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## Human perception and response to flood hazards: A case study of Baitarani basin in Odisha

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### Abstract

Flood is one of the calamitous events which disturbs not only the life pattern of the human beings but also destroys their lifelong stored properties every year. Floods are high stream flows, which overlap natural or artificial banks of a river or a stream and are markedly higher than usual as well as inundation of low land. Sometimes copious monsoon rains combine with massive flows from the rivers, and then the floods indeed become calamitous. Through geophysical studies, it has been found that more than one and half billion of people on the Earth planet reside on riverside or coastal flood plains where they produce 1/3 of world's food production. At least some fraction of these plains go under flood water one or the other day, hence causing widespread losses to human lives, devastated homes and heads of cattle dead, destroy agricultural crops and disrupt the communication links such as railways, roads as well health hazards. Even after the receding of floods, it takes several months or even years before the community comes to the pre-flood level. In flood control and management, the strategy should be reduced the intensity of floods. Indiscriminate occupation of, and economic activity in coastal areas and flood plain zones should be regulated.

**Keywords:** Flood hazard, inundation, health hazard, geophysical study, flood intensity, flood calamity, flood control, flood plain zones

### Introduction

Amongst all the natural disasters afflicting to Odisha, floods are the most frequent and devastating one. Above 75% of the annual rainfall is concentrated over a short monsoon period of four months. While the coastal plains are very flat, the slopes in the inlands are precipitous. This leads to heavy siltation, flash floods and poor discharge of flood waters into the sea and thus the embankments are breached with alarming frequency. In the Baitarani basin, damages due to floods which have a common delta with river Brahmani and Mahanadi where floodwaters intermingle, and, when in spate simultaneously, wreak considerable havoc. The problem is further accentuated when flood synchronises with high tide. The silt deposited constantly by these rivers in the delta area raises the bed levels and the rivers often overflow their banks or break through new channels causing heavy damages. Floods and drainage congestion also affect the lower reaches and also cause floods.

The entire coastal belt is prone to storm surges, which is usually accompanied by heavy rainfall thus making the estuary region vulnerable to both storm surges and river flooding. Few blocks at the middle portion of Odisha are prone to flash floods. Various factors contribute to the high degree of vulnerability and damages in the basin.

Above 75% of the rainfall in the basin occurs within four months, which also coincides with the main cropping season. High population densities in the flood-prone coastal and delta regions, increased encroachment in the flood plains because of comparatively better livelihood opportunities and development are important contributors to the increased vulnerability to flood. Poor socio-economic condition of the majority living in the flood plains, and the local economy being primarily dependent on the monsoon paddy add to the vulnerability of the community.

In flood disaster situations, a quick rescue and relief mission is inevitable; however considerable damage can be minimized if adequate preparedness levels are achieved. Indeed, it has been noticed in the past that as and when attention has been given to adequate preparedness measures, the loss to life and property has considerably reduced. Preparedness measures, the loss to life and property has considerably reduced. Preparedness measures, the loss to life and property has considerably reduced. Preparedness measures such as training of

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role players including the community, development of advanced forecasting systems, effective communications and above all a well-networked institutional structure involving the government organisations; academic and research institutions, the armed forces and the NGOs would greatly contribute to the overall disaster management of the region.

Recent trends have revealed that the community as an institution in itself is emerging as the most powerful in the entire mechanism of disaster administration. In event of actual flood disasters, the community, if well aware of the preventive actions it is required to take, can substantially reduce the damage caused by the disaster. Awareness and training of the community is particularly useful in areas which are prone to frequent disaster. It is laudable; the efforts in certain areas where communications have formed their own organisations which are take the right initiative in such situation. One such community based organisation is the Village Task Force formed. The village Task Force has been trained in emergency evacuation and relief within the village. It is elected by the people themselves and during disasters it serves as the nodal body at village level which has to mobilize resources for the community and disseminate necessary information passed on by the outside agencies. While the community as an effective Institution is yet to take shape in this country with low literacy levels and widespread poverty, considerable efforts are being made to form and strengthen community based organisations at grass root levels.

The study of human response to environmental extremes provides a useful theme and attracts researchers from many disciplines within the social sciences (Sewell and Graham, 1969). There have been many attempts to synthesize human response and adjustment to disaster only in its aftermath or as it has occurred. Perception and response survey during this study is aimed at finding people's perception and responses towards the flood hazard. In the light of these responses, recommendations have been made for adjustments in the physical and human system.

### Objectives

This study attempts to find out the human perceptions and their responses about the flood hazard in the Baitarani basin, Odisha.

### The study area

The river Baitarani is one of the important east-flowing rivers of peninsular India located in northern Odisha. The river is flashy in nature having a total length of 355 km. and an area of 10,982 km<sup>2</sup>. The basin is situated approximately between of 85° 10' and 87° 03' East longitude and between 20° 35' and 22° 15' north latitude. The basin is surrounded by the Brahmani basin on the south and west and Subarnarekha basin on the north, the Budhabalanga and the Bay of Bengal on the east. It covers an area of 10,982 km<sup>2</sup> of which 10,246 km<sup>2</sup> (93.3%) lies in Odisha and 736 km<sup>2</sup> (6.7%) in Jharkhand. The northern portion comprises of rugged hilly terrain. The basin perimeter measures 622.22 km.

The geological setting of the hill catchment of the basin mostly includes rocks of Pre-Cambrian formation. The plain part of the basin is characterized primarily by sands with admixture of cobble and boulder in its upper part and alluvial soils, mostly silt and clay formed of recent alluvium, in the lower part.

The Baitarani river receives a number of small tributaries along its course. The main tributaries of the river are the Kangira river, the Aradei river, the Khairi-bandhan river, the Deo river, the Kanjhari river, the Sita river, the Musal river, the Kusei river, the Salandi river which meet together and flow as Baitarani in Odisha. The tributaries have considerable contribution towards the discharge of the main stream, Out of which the tributaries, Salandi river and Khairi-bandhan river, are solely responsible for most of the sediment contribution to the Baitarani river.

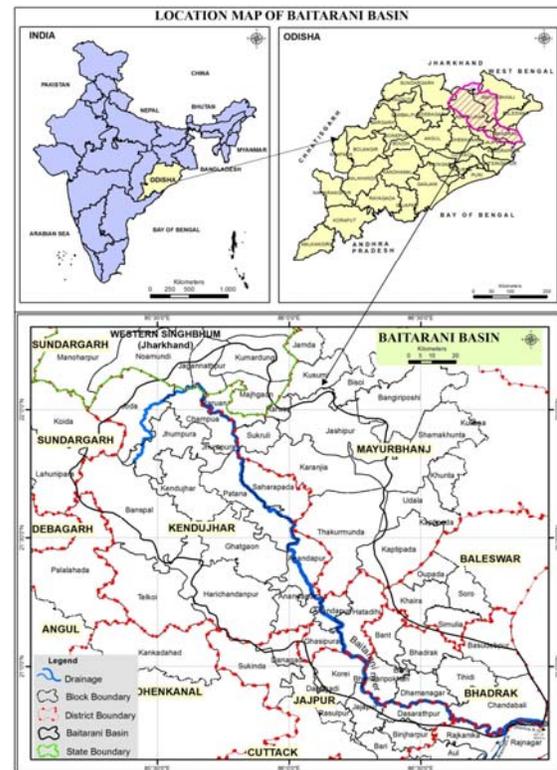


Fig 1

### Database and Methodology

To achieve the objectives of the study both primary and secondary sources were used. The primary source was considered most appropriate for necessary data collection. The primary source was considered most appropriate for necessary data collection. The primary data was collected from the general public of nine selected villages in the Baitarani basin. For this purpose a standard questionnaire was designed to collect the relevant data. Interviews with the general public and observations were also undertaken.

As the secondary data is concerned, it includes the report, journal, books etc of various line agencies. Ultimately the collected data and information were classified and analyzed keeping in view the existing socio-economic and physical environment of the study area.

Consequently, the conclusion were drawn and presented in the form of map, tables and description. Analysis was conducted through computer accessories.

### Human Perception and Responses to Flood Hazard

To find out the human perception and response to flood hazard, a model questionnaire prepared by the scholar has been used during field survey (Table 2). For this purpose, nine villages were selected which were affected during

minor flooding. The respondents were selected randomly, which make 2095 of the total population. Their responses were tabulated, analysed and the result has been drawn.

**The hazard as a natural and inevitable event**

In response to this perception, none of the respondent denies the existence of flood hazard. They were of the opinion that flood is a recurrent phenomena in the study area. When asked about the perception to accept the flood hazard as a natural and inevitable event, majority of the respondents said that whenever flooding occurs, we can only pray for the retreat of flood as it is in the hands of Almighty God, who protect us from such calamities. The respondents of Bella's villages said that we were trapped by the floodwater from all sides. Flood water entered into the houses and caused great damage. The respondents replied that we took protection over the roof of the houses and pray all the time for the flood receding. In Shyamsundpur (82%), Govindpur (87.5%), Dakshinakorna (85.7) and Kamardihi (82.8%) expressed that we can only pray in such a situation, while respondents of other villages also expressed the same response (Table 3). Many of the respondents said that we do nothing; we only wait for the retreat of flooding. We only try to transfer our belongings either to roof of the houses or any other safe place, but we do not leave our houses. They said that they get high floods almost in every five years. In Fakirpur (35.7%), Hirapur (31.6%), Bajarpur and Urasahi each (28.5%) said that we do nothing as flood occurs here recurrently.

When asked about the perception that flood hazard is inevitable but it is controllable by taking some structural adjustments (Table.2); in village Urasahi (82.9%), Govindpur (87, 5%) and Bajarpur (51.4<sup>00</sup>%) respondents were of the opinion that government should construct embankment and dykes to restrict floodwater within the channel limit. Whereas some of the respondents replied that reservoir and barrages can't stop flooding, rather it is a cause off loading. It was especially realized in village Shyamsundarpur (17.5%) that was severely affected during 1992 flood that due to the release of stored floodwaters at Hadagarh barrage, whole of the village was under water for almost two weeks. Similarly, the respondents of Bella have also expressed the same feelings, as they believed that due to the sudden opening of the reservoir gates we suffered more as compared to the downstream villages. In response to modify the causes of flooding by the afforestation in the catchment areas, the respondents of Chardia (60%), Dakshinakorna, Fakirpur and Kamardihi (71.4%) and Shyamsundarpur (82.5%) were in favour of the afforestation not only in the catchment areas but also along the bank of the river Baitarani, Salandi and Genguti. The reason for this response is to be high in those villages where the literacy ratio is comparatively high, so the people are aware of the benefits of the long term sustainable solution of the flood control. Most of the respondents replied that there must be some permanent solution for reducing the adverse affects of flood hazard.

**Table 1:** Model Questionnaire

| S.L. No | Hazard perception   | Common response  |
|---------|---|--|
| 1       | The hazard exists at all                                  | Do nothing e.g. It can't happen here. It happens 20 years ago but it will never strikes in the same place again.   |
| 2       | Accept the hazard as a natural and inevitable event       | Do nothing e.g. we get floods recurrently.<br>Pray e.g. it's all in the hands of God.  |
| 3       | Hazards are inevitable, but controlled                    | Modify the causes of flooding e.g. Forest plantation in the catchment areas.<br>Modify the flood level e.g. Building reservoirs, embankments/dykes & barrages etc to control the river in its channel.   |
| 4       | Hazards are inevitable, but the effects can be controlled | Reduce the damage potential e.g. Warning systems; community awareness programs; evacuation procedures, special building designs or land use zoning etc.<br>Leave the area e.g. seasonal nomadism; move with friends or family; permanent migration.<br>Plan for the damage & losses e.g. Flood insurance.<br>Spread the losses across the community e.g. Disaster relief funds; Govt. subsidized insurance, international emergency relief.<br>Bear the losses e.g. Use savings. |
| 5       | Some hazards are made or intensified by the people        | Alter human behaviour & land use patterns e.g. Land use Zoning, stop erosion; change of social, political & economic factors   |

Source: Field survey by the Researcher

**Hazards are Inevitable, but the Effects can be controlled?**

Table 4 indicates that majority of the respondents were in favour of both structural and non-structural adjustment. Some of them were in favor of improved flood warning system. However, they were dissatisfied with the warning system given by the civil administration about flooding. Some respondents were found interested in community awareness programs. However, they were not in favour of adopting special building design. In the study area majority of the people are living below poverty line; therefore they are unable to construct their houses according to the building codes and design. Similarly, some respondents oppose the idea of land use planning and regulations as they said that it is not possible to shift to other places.

In village Fakirpur (80%), Kamardihi (78.6%), Urasahi (71.4%), Dakshinakorna (71.4%) and Chardia (60%) respondents expressed that flood-warning system should be improved as well as the government should introduce community awareness programs at the village level. The respondents of Bella especially complain about flood warning system. They said that in spite of living very near to the Bhadrak city and Hadagarh dam, the government machinery do not inform us well in time. In response to leaving the area either permanently or seasonally, only a few respondents favored. One reason for such a poor response was the emotional attachments to their ancestral places as they expressed that it is our property, also our forefathers were living here. No data was recorded for leaving the area in village Chardia, Govindpur and Hirapur. In Fakirpur 25%

and Bajarpur 7.1% said that if government provides shelter then they are ready to leave the area. Another reason for the positive response was that the respondents were living in kasha houses made of mud. Hence they demanded that government should construct pucca houses for them. However, the respondents in village Chardia (20%), Dakshinakorna (14.3%) and Kamardihi (10%) were in favour of flood insurance. They said that it is not possible due to low income in our country but still flood insurance is necessary if there is no way out. The reason for favour of god insurance was that majority of the respondents were educated in these two villages. In other Villages no one was

in favour of insurance schemes for the flood affectees. When asked about the disbursement of disaster relief funds, an over helming majority of respondents in Hirapur (90%), Bajarpur (84.3%) and Govindpur (75%) favored relief funds for the flood affectees. They blamed government officials that they normally interfere in the distribution of relief. As a result, the relief could not reach to the target population. In these villages majority of the respondents were illiterate, who show their narrow approach to-wards selecting a short-term solution of the problem. In response to bearing of losses, the respondents said that they are very poor and can't bears all the expenses by themselves.

**Table 2:** The hazards as a natural and inevitable event. Hazards are in evitable, but controllable

| Response                                     | Urasahi | Chardia | Govindpur | Dakshinakorna | Kamardihi | Shyamsundarpur | Hirapur | Fakirpur | Bajarpur |
|--|---------|---------|-----------|---------------|-----------|----------------|---------|----------|----------|
| Do nothing; e.g. we get floods in every year | 28.5    | 25      | 12.5      | 14.3          | 17.2      | 18             | 31.6    | 35.7     | 28.5     |
| Pray e.g. its all in the hands of God        | 71.5    | 75      | 87.6      | 85.7          | 82.8      | 82             | 68.4    | 64.3     | 71.5     |

Source: Field survey by the Researcher

**Table 3:** Hazards are inevitable, but controllable

| Response   | Urasahi | Chardia | Govindpur | Dakshinakorna | Kamardihi | Shyamsundarpur | Hirapur | Fakirpur | Bajarpur |
|--|---------|---------|-----------|---------------|-----------|----------------|---------|----------|----------|
| Modify the causes of flooding e.g. afforestation in catchment areas    | 17.1    | 60      | 12.5      | 71.4          | 71.4      | 82.5           | 50      | 71.4     | 48.6     |
| Modify the flood level e.g. build reservoir, embankment & barrage etc. | 82.9    | 40      | 87.5      | 28.6          | 28.6      | 17.5           | 50      | 28.6     | 51.4     |

Source: Field survey by the Researcher

**Some hazards are made or intensified by the people**

The response of intensifying the flood hazards, a few respondents said that there should be ban on living in the flood prone areas. However, in Kamardihi 28.6%, were in

favour of ban on living in the flood prone areas. Infact most of the respondents in this village were literate, therefore, they

**Table 4:** Hazards are inevitable, but the effects can be controlled.

| Response   | 1    | 2  | 3  | 4    | 5    | 6    | 7  | 8    | 9    |
|--|------|----|----|------|------|------|----|------|------|
| Reduce the damage potential e.g. warning system; community awareness programs; evacuation procedures; special building designs; land use zoning etc. | 71.4 | 60 | 25 | 71.4 | 78.6 | 42.5 | 10 | 80   | 8.6  |
| Leave the area e.g. seasonal nomadism; move with friends or family; permanent migration etc  | 2.9  | 0  | 0  | 2.9  | 7.1  | 25   | 0  | 2.9  | 7.1  |
| Plan for the damage & losses e.g. flood insurance  | 7.1  | 20 | 0  | 14.3 | 10   | 0    | 0  | 0    | 0    |
| Spread the losses across the community e.g. disaster relief funds, Govt. subsidized insurance; International emergency relief                        | 15.7 | 20 | 75 | 4.3  | 2.9  | 32.5 | 90 | 15.7 | 84.3 |
| Bear the losses e.g. use savings   | 2.9  | 0  | 0  | 7.1  | 1.4  | 0    | 0  | 1.4  | 0    |

Legend: 1: Urasahi 2: Chardia 3: Govindpur 4: Dakshinakorna 5: Kamardihi 6: Shyamsundarpur 7: Hirapur 8: Fakirpur 9: Bajarpur

Source: Field survey by the Researcher

**Table 5:** Hazards are made or intensified by people.

| Response   | Urasahi | Chardia | Govindpur | Dakshinakorna | Kamardihi | Shyamsundarpur | Hirapur | Fakirpur | Bajarpur |
|--|---------|---------|-----------|---------------|-----------|----------------|---------|----------|----------|
| Ban on living in flood prone area                        | 7.1     | 15      | 0         | 7.1           | 28.6      | 0              | 0       | 7.1      | 2.9      |
| Stop erosion   | 28.6    | 10      | 6.2       | 40            | 14.3      | 19.2           | 10      | 5.7      | 2.9      |
| Alter political, social and economic factors of the area | 57.2    | 75      | 81.3      | 50            | 57.1      | 68.3           | 65      | 85.7     | 65.6     |
| Do not express   | 7.1     | 0       | 12.5      | 2.9           | 0         | 12.5           | 25      | 1.4      | 28.6     |

Source: Field survey by the Researcher

were fully aware of the physical adjustment, however they said that in future government should ban on further encroachments in the flood prone areas. In response to stop erosion in the flood prone areas, in village Dakshinakorna (40%) and Urasahi (28.6%) respondents said that government said take some concrete steps to control the erosion (Table.5)

**Findings of the Study**

Following are the main findings of the study,

- Field study revealed that nobody denies the occurrence of flood hazard.
- Majority of the respondents were of the view that although hazards are inevitable but by adopting some protective measures, floods can be reduced.

- Respondents blamed the agencies for proper warning.
- The respondents did not accept the idea of land use planning and adopting design codes for the construction of houses in flood prone areas.
- The studies also revealed that majority of the respondents were not ready to migrate either on permanent or seasonal basis to safe areas.
- The interference by the government officials and political leaders during the disbursement of relief was also noted in some villages.
- The study revealed that, majority of the people said that we are unable to protect our self from floods.
- The respondents admitted that mankind is also a source of accelerating the flood hazard.
- It was found that most of the respondents were in favour of changing the socio-economic condition of the area

### Recommendations

The following recommendations are put forward in order to reduce the adverse effects of flood hazard.

#### Improved flood forecasting and warning system

The National Flood Forecasting and Warning Bureau should be well equipped with the improved techniques including the installation and up-gradation of various facilities such as wider range RADAR, telecommunication and satellite receiving systems; improved warning dissemination through radio, television, newspapers, telephone, fax, e-mail, internet and special warning system, upgraded data collection system and better prediction technology for flood warning. Also it is important for the civil administration of the concerned area to issue flood warning within limited time. With the application of modern techniques, they will be able to communicate reliable and advanced warning to the people of flood prone areas. The receipt of early warning will allow the flood hazard coordinating bodies and the general public to undertake more effective measures to cope with the flood threat (Gunny 1983).

#### Improved Communication and Infrastructure Network

The important aspect of the communication network is the effective evacuation of the people who are living in the flood prone areas, especially road network and bridges over the river should be constructed on priority basis (Gunny 1983). All communication links with flood prone areas should be examined throughout the year and especially before monsoon season, so that they would function without creating problems during flooding.

#### Community involvement and awareness programs

The government and affected communities are interdependent. The government should involve the affected communities not only in the planning process but also it is necessary to arrange some awareness programs in the flood prone areas. For this purpose, awareness programme should be held periodically. It is also very necessary to incorporate awareness programs in the syllabus for school going children. Community should also implement certain measures of self-help hazard reduction activities. For this purpose community should be better equipped with natural hazard situation. They should form Community Based Organizations (CBOs), and Village Based Organizations (VBOs) to undertake the measures. Moreover, the commu-

nity should built linkages for exchanging information among them and feed it to the higher-level authority.

#### Proper compensation policy

During field survey, it was observed that the affectees were not compensated properly, People used unfair means to get the compensation. Similarly the compensation price does not full fill the demands of the affectees. Such compensation policies should be introduced that every affectees could get the compensation according to their need with fair game. The disbursement of money should be distributed by involving the representatives of OSDMA (Odisha State Disaster Management Authority).

#### Construction of dykes and embankments

The construction of dykes and embankments along the river courses are utmost required, particularly near Bajarapur, Kamardihi and all other important villages. These dykes will ultimately control further bank erosion (Mustafa 1998).

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