelerating community resilience process with gender inclusion and partnership approach.
- Incorporate community resilient plan, safety nets at panchayat level linking to governance and livelihoods.
- To establish a dynamic platform for change management at the bottom with an evolving process to reduce poverty and climate vulnerabilities.
- Enable the community to access benefits of government and non-govt schemes, and social security to improve quality of life and reduce marginalisation, distress migration linkage of families and welfare of economic excludes.
- Enable local communities to have economic and ecological gains through self-empowerment and community mobilization process.
- Acknowledge enhancement of social justice where livelihood security, food security and entitlement benefits.
- Government should provide better coping mechanism and strategies that will ensure and enlarge at local level that enhance the people with dignity, safety-net for energy conservation and use of adaptive eco restoration for vulnerability reduction to disaster, climatic changes and global warming.
- Information gaps must be filled, but they need not prevent planning. There are major gaps in knowledge and literature, and better mechanisms are needed to share current knowledge. Outreach activities and investments should be encouraged research to improve the knowledge, program and policy on climate change and disasters.

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