

COMMUNITY-LEVEL ASSESSMENT OF FLOODS AND CYCLONES IN COASTAL ODISHA, INDIA: IMPACT, RESILIENCE, AND IMPLICATIONS

India is among the countries that have been severely affected by both floods and cyclones. In 2012, the Government of India estimated that nearly 12 percent of India's land is prone to floods and river erosion (GOI 2012). In 2013, Cyclone Phailin displaced 1 million people in India including in the state of Odisha (Singh and Jeffries 2013; IDMC 2015).

Odisha is among the states in India that are most vulnerable to the effects of climate change and natural disasters—including floods, cyclones, drought, and heatwave (Ray-Bennett 2009; GOI 2012; OSDMA 2016; Patel 2016). To date, there is limited literature that assesses the health and socioeconomic impact of natural disasters on local populations.

To fill this gap, the Population Council conducted a formative research to explore the people's perceptions on impact and resilience to cyclones and floods, and to examine the state-level infrastructure and institutional initiatives to strengthen responses to these events.

Methodology

Data for this brief are drawn from a qualitative study conducted between April and June 2017 in a rural setting in the Jagatsinghpur district of Odisha, which is highly vulnerable to floods and cyclones (Map 1). Information was collected from a range of stakeholders through 24 in-depth interviews (IDI) and two focus group discussions (FGD). IDIs were conducted among community members (e.g., farmers, laborers, women with children, young women without children, and the elderly and disabled), and stakeholders at the panchayat, block, district, and state levels. The FGDs were conducted separately among adult women and men in the community.

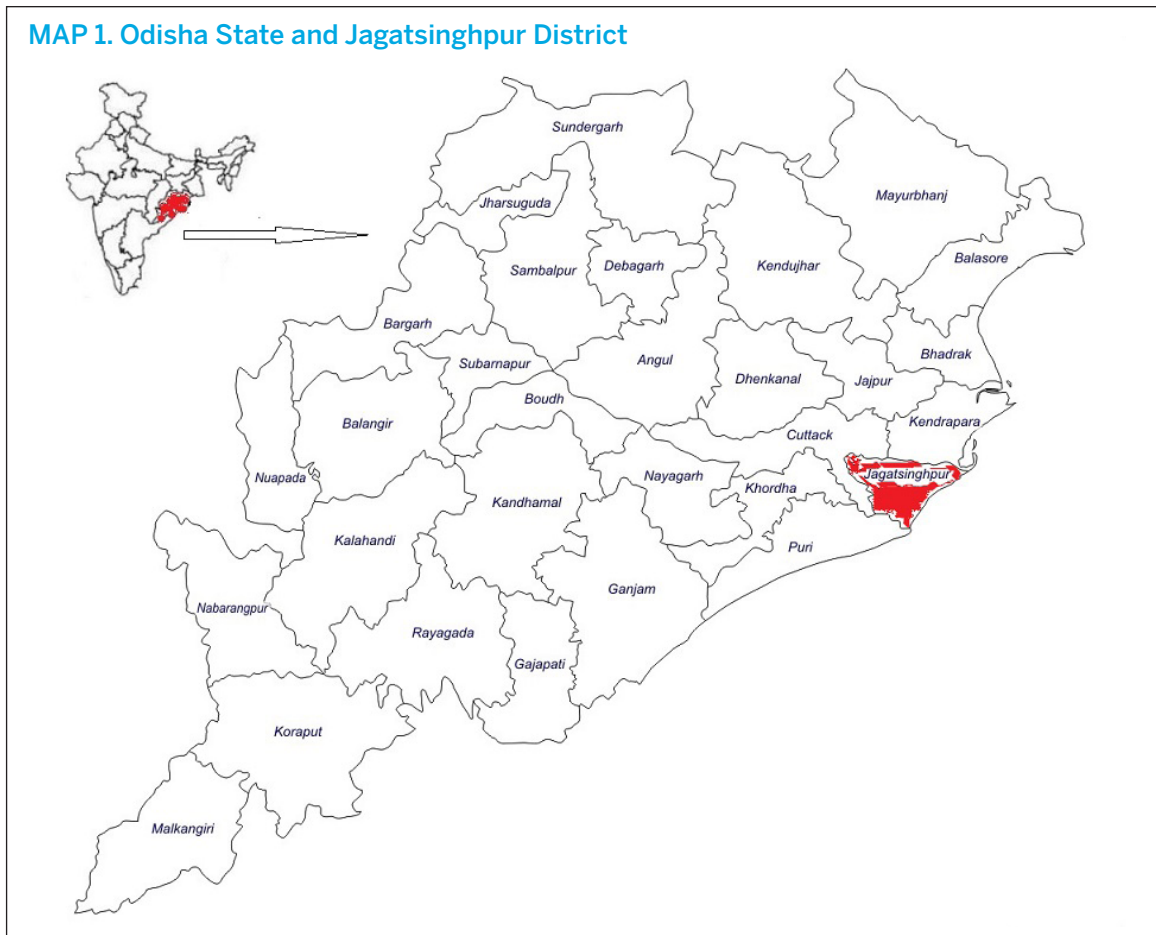


Flooding in Odisha, India. (Source: The Hindu)

A flood is an overflow of an expanse of water that submerges land, a deluge.

Cyclones are a rotating air mass cause by atmospheric disturbances around a low-pressure area. Cyclones are distinguished by swift and often destructive air circulation and are usually accompanied by violent storms and bad weather.

MAP 1. Odisha State and Jagatsinghpur District



Findings

Climate change, cyclones, and floods: Beliefs/perceptions of causes and experiences

Most participants were aware of climate change and they related climate change to deforestation, loss of mangrove cover, pollution, mining activities, factories, and construction of buildings, and roads. Many had witnessed several natural disasters, including flood and cyclone, along with uncertainty of seasons such as shorter winters, unpredictable temperature change, late onset of monsoons, and delay in the cropping season. Participants believed floods were mainly caused by heavy rainfall. They said the severity of floods had increased because of breached embankments and absence of a proper canal system to divert water.

“Starting from cyclone, flood, thunderstorm, heatwave, to lightning, everything happens in the district as it is close to the Bay of Bengal. Uncertainty of rain during the rainy season and increase of heatwave have been noticed over the years. The district experienced the super cyclone in 1999, Phailin in 2013, Hudhud in 2014, flood in 1982, 2001, 2003, 2008, 2011, 2014....”
(DEO, Jagatsinghpur)

“In our village, if heavy rain occurs, then flood happens. There is no provision of a drainage system in our area, so water stays for months. Gradually it starts smelling bad, resulting in diseases.” (FGD participant, Jagatsinghpur)

Flooding and cyclones have had a disproportionate affect on vulnerable groups, including women, children, the elderly, and disabled people, in addition to the poor and the landless.

Impact of cyclones and floods

Impact of floods and cyclones on livelihood, livestock, and other socioeconomic conditions.

Participants recounted that cyclones and floods damaged and destroyed houses, schools, property, roads, crops, trees, and tube wells, leading to heavy economic losses, while also killing people, livestock, and fish. While the super cyclone in 1999 led to many deaths, people were much more prepared during subsequent cyclones (*Phailin* in 2013 and *Hudhud* in 2014). Although there was less destruction from the cyclones in 2013 and 2014, they still had a devastating impact on people.

“Our house was completely washed away, and there were no remains of it. Our paddy crop was also destroyed completely. We had nothing except clothes. We stayed under a polythene hut for more than six months. In 2013, the main house did not collapse but the thatched roof was destroyed, the kitchen and the cattle shed collapsed. There was no food to eat for two to three days after cyclone Phailin. The crop was also badly affected. The fish pond was also submerged and all the fish were lost. The entire lot of paddy seeds was destroyed. The tube well also broke as tree branches fell on it. In the 2013 cyclone the accumulated loss for us was over INR 2 lakhs.” (Female, 20 years, IDI)

Participants said that cyclones and floods interrupted essential services such as electricity and water supply, and the transport and communication systems were halted for many days and weeks, delaying the distribution of relief aid. The absence of *pucca* (good) roads meant that roads were damaged by floods each year. Schools

were used for shelter, which affected children's education. Often recovery took up to four months, for both cyclones and floods.

Cyclones and floods affected livelihoods, according to participants. Cyclones destroyed the livelihoods of those dependent on fishing by damaging boats, fishing nets, ponds, and prawn hatcheries. After the super cyclone in 1999, cultivation of tiger prawns was affected, resulting in heavy losses to the aqua farmers, which was one of the main livelihoods of people in the area. Subsequently, tiger prawn cultivation was replaced by white shrimp cultivation. Because of floods and delays in repairing embankments, participants believed that agricultural productivity had dropped over the years.

“My house completely collapsed and we had to stay outside for a long time, with many problems. All the household items, important documents, children's books, clothes, rice, green gram, black gram, seeds were destroyed during the flood. You know how difficult it is to build a house? After building a house, when all the household belongings are destroyed by flood, it is difficult to predict the cost of loss. The cost of a bamboo is INR 50, so to build a small hut, it requires at least INR 5,000–10,000. Now you can understand what would be the cost when our house is completely destroyed (...expressed with sadness and teary eyes). We had two rooms with a long hall of thatched house, more than one quintal (100 kilograms) of rice which became completely wet. We could manage to eat a little amount of the wet rice. After the house collapsed, we got only a meager amount of INR 1500 as compensation from the government.” (Widow, 55 years, IDI)

“We lost our fish pond, two prawn hatcheries, paddy cultivation on three and half acres, and a cow after the super cyclone. If you calculate this, it would be over INR 5 lakhs. During the super cyclone



Shrimp cultivation in Padmapur, Jagatsinghpur, Odisha.



Planting of casuarina shrubs to protect from the sea waves in Jagatsinghpur, Odisha.

time we had a truckload of rice and other food items. But the rain and seawater completely destroyed the entire lot. When we returned after 30 hours we did not find anything, so to save our lives we ate green coconut, wet rice for next seven days. After seven days, the government airdropped food.” (Female, 66 years, IDI)

The 1999 super cyclone had a dramatic effect on agricultural livelihoods due to saline water ingression that made it impossible to cultivate in the following years. This led to both seasonal and permanent migration. Some seasonal migration destinations included Balikuda in Jagatsinghpur District of Odisha, and other places outside the state such as Gujarat, Chennai, Hyderabad, and Bangalore. Some even migrated to Dubai for work.

Impact of floods and cyclones on food security.

Availability of sufficient food became a major challenge after floods and cyclones. Participants talked about available food stocks getting depleted within 10 days, stored food grains getting washed away, and shops not opening for weeks. Standing crops and vegetable farming were damaged during floods, affecting the availability of food. Sometimes, people living in flood/cyclone-prone areas faced challenges in securing food for their

Floods and cyclones have affected people physically, financially, and psychologically because of the constant losses in agriculture, livelihoods and assets.

families for as long as a year. Some large families with low income struggled to meet their food requirements leading to an increase in debts. Some participants complained that food grains from the Public Distribution System (PDS) were not sufficient during floods and cyclones.

“Food is always a problem in my home. But during the 1982 flood, we went without food for many days. During the 2014 flood, we had less food for 3 to 4 days and after that relief reached to us. During that time, if anyone distributed relief, we went there to get it. People and organizations distributed biscuits and Upama (prepared from flattened rice). After the flood, people gave cooked food so we took it and I ate half, and kept half for my children. Many times, I had to stay without food because I had to feed my children.” (Widow, 55 years, IDI)

Concrete houses built under the Indira Awas Yojana and MCRC and schools built after the 1999 super cyclone have proved beneficial for people during floods and cyclones.

“Crop loss is a major challenge for us due to flooding. As the yield of grains from agriculture field is affected, my purchases from the market increases. It obviously affects my household food security and we have to compromise our food consumption.” (Male Farmer, 70 years, IDI)



Flooding in Odisha, India. (Source: Odisha360)

Impact of floods and cyclones on water and sanitation.

Participants described water, sanitation and hygiene conditions in the community being badly affected by cyclones and floods as a result of the invasion of saline water in the land area that affected drinking, cultivation, and daily life. The impact of the 1999 super cyclone was so heavy that the cultivable lands became unusable for years and people were also unable to find good sources of drinking water. When cyclones and floods hit, people tend to drink saline water because tube wells get submerged. While some people take safety measures by boiling water for drinking, others fall ill from drinking the saline or contaminated flood water. Additionally, participants said that open defecation caused contamination during floods, creating unhygienic conditions and leading to many health problems and diseases, such as fever, vomiting, diarrhea, jaundice, and typhoid, among others. Sanitation and hygiene after the 1999 super cyclone were particularly poor, as few toilets were available in villages at that time, however the situation is little better now.



List showing assistance provided by the government of Odisha for people affected by the disaster.

Summary of views from the participants about enablers and continuing challenges related to floods and cyclones

Enablers

- Proactive steps taken by the government in the form of early warning systems has proved useful in averting deaths and reducing loss.
- Social capital: Communities tend to offer the first responses themselves during cyclone and floods, through family and community groups.
- Houses provided under the Indira Awas Yojana and multipurpose cyclone rehabilitation centers have proved useful for providing shelter to disaster victims.
- Self-help groups have proved useful in assisting people with livelihood activities.

Challenges

- Availability of safe drinking water and healthcare services in the area is poor after cyclones and floods. Out-of-pocket expenditures for treatment are high and people have to travel long distances to seek treatment during and after the cyclones and floods.
- The restoration of basic infrastructures and facility (e.g., concrete roads, embankments, water and electricity supply) is not timely after cyclones and floods.
- Compensation provided for the loss and damage after floods as well as cyclones has been found to be insufficient, and awareness of flood-tolerant crops and crop insurance is low.
- Lack of resources and alternate livelihood options are putting the community under pressure because of short-term and long-term impacts of cyclone and floods.
- Food grains provided by the PDS have proved insufficient in the aftermath of cyclones and floods.
- Education is affected as schools are used as shelters.



Multipurpose Cyclone Rehabilitation Center at Padmapur village, Jagatsinghpur, Odisha.



Geo-synthetic embankment wall at Padmapur, constructed by the Odisha government with support from the World Bank.

“The coastal areas...are facing drinking water problems due to saline ingression and agricultural land is also affected by salinity due to frequent floods and cyclones in the area.” (DEO, Jagatsinghpur)

“No irrigation facilities are available here. We are completely dependent on rain water. Here, cultivation and plantation are not possible due to saline ingression. Over the years, production has gone down in our area.” (Housewife, 35 years, IDI)

“During floods, all the tube wells are submerged in the floodwater. In these conditions, the river water is the only source and people drink it after boiling it.” (FGD participant, Jagatsinghpur)

Impact of floods and cyclones on health.

Participants described how floods and cyclones caused adverse health conditions, including diarrhea, malaria, jaundice, pneumonia, vomiting, fever, colds, and skin infections, and even led to deaths. With the inundation of water—often contaminated by presence of dead bodies and open defecation—people contracted diseases and snake bites. In the aftermath of flooding, survey participants said it was difficult to find clean drinking water as

well as water for domestic use. Psychological trauma has also been reported, linked to continuous losses in agricultural livelihoods. Cases of post traumatic disorders (PTSD) and trauma have also been reported, particularly after the 1999 super cyclone.

Participants said that flooding and cyclones make accessing health care more difficult, particularly when hospital care is needed. Roads damaged by flooding and cyclones made it challenging to transport sick people and pregnant women in emergency situations to government hospitals. People had to pay out of pocket for travel expenses. Furthermore, while there is no fee for consultations at government hospitals, and some medicines are also free, participants said that people often have to buy more expensive medicines at pharmacies. They also noted that staffing was inadequate in hospitals during the time of disasters as a large number of people visited hospitals and people ended up standing in long queues.

“People were having psycho-social problems due to the flood and cyclone in the area. They were suffering psychologically because when the crops were continuously completely lost to floods, farmers are always experiencing mental stress about how to sustain their

Interpretative recommendations

A list of recommendations is outlined below to meet the needs of the population as indicated by the findings.

- **Following a natural disaster, prioritize restoring basic infrastructure and facilities**

Immediate restoration of basic infrastructures and facilities may be given priority, so that basic commodities, relief, drinking water, and health services can be accessed by the community during and after disasters. Proper sanitation facilities need to be set up to prevent the outbreak and spread of water-borne diseases during floods/cyclones. Health facilities and services need to be made accessible and affordable. It is crucial to conduct disease surveillance following a cyclone or flood. It is also important to procure medicines and medical equipment, and have sufficient medical personnel stationed at health facilities during floods and cyclones. Additionally, mental health care and counseling also need to be provided. Emphasis may be given by the district authority in development of desalination technologies in the flood and cyclone areas for providing safe drinking water to the households.

- **Provide information on flood-tolerant crops, insurance policies, and weather**

Educate communities about flood-tolerant crop varieties (e.g., rice varieties, maize, sugarcane), crop insurance, and schemes and subsidies. Flood risk insurance can lower the costs of financial damage caused by floods and cyclones. Flood-resilient crop varieties may help individuals who experience crop loss in flood/cyclone-prone areas. Additionally, provision of sufficient food grains should be available and provided through public distribution systems in the aftermath of floods and cyclones.

- **Build adaptive capacity through alternate livelihood options, employment opportunities, and skill development**

Generating alternate sustainable livelihood options needs to be given priority in flood/cyclone-prone areas as a mechanism to build adaptive capacity. In addition, these alternative livelihood options can be beneficial in the aftermath of cyclones/floods. Community members could be involved in small-scale industries and running small shops. Engage community members (women in particular) outside the agricultural sector to enhance women's work participation. Skills development, vocational training programs, and building adaptive capacity among the community members can go a long way toward mitigating the effects of natural disasters and strengthening social capital within the community.

family. There is no health facility in our area, only government health service providers came by boat and provided health services at the CHC (community health center). The nearest health center is five kilometers from the village. There is no doctor there, only a pharmacist who manages the CHC.” (FGD participant, Jagatsinghpur)

Resilience to floods and cyclones

Coping and adaptation mechanisms by the community. Participants described a number of adaptive behaviors taken by community members and measures by the government prior to, during, and after cyclones and floods. Communities tend to offer the first responses themselves, through family and community groups, with the government subsequently providing support. For example, in the wake of the super cyclone in 1999, study participants reported that the community members themselves provided help or shelter to affected neighbors, with the government later offering support through rescue and relief activities. Participants said they were better prepared during the 2013 and 2014 cyclones; they coped by migrating, borrowing food/money, skipping meals, and taking food on credit. Participants noted a strong sense of community that developed during the floods. They described how people carried sticks and torch lights to rescue people at river embankments and other areas.

Participants also said that people were forced to eat rice that had become soggy due to the floods and green coconut to cope with food shortage in the immediate aftermath of cyclones or floods. Participants described instances of people eating one meal a day, with food distributed equally among other family members (particularly among children and elderly persons).

After being caught unprepared for the 1999 super cyclone, community preparedness for cyclones, especially during the peak period (between August and November) has improved. Participants said

that mechanisms to save human lives and cattle have been given priority. People have become more proactive in taking preventive measures, such as storing dry food like flattened rice, jaggery, biscuits, potatoes and other vegetables, stoves, kerosene and drinking water. When floodwater increases beyond a danger line, people try to move to a higher place (e.g. pucca houses of neighbours or public building such as a multipurpose cyclone rehabilitation center [MCRC] and/or school) with dry foods. After the devastation in 1999, people who could afford them built pucca houses with raised foundations. In their houses, they built a shelf (plank) for keeping important possessions dry.

Other adaptation measures described by participants were raising the platforms of tube wells, building toilets higher off the ground, and growing plants to protect houses from strong winds during cyclones. Increased attention was put on preserving coastal mangroves to protect villages from the effects of cyclones. Community members keep themselves updated and informed about impending floods through television and newspapers. For livelihood and food security, participants report that some people have grown alternate crops such as black gram, some have switched to cultivating white shrimps rather than tiger prawns, while others have taken up alternative occupations, migrated, borrowed food/money, or have taken on debt.

“The super cyclone in 1999 was an eye opener for our area. When we hear about a cyclone, we store dry food, drinking water, polythene, winter clothes. If the speed of the wind increases constantly then we leave home and go to a safer place. We leave the cattle open so that they can go to an open and safe place, mainly a school building. Now, we have built a semi-pucca house with a cement wall and thatched roof for our family. We have also planted acacia, eucalyptus, and casuarina near the house to protect from the wind. We purchased a TV

and newspaper in our home so we receive disaster-related information. We also raised the foundation of our house for protection from floodwater and constructed a high rise tube well in the house for drinking water. In addition, we keep polythene and rope in our home, store kerosene, keep important documents in a box for safety, and stored food during the months of August to November, because of the prevalence of cyclone particularly in these months.” (Female, 20 years, IDI)

“Rescuing people is the immediate step undertaken. We have a county boat to rescue people in submerged areas and keep them in a school building. Necessary arrangements are also made to move livestock to high ground for their safety. Priority is given to the scheduled caste community because most of them are poor and have small thatched houses. There are chances of their houses collapsing.” (Male, 55 years, IDI)

Measures taken by the government

Some of the government initiatives and measures, such as the construction of multipurpose cyclone rehabilitation centers (MCRCs) in the flood and cyclone-prone areas, were found to be beneficial and highly appreciated by people. Government stakeholders explained that the shelter management committee does a vulnerability assessment to map different people in the community to prioritize rescue and evacuation operations during disasters. Through the vulnerability assessment map, houses that have disabled residents, pregnant women, children, and the elderly are marked red for immediate attention. A warning group informs people in villages to go to the MCRC ahead of cyclones/ floods, and priority is given to the poor, as many of them live in houses made of thatch that cannot withstand the cyclone winds. The panchayat stores food for people in times of emergency. Additionally, the government asked the PDS dealer to be prepared for eventualities.

However, community participants and even the village head raised issues of maintenance, human resources, and monitoring of these MCRC shelters. Stone embankments were constructed by the government in some places to prevent seawater and floodwater from entering the village, however according to community members, in many places the stone embankments were damaged.

“At the time of flood, no support came from government or nongovernment sources. But when the flood water receded, the government sent relief and the NGOs and private people also distributed relief after only four days.” (Male, 72 years, IDI)

“During 2013 and 2014, people had Indira Awas houses, the multipurpose cyclone rehabilitation center, and school buildings. So people stayed according to their convenience after they heard about the cyclone in the mike announcement. Due to the fear of the super cyclone in 1999, people stayed in safe places and also stored dried food like flattened rice, biscuits, etc. with them. We knew the difficulties encountered during the super cyclone.” (FGD participant, Jagatsinghpur)

After the floods, participants said that medical teams visited the village, offered free treatment, and distributed medicines. The government and nongovernmental organizations were involved in clean-up operations after the disasters, which included putting bleaching powder in wells, distribution of halogen tablets, and burning of garbage. Self-Help Groups (SHGs) were beneficial and their financial condition also improved. SHGs assisted people with fish cultivation, prawn/shrimp cultivation, paddy cultivation, the rice business, and mid-day meals in schools. The agricultural department was involved in conducting meetings on cultivation and provided paddy seeds and fish seedlings to the SHGs.

Other strategies the government used to help people during floods and cyclones included early weather information and updates on natural disasters, communicated to the special relief commissioner and the Odisha State Disaster

Management Authority (OSDMA). The district collector and organizations such as the National Disaster Response Force (NDRF), the Central Industrial Security Force (CISF), the Airport Authority, and hospitals were informed about the weather through SMS. Regular weather updates were provided to the print and electronic media. Warnings were disseminated through a digital cyclone detection center. Satellite technology was improved and forecast on lightning and thunderstorm were available using Doppler radar.

Government participants said that preparedness of the district emergency officer (DEO) is crucial to cope up with any disaster. Prior to a disaster, the district emergency office organizes a preparatory meeting with all the line departments. Rescue, operation, and first aid teams are formed. Fifteen men and 10 women were trained as part of a team to offer their services during a disaster. With technological advancements, people were informed well ahead of cyclones *Hudhud* in 2013 and *Phailin* in 2014, and had time to evacuate to safe places with minimum casualties. The government also provided *pucca* houses under the *Indira Awas Yojana* program to families below the poverty line, which was considered beneficial for people. However, the amount provided under different compensation schemes was found to be insufficient.

“Generally, we intimate early weather information to the special relief commissioner and OSDMA about major disasters. We inform them about cyclones at least 5–6 days earlier, regarding heatwave 2–3 days earlier, and during monsoon we provide information about heavy rain two days earlier. Apart from this, we also provide regular weather updates to press, both print as well as electronic media, about the daily temperature (maximum and minimum), rain forecast, etc., so that the people can be aware of the weather conditions. We are strengthening the observational aspects, how to provide weather-related information to the people so that they can be aware. We are now planning to establish

meteorological observation centers in all the district headquarters and it is now in the approval stage, so by next year we will be able to establish it in all the districts. We have already installed 37 automatic weather stations and 177 automatic rain gauge systems.” (State Meteorological Department, Bhubaneswar)

Further, the state nodal officer, climate change, highlighted that the Odisha government has initiated pro-climatic policies and adaptation strategies for agriculture.

“The state government has initiated more pro-climatic policies and started adaptation measures to address challenges posed by floods. The government is providing more lift irrigation facilities, creating captive irrigation projects, promoting shallow tube wells. The Government of India recently launched the Pradhan Mantri Krushi Sinchai Yojana (PMKSY) with the slogan of ‘More crop per drop.’ We are planning micro-irrigation, how to use the available water resources in a scientific and judicious way to get maximum benefit from limited water resources. This is the main focus of the Odisha government right now. The department is focusing on a Land Use Survey besides focusing on Paramapragat Krushi Bikash Yojana (PMKBY) to promote organic farming.” (State Agricultural Department, Bhubaneswar).

The views received from communities nevertheless show a mixed picture about government interventions and schemes. People said that additional government interventions are needed particularly focusing on agriculture, irrigation, and drinking water facilities. Participants also said that very few people were aware of the existing government programs, schemes, and benefits, and these often do not reach the community level.

References

Government of India (GOI). 2012. *Disaster Management in India*. GOI-UNDP project on disaster risk reduction program (2009-2012). Ministry of Home Affairs, GOI.

Internal Displacement Monitoring Centre (IDMC). 2015. *Global Estimates 2015: People Displaced by Disasters*. Geneva: IMDC.

OSDMA. 2016. State Disaster Management Plan 2016. Bhubaneswar: Government of Odisha, OSDMA.

Patel, S.K. 2016. "Climate change and climate-induced disasters in Odisha, eastern India: Impacts, adaptation and future policy implications," *International Journal of Humanities and Social Science Invention*, 5(8): 60–63.

Ray-Bennett, N.S. 2009. "Multiple disasters and policy responses in pre- and post-independence Orissa, India," *Disasters*, 33(2): 274–290.

Singh, D. and A. Jeffries. 2013. *India Cyclone Phailin in Odisha October 2013. Rapid Damage Needs Assessment Report*. Government of Odisha.

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