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Operational Research to Support Mainstreaming of Integrated Flood Management under Climate Change

Volume 6b

Community Survey Report: Brahmani-Baitarani

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Deltares in association with RMSI and JPS

Cover photo:

Panchayat constructed bridge across Gandak River in Sonpur and community consultation in Odisha and Bihar

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Abbreviations

ADB	Asian Development Bank
BB	Brahmani-Baitarani
BG	Burhi-Gandak river basin in Bihar
CBO	Community Based Organization
CHC	Community Health Centre
CSR	Corporate Social Responsibility
CWC	Central Water Commission
DDMA	District Disaster Management Authority
EWS	Early Warning System
FGD	Focus Group Discussion
IFM	Integrated Flood Management
IMD	Indian Meteorological Department
NGO	Non-Governmental Organization
NH	National Highway
NRSC	National Remote Sensing Centre
OBC	Other Backward Classes
PHC	Public Health Centres
RFIS	Reliance Foundation Information Services
SC	Schedule Caste
SDMA	State Disaster Management Authority
ST	Schedule Tribe
WRD	Water Resources Department

Units

MWh	Mega Watt hour – unit of Energy
m	Metre – unit of Length
cm	Centimetre – unit of Length
mm	Millimetre – unit of Length
Cumec	Cubic meters per second – unit of Flow
km	Kilometre – unit of Length
Sq.Km	Square Kilometres – unit of Area

Executive summary

This community report is prepared as part of the PATA-8089 IND Operational Research for Mainstreaming Integrated Flood Management under Climate Change Phase II. The objective of this operational research project is to demonstrate that flood risks can be reduced through a broad mix of flood management measures, typical for the Indian context, with specific considerations for Climate Change. The project also aims to demonstrate to central and state governments the benefits of such an integrated flood management and planning process, and to provide guidance on such planning process, to translate results into updated CWC guidelines and regulations relevant for future DPR approval.

The key focus of the community sub-component of this assignment is to assess the flood-related issues the community is facing and their needs, and develop a proposal for mainstreaming the community needs and initiatives into IFM and reflect this in an inclusive IFM planning process.

The methodology adopted for understanding the community needs and problem include consultations and household survey. The analysis of the information collected through these field based activities was supplemented by secondary data including census data, hazard and loss data available at the state.

There are 12 districts and 122 talukas in the BB basin with a total population of 19.9 million and has a population density of 314 person/sq km. The density of population is high in the downstream of the basin compared to up and midstream. The basin constitutes substantial Schedule Caste (SC) and Schedule Tribe (ST) population (40%). The districts in the basin have higher literacy rate compared to the state average and the new generation tends to attend school. The average household size is 4.1 person with SC and ST with higher than the average household size. About 21% of the population is constituted by age <6 and >60. The house type constitutes 70% kutcha houses, and rest are semi pucca and pucca houses. The community in the basin mainly depends on agricultural activities in general with urban population depend on service sector. Most of the rural households keep few livestock (cattle, goats, and pig) and poultry as assets. There is substantial number of households in the income group of INR 3,000 - 5,000 and 5,000 - 10,000 per month. The house type is not reflecting the economic status of the community as a substantial number of people living in kutcha houses have a middle income.

BB basin has intermittent embankment and people are also living on the river side of the embankment. In general, the houses are in elevated area with agricultural fields in low lands. The rural villages in the basin are characterised by poor sanitation and health facilities and poor road access.

Floods occur almost every year in the State. State has reported both flood and drought events in year 2009, 2010, 2011. There are some villages in the basin which experienced more than one flood event a year. Floods occur due to heavy monsoon rain and well as due to the cyclonic depression. Floods cause heavy damage – loss of life: human and livestock casualties and loss of agricultural crops. Flood is more extensive and regular in the downstream of the basin which is densely populated. Large number of houses experience < 1 m flood during heavy floods and agricultural field experience 1-2 m flood height. The flood water normally stays in low-lying agricultural land of 10-12 days and residential areas for 3-5 days. Apart from flood waterlogging is one of the key

environmental problem and both midstream and downstream stretch of the basin experience this. Other problems include lack of water after rainy season due to fast runoff, sand casting of agriculture field during heavy flood and saline intrusion in the lower reaches. Flood and waterlogging also cause health problems including vector and water borne diseases. Flood often occurs along with continuous rain and there are inadequate shelters in the basin.

Community are of the opinion that small floods in the start of Rabi season is good as it not only bring silt to improve the fertility of the soil but also help to improve the availability of water for Rabi crops as many part of the basin face water shortage after the rainy season. But long standing flood destroy the crops and reduce the yield. It affects livestock also.

Communities are of the preference of having flood protection structures (construction of dikes) and expect government to support in developing flood proofing of houses. Awareness on agriculture insurance is poor and only 14% suggested that there should be agriculture insurance to protect their crops from flood.

Even though communities are aware of flood, the level of flood preparedness is not sufficient. The village level Disaster Management (DM) committees formed as part of the government initiatives across the state is not active in most of the villages. There exists "*Palli Sabha*" (Gram Sabha – community meetings at local body) in most of the villages to discuss about the development issues of the village. But these meetings hardly discuss and suggest solutions for the flood issues.

It is important to understand the community specific needs and problem and this needs to be integrated in the IFM planning process. The key elements that need to consider while developing the strategies includes:

- Flood hazard occur almost every year and cause heavy loss of livelihood and asset. There is high casualty of human and livestock. Flood occurs more than once a year in some villages in the basin.
- There is high population density in the downstream of the basin which is highly vulnerable to flood.
- It takes about 10-12 days for flood water to recede from the agricultural land. The settlements are mostly in elevated area but still get affected by flood.
- The community needs and problems are distinctly different in the up-, mid- and downstream sections of the basin.
- Basin level coordination is required for effective flood management.
- Waterlogging is a key problem in midstream and downstream parts of the basin. Other than that the downstream is characterised by sand casting and saline water intrusion while midstream area face water shortage after rainy season.
- Poor sanitation, lack of drinking water, availability of fodder and shelters are the key issues community face during flood season.
- The community preparedness for flood risk management is poor even though the level of awareness on flood risk is reasonably high.

Following are the key suggestions for developing strategies for community involvement in IFM activities:

Planning and implementation of mitigation measures

- As community needs and problems are very specific to river basin. The State WRD and CWC should carry out community need assessment priority to any major intervention projects
- The State WRD and CWC should make it mandatory to conduct community consultations to ensure acceptance of community before finalisation of any project to implement.
- SDMA should prepare flood hazard map and publicise so that community will have a good understanding of the flood risk of area they are living of investing for businesses.

Preparedness

- SDMA with the support of local administration and DDMA should empanel local NGOs/CBOs and should engage them for awareness (for preparedness) and for sensitizing on flood risk at local level. The NGOs/CBOs can be effective means for mobilising communities and community based activities for flood management at local level.

  SDMA with the support of local administration and rural development departments should devise incentive mechanism and ensure that local DM committees are active and follow the defined roles and responsibilities of the sub task committees. The local administration representative should be part of the DM committee and should ensure that this committee meet at least once a month.

Protect livelihood to improve resilience (adaptation measures) specific to BB basin based on existing issues

- State agricultural department through its extension services and NGOs/CBOs should promote use of flood/salt tolerant varieties of rice in high flood/saline affected areas.
- State agricultural department should provide locations and crop specific agro-advisories with sufficient lead time for farmers to follow rainfall calendar for the farming activities and choosing right crops. In high flood risk area, encourage farmers to switch to other crops which are water intensive such as sugarcane.
- State agricultural department through agricultural extension service should support farmers to identify suitable crops (e.g., water intensive crops) or provide alternate livelihood options suitable in waterlogging areas. However, while identifying alternate crops, supply chain of crop produce needs to be mapped and ensure that the suggested alternate crop produce has adequate market.
- State agricultural department through farmer cooperatives and agri-business companies should promote crop insurance as safety net for the community in case of any flood/drought event.
- WRD in coordination with CWC and IMD should improve the effectiveness of early warning system to reduce the flood induced risks. Real time flood forecasting system should be established.
- WRD should enforce strict landuse practices on the river side of the embankment (no permanent structures) to reduce casualty and loss.
- The local administration should utilise the development funds along with community contribution and participation to constructing channel to resolve localised waterlogging issues.

Chapter 1 Background and Organisation of the Report

The PATA Operational Research for Mainstreaming Integrated Flood Management under Climate Change was included in Asian Development Bank (ADB)'s country operations business plan, 2012-2014 under the 2012 pipeline in December 2011. The ADB fact-finding mission was conducted on 15 February 2012 and 9 March 2012 to consult the Government of India on the preliminary design of the TA, including expected impact, outcome, and outputs: the financing modality; cost estimates, and implementation schedules and arrangements. Thus the present PATA-8089 IND has emerged. PATA is co-financed by UK aid, whereas the executing agency is the Ministry of Water Resources.

PATA is implemented in two phases. It started with Phase I from March to August/October 2013 which comprised Scoping and Planning studies. The present Phase II addresses and elaborates the Operational Research to support the mainstreaming of Integrated Flood Management (IFM) in a way that takes into account projected future conditions and climate change uncertainties. This phase is scheduled for 18 months with effect from 19th February 2014 till 31 October 2015.

The overall objectives of the study are:

- *To demonstrate that flood risks can be reduced through a broad mix of flood management measures, typical for the Indian context, with specific considerations for Climate Change;*
- *To demonstrate to central and state governments the benefits of such an integrated flood management and planning process;*
- *To provide guidance on such planning process, and*
- *To translate results into updated CWC guidelines and regulations relevant for future DPR approval.*

The objectives encompass the combination of structural and non-structural measures as well as increasing the resilience of the communities in flood prone areas of the two selected basins (Burhi-Gandak and Brahmani-Baitarani), such that the selection of such measures can be replicated or adapted in other basins/sub-basins. The selection process should enable the evaluation of investment programs based on scientific reasoning and economic efficiency.

This report "Community Survey Report Brahmani-Baitarani, volume 6 (Part 1)" is one of the series of reports presenting the study findings of the community sub-component of the Brahmani-Baitarani (BB) basin. The Part 2 report provides the study findings of Burhi Gandak (BG) basin.

The objective of the community sub-component of this assignment is to assess the flood-related issues the community is facing and their needs, and develop a proposal for mainstreaming the community needs and initiatives into IFM and reflect this in an inclusive IFM planning process.

As part of this report we have covered the following key aspects of the basin:

- A review of community flood issues, practices, and needs in the two sub-basins, based on extensive consultation and participatory appraisals (D24);
- Identification of potential pilot projects to increase flood resilience and coordination with potential implementing partners (D25);

- Synthesized outputs of the community needs to support the preparation of flood management strategies and the IFM plan for the focal sub-basin (D26);
- Proposals to mainstream community needs and initiatives into IFM and reflection in an inclusive IFM planning process (D27).

Chapter 2 Introduction

Impact of flood on communities can be broadly categorised into losses to life, assets, and livelihoods. However, the characteristics of floods and how they affect the local communities varies from river basin to river basin. For the same reason, the community needs also vary from basin to basin. During the field investigation, we found a variation in community problems and needs within the basin as well, since floods impact upstream and downstream communities differently.

The Phase 1 Report documented the IFM best practices across the world and flood management practices in India in detail. It also provided a separate section on community based flood management in the country. These sections documented some of the recent projects implemented in the country which have community components for disaster management. It is apparent from the review of these projects the importance of community involvement in flood management is well recognised in India and several initiatives have already been taken in this direction.

2.1 Methodology adopted for identifying community flood issues and needs

A two-pronged approach was adopted to collect community based information – community consultations through Focus Group Discussion (FGD) and household survey. The purpose of these community based activities is basically to collect first-hand information on the localized issues, needs and community perception on flood hazard and associated risk, community preferences on structural and non-structural interventions for flood management. While community consultation provides a larger picture of the community in general, the household survey provides household specific information, including losses and damages caused by flooding.

2.1.1 Focal Group Discussions

FGDs were carried out in 5 villages each in the basin. Out of these 5 FGDs, 2 were exclusively among women's groups. The women's group consultations help in understanding the gender issues, difference in the perception of men and women towards various flood management issues and activities, specific needs and priorities, etc. The districts and villages within the district for FGDs were selected across the basin and covered the upper, middle and lower reaches of the river. This is important as the issues and needs are different in these river stretches. The upper stretches do not have many issues related to flood but probably have issues related to lack of water availability for agricultural purposes.

The FGDs were conducted using guiding questions and followed the key rules of community consultations. The team visited the village identified for the FGD one day ahead of time and informed the important people in the village regarding the intent of the community meeting and invited the community for the meeting with the support of these people. People from different age groups, both male and female, were invited to participate for the meeting.

2.1.2 Household survey

The community consultations (FGDs) were supplemented by household surveys. Stratified random sampling method was adopted for the selection of the samples across the basin. Total of 350 households were surveyed in which samples from rural and urban areas were included. Out of the 350 households, 300 houses were surveyed in rural areas in 15 villages across 3 districts and 25 households each in two urban areas in each basin. The districts were selected in the upper, middle and lower reaches of the basins. Economic strata is considered while selecting the household and this was done by considering the house type used as key criteria. Based on the composition of kutcha, pucca, and semi pucca houses in the census data, similar percentage composition of houses were considered (60-20-20 respectively) while selecting the sample for the survey.

The household survey was administered through a pre-tested structured questionnaire (Annex). The survey was conducted with the help of trained surveyors hired locally. The survey activities were supervised by the community experts and regular quality checks were carried out during the course of the survey. The data collected were later tabulated and analyzed to understand community profile, needs, and issues. Figure 2.1: Locations of community surveyed in BB basins.

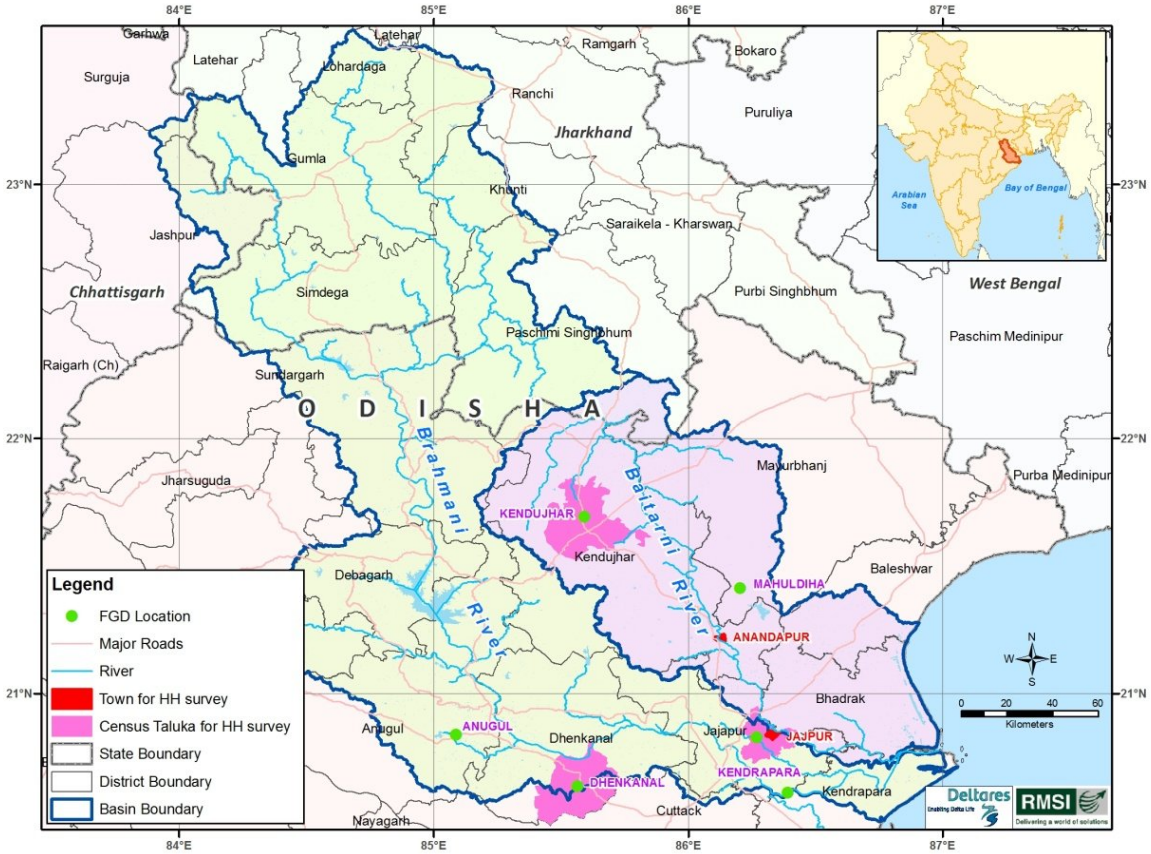


Figure 2.1 FGD and Household survey locations in Brahmani-Baitarani basins

Chapter 3 Community Profile

3.1 Demographic characteristics

3.1.1 General description

There are 12 districts and 122 talukas in the basin. The districts has a total population of 19.9 million which is 47% of the Odisha state population.

The study area mainly constitutes of rural population with 8 municipalities, which are district headquarters and 6 notified area councils (class III and IV towns).

3.1.2 Population profile

The population density is 314 person/sq km while considering the districts in the basin against the state population density of 260 person/sq km. The Debagargh district has the lowest density of 106 person/sq km and Cuttack district has the highest density of 666 person/sq km. The sex ratio is 974 female for 1000 male population, which is very close to the state statistics of 978 female to 1000 male.

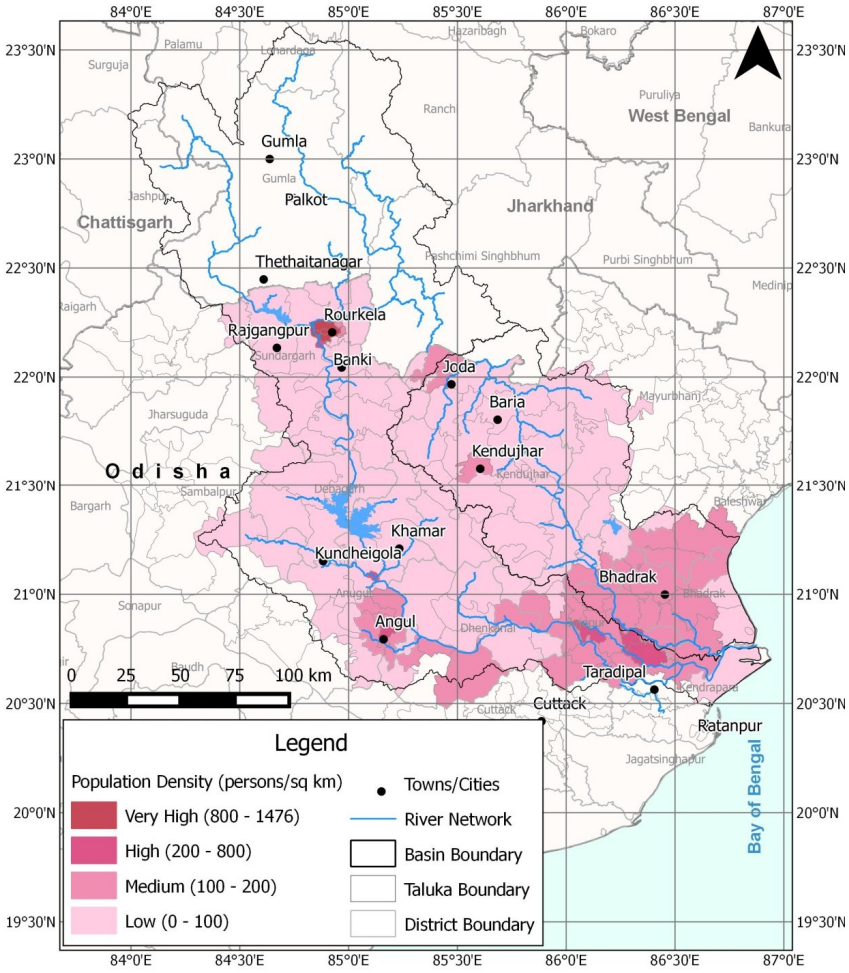


Figure 3.1: Taluka-level population density distribution in BB basin, Odisha, Census 2011

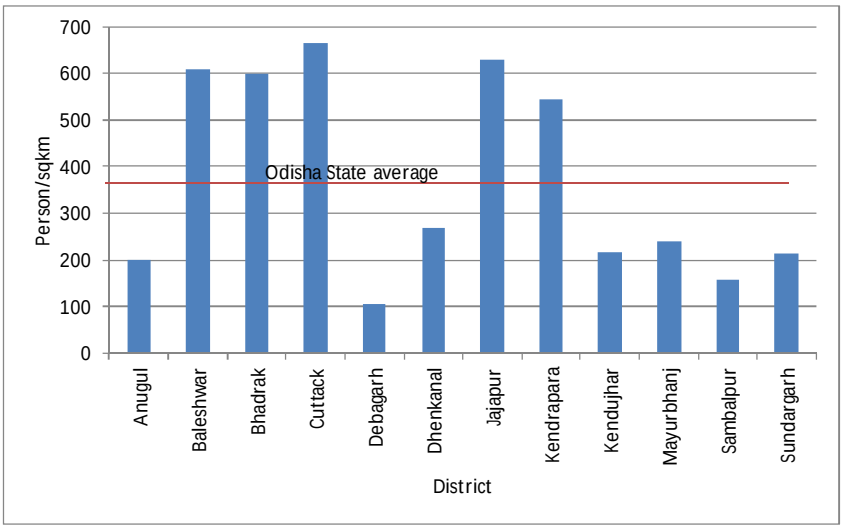


Figure 3.2: Population density at taluka level, Odisha, BB basin (Census 2011)

As per the Census 2011, the Schedule Caste (SC) and Schedule Tribe (ST) population forms 17% and 23% respectively of total population of the BB basin. In the sample, we have SC and ST household of 27% and 15% respectively. As per the survey, the majority of the rural population are SC, ST, and Other Backward Classes (OBC) while general category population constitutes major share in urban area (Figure 3.3). In general category, the SC and ST population is part of the economically weaker communities. However, this is not true in the case of the communities in the basin. Our caste vis-a-vis income analysis shows there is not much disparity in the income distribution across the castes. (

Figure 3.13).

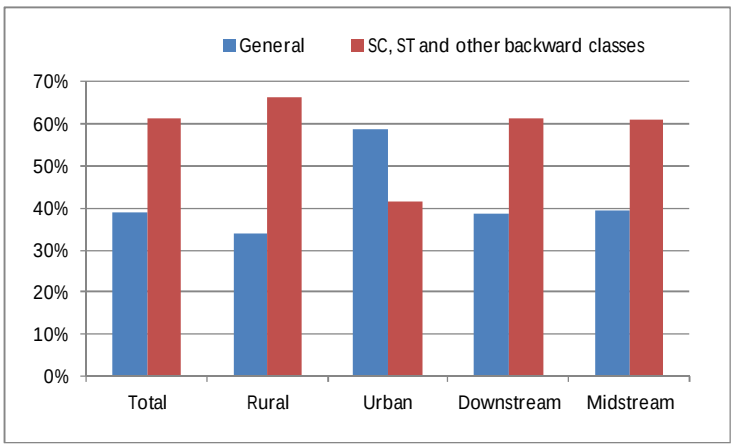


Figure 3.3: Caste composition of population, BB basin

3.1.3 Education profile

Education is one of the important elements for communities to access information related to disasters, early warnings, access relief-related information, etc. Odisha has recorded an increase in literacy rate from 63% (census 1991) to 73% as per the Census 2011. The literacy rate of the talukas in the BB basin as per Census 2011 is 67%, which is lower compared to the State average of 73%. However, the household survey shows higher literacy rate of 94% (Figure 3.4). During the FGD, it is also observed that young people are mostly literate showing the preference to go for schooling.

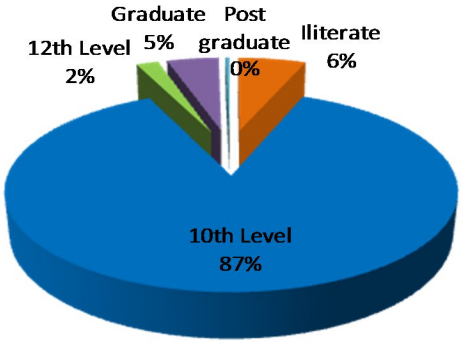


Figure 3.4: Education composition of the household

The sample survey shows a drastic difference in the literacy between midstream and downstream sections and also between rural and urban areas. The midstream and urban samples show a higher percentage of literates. This can be due to better infrastructure facilities including roads and access to schools in the urban areas midstream of the basin.

There is no distinct variation in the literacy among general category population compared to ST and SC population as per the sample survey.

The basin has a reasonable good density of schools (24,602 schools). However, considering the population between age group 6-16 in the basin, the student per school is 95 students per school as per the Census 2011, meaning very good density of schools available in the basin. However, these schools are mostly clustered around the midstream area of the basin compared to upstream and downstream, while downstream area is densely populated area in the basin.

3.2 Household characteristics

3.2.1 General description

The average household size is 4.41 persons per household. Debagarh district has the lowest household size of 4.14 and Bhadrak has the highest, which is 4.91 persons per household. The sample survey shows higher figures of 6.0 persons per household. The urban areas show a slightly higher family size of 6.2 persons per household. The household size of SC and ST population is also higher than the average household size and is 5.7 and 5.5 respectively.

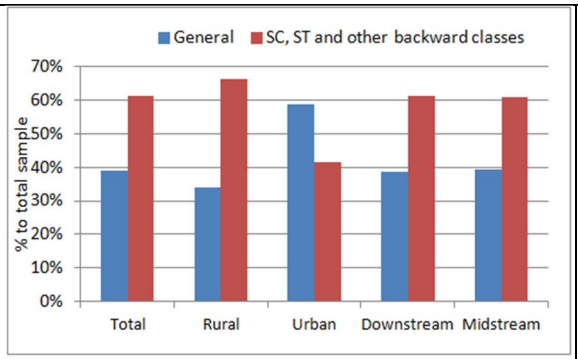


Figure 3.5: Population composition, BB basin as per household survey

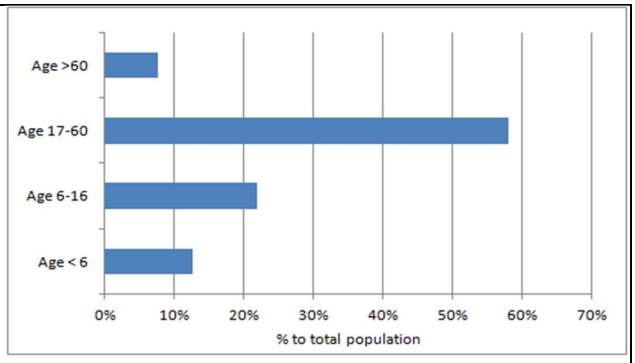


Figure 3.6: Age structure, BB basin, Odisha Census 2011

As per Census 2011, the age structure shows population of age <6 and >60 together constitute 21%, while population between age 6-16 constitute 22%. This means, the potential income earning population constitutes 58% of total population. The sample survey data shows there is a substantial number of differently abled/ chronically diseased people (about 14%).

3.2.2 House type

In general, across the country there is a distinct difference in house type composition among rural and urban area and this holds true for Odisha State as well. It is important to understand the house type composition as vulnerability to flood varies with house types. The house type is also an indicator of the economic well-being of the community. The rural areas of the BB basin are also characterized by more kutcha houses and fewer number of pucca houses. The distribution of houses as per our survey is presented in Figure 3.7, which shows almost 70% of the houses are kutcha houses and rest are almost equally shared by semi pucca and pucca houses. In the case of urban areas, this scenario is reversed with more pucca and semi pucca houses with exceptions in slum pockets which are mostly kutcha houses.

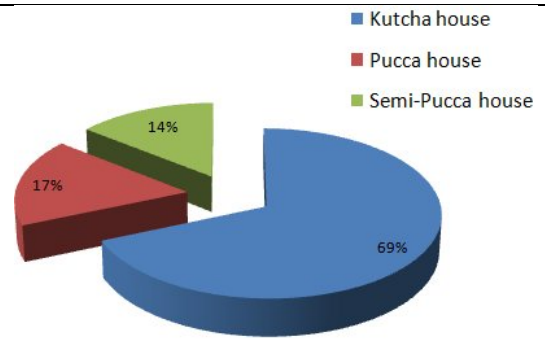


Figure 3.7: Composition of house types in the BB basin

Figure 3.8: Kutcha house

Figure 3.9: Semi-pucca house

Figure 3.10: Pucca house

The houses are classified into kutcha, semi pucca and pucca house-types, based on the roof, wall and floor materials. kutcha houses are mostly huts and are made or straw, grass, plastic and wood. The semi pucca houses are with tile/tin/asbestos roof material, burnt brick, mud or mud brick covered with cement wall materials, and floor material as floor covered with cement. Pucca houses are

concrete houses with roof made of concrete, walls with bricks and cement, and floor cement/tiles/marble (Figure 3.8, Figure 3.9 and Figure 3.10).

3.2.3 Income and sources of income

The primary income source of the community is agriculture and rearing livestock and poultry in the basin. The urban population depends mainly on the service sector. It is interesting to note that majority of the households in the basin are in the income group (INR 3,000-5,000 and INR 5,000-10,000 per month).

Majority of the farmers are engaged in subsistence farming (for own consumption) and some for generating income as well. The composition of sources of income as per the survey is provided in Figure 3.11. The income from sale of agriculture crops do not match the income reported by the families. The reason could be that farmers are not keeping proper track of income and expenditure from agriculture. Farmers in the basin mostly grow single crops in a year. A handful of farmers engage in fishing activities during rainy season or when their agriculture lands are flooded.

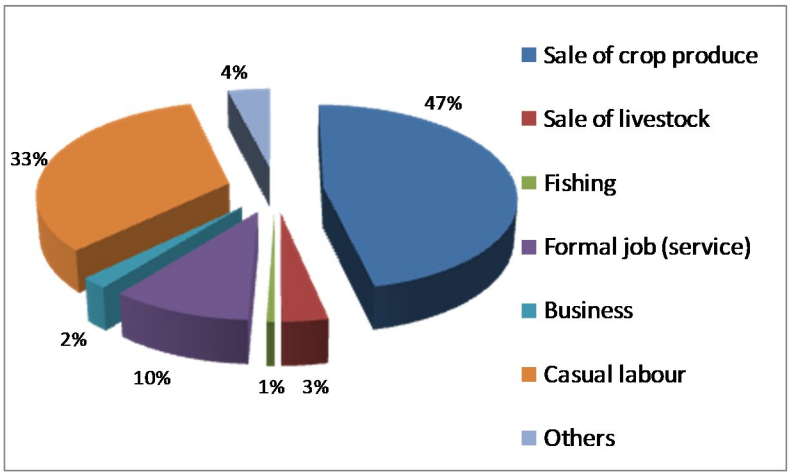


Figure 3.11: Income source of the community

It is interesting to note that substantial % of the sample household living in kutcha houses are also are in the income group of INR3,000 - 5,000 and INR 5,000 - 10,000 per month. The income verse house type information is provided in Figure 3.12.

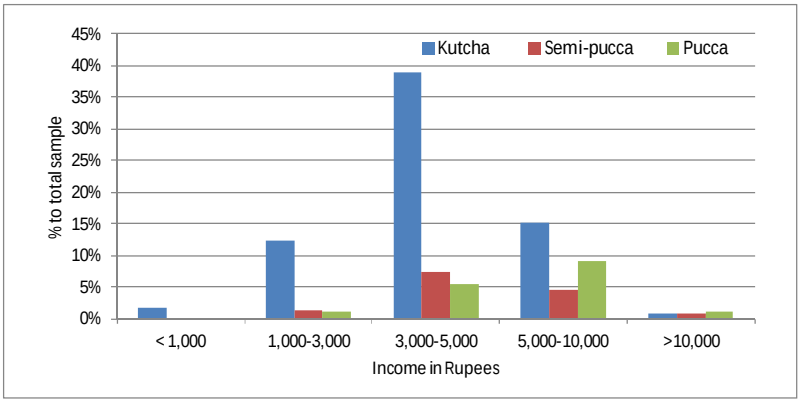


Figure 3.12: Income and house type, BB Odisha

The income composition among social groups (caste) – general category and other communities, does not show much disparity.

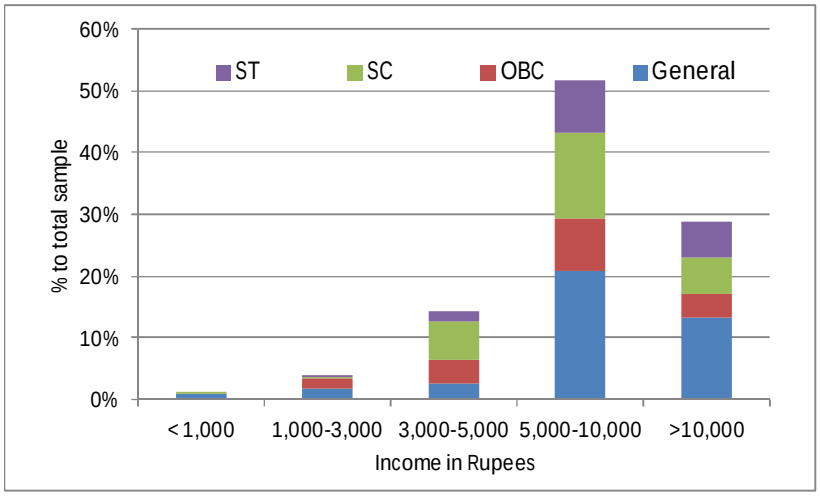


Figure 3.13: Income distribution among various social groups

3.2.4 Household assets

Household amenities reflect the economic affluence of the community. Comparison of household assets shows that general category community has better assets compared to SC and ST households. The income distribution also shows similar trends. About 66% of the households have TV and 78% have radio, which are the main means of early warning information. The cell phone penetration in the basin is very high at 121%, which means many of the houses have more than one cell phone. About 35% of the households have motorbikes.

Livestock is one of the major assets of the household. The number of livestock and poultry is mostly single figures but most of the houses have livestock/poultry. Cattle, goats and poultry constitute the major share. Figure 3.14 shows the composition of livestock and poultry in the sample household surveyed. An average of 3 cattle, 3 chicken and 2 goats are there in each household.

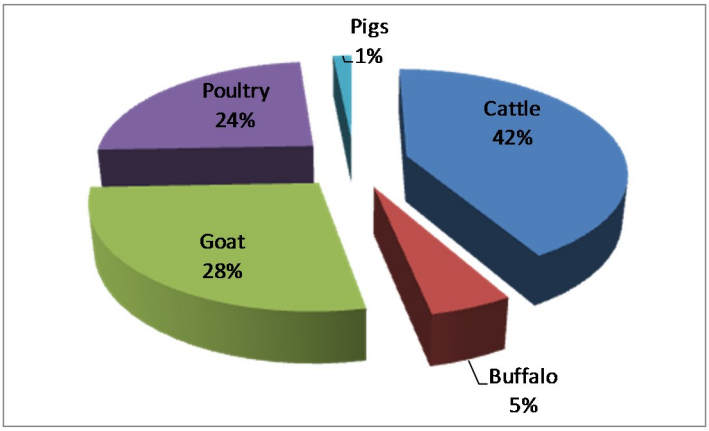


Figure 3.14: Livestock and poultry compositions

3.2.5 Location of house

As mentioned in Volume 1 and 2 reports, BB river has intermittent embankments and the flow in Brahmani is regulated by the Rengali Dam. However, the Baitarani flow is not regulated. The embankments in Baitarani are sparser when compared to Brahmani. The deltaic formation causes large portion of land to be engulfed between the two braided rivers and the lower reaches of the river are densely populated (Figure 4.1a).

The survey shows that 40% of the sample houses are on the landward side of the embankment. The downstream side of the river has a large number of houses on the floodplain compared to midstream. There is a significant population living within the embankment. However, the houses on the landward side of the embankments are not protected due to the braided nature of the rivers.

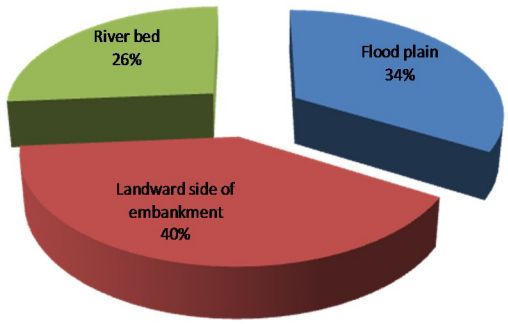


Figure 3.15: Distribution of houses in the BB basin

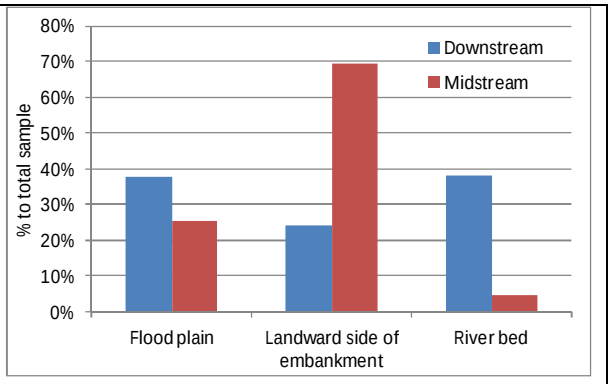


Figure 3.16: Difference in the distribution of houses in mid stream and downstream, BB basin

Figure 3.17 shows satellite imagery overlaid with the flood inundation of 2008, showing a significant number of houses (including pucca houses) and other structures on the river side of the embankment.

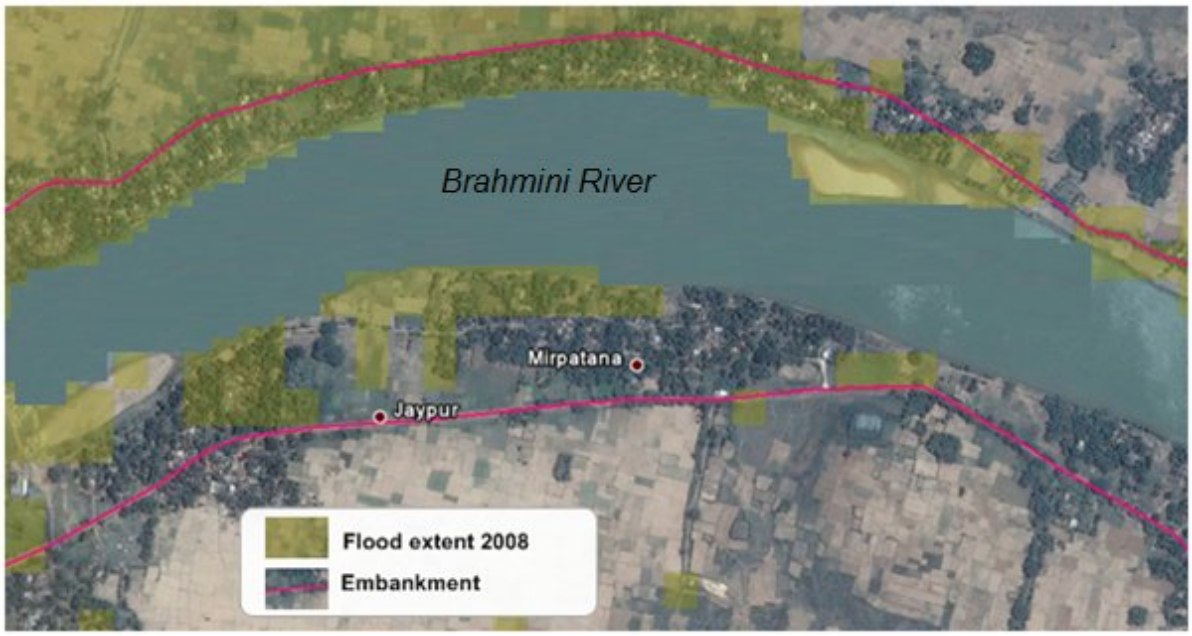


Figure 3.17 Community living on the river side of the embankments and the 2008 flood inundation, BB basin, Odisha

It is interesting to note that the percentage of SC and ST communities living on the flood plain is significant. As mentioned earlier, the SC and ST household sample only accounts for 27% and 15% of the total sample. The reason for this could be the capacity (economic status) to buy land, as land normally on the landward side is more expensive as compared to the river side.

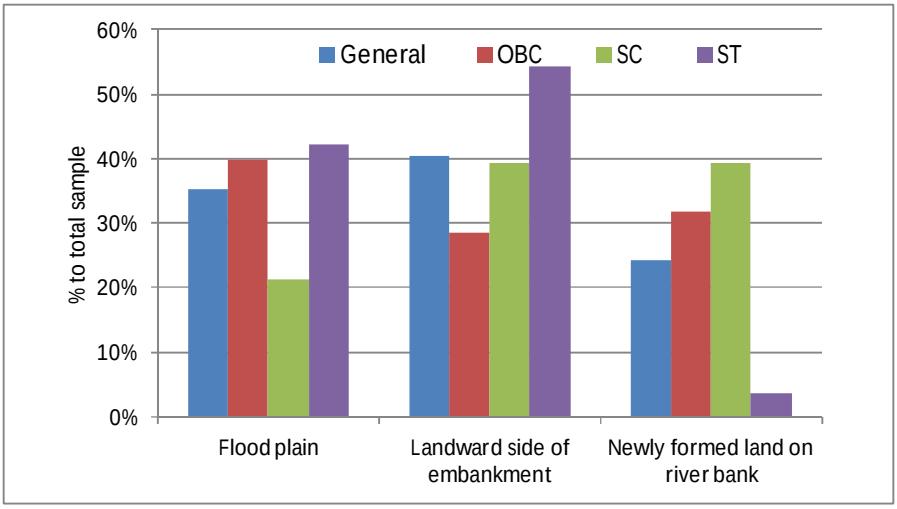


Figure 3.18: Location of houses by social group (caste)

3.3 Access to public facilities

As per census 2011, only 84% of the households have electricity connections and 16% of the households have drinking water connections and access to treated drinking water. The rural households use public taps, public wells, etc. In the FGDs, one of the key problems discussed was access to safe drinking water during the flood season. The incidence of water borne and vector borne diseases is very high in the state. The FDG and survey results also capture this as a key problem.

The state has very poor toilet coverage. One of the recent baseline surveys by the Rural Development Department presented in the State Assembly shows that the State has only 11.5% of toilet coverage. About 22% of the households surveyed have got toilet facilities. There is a disparity in the distribution of toilet facilities in urban and rural samples as well as between the general category community and SC/ST communities. Out of 22% of the sample, 9% are from the general category community and the rest from SC, ST, and OBC.

3.3.1 Access to road

The rural areas have poor access to all-weather roads, particularly in the downstream where there is a high population density. The deltaic condition contributes to poor access in the lower reaches of the basin. The urban areas in the basin have better access to all weather roads. The sample survey shows that 34% of the community has to travel more than 5 km to reach all weather roads, while majority of the urban communities have better access to all-weather roads.

3.3.2 Access to public health facilities

As per the census 2011, there are 4,124 hospitals, which include village level basic health facilities like Public Health Centres (PHC), Community health Centre (CHC), and medical colleges in the 121

talukas in the basin. This also includes private hospitals and clinics. This means that there is one hospital/health facility per 2,593 people. During the field visit and FGD, the community opined that they had to travel a long distance to avail any medical facilities. There are a lower number of health facilities in the rural areas in the basin. Villages are often equipped only with basic PHCs. During the survey, it was observed that the communities have poor access to health facilities, particularly the rural communities. Out of 350 samples surveyed, only 20 households responded that the nearest health post or facility was within one 1 km and the rest responded that it was more than 5 km. The referral hospitals and speciality hospitals are mostly 5 km away from the rural communities. There are more health facilities in the downstream of the basin, which is densely populated.

Chapter 4 Problems and Issues in the Community

4.1 Flood hazard characteristics

Floods occur in BB basin is mainly due to heavy monsoon rain or due to cyclonic depressions. Flood is associated with continuous and heavy rain. Table 4-1 shows the historical flood statistics of the state. Most of the floods occur during the months of July to September with heavy casualty of human life and livestock. In addition to this, there are damages to public utility and assets. The casualty numbers per year and economic losses per event are less compared to cyclone events in the state even though flood is more frequent in the state. In the recent flood events in the state, the 2011 and 2013 events are the most devastating floods according to the community.

Table 4-1: Flood statistics, Odisha (1974-2014)

Year	Month	No. of district affected	Human casualty	Livestock casualty	Agriculture loss (INR lakh ha.)	Houses	Loss reported (INR crores)
1974	Aug	5	NA	NA	5.4	NA	NA
1980	Sept	10	82	16,669	3.19	NA	65
1982	Aug-Sept	8	126	26,359	12	NA	616
1984	Jun-Sept	8	27	NA	3.92	NA	NA
1985	Aug-Sept	9	22	5,281	3.1	NA	NA
1986		9	24	337	1.08	NA	55.31
1991	July-Aug	10	52	1,145	6.62	NA	NA
1992	Jun-Aug	11	43	1,397	4.17	NA	184.48
1994	July-Sept	20	50	NA	10.17	NA	NA
1995	May-Nov	23	76	372	16.09	NA	112.42
1997	June & Aug	18	29	52	5.27	NA	NA
1999	July-Aug	7	10	NA	1.49	NA	54
2001	July-Aug	24	102	18,149	7.99	NA	883.42
2003	July-Oct	26	92	2,956	5.03	NA	1000
2006	July - Aug	27	90	1,656	3.1	1,20,446	2043
2007	Jul-Aug-Sep	27	NA	NA	NA	NA	NA
2008	Jun & Sep	21	110	50,163	4.45	2,58,155	NA
2009	July, Aug and Sept	17	59	NA	NA	13547	483.02
2010	July & Aug	6	14	29,067	NA	5402	NA
2011	June, Aug & Sept (twice)	21	82	1,504	NA	1,76,980	27.76
2012	Aug	5	3			13,307	NA
2013	Oct	13	15	NA	1.98	4,07,306	NA
2014	Aug	23	47	149	366541.7	45953	NA

Source: Special Relief Commissioner, Odisha

Note: NA-Not Available

Most of the settlements in the villages are located in elevated areas and the flood height is relatively less compared to agriculture fields. However, as mentioned earlier, there are a larger number of people living on the river side of the embankment, and on flood plain.

4.1.1 Occurrence of flood

The flood occurs almost every year in one or the other part of the State. State has reported both flood and drought events in the years 2009, 2010, 2011 (Special Relief Commissioner, Odisha).

During the FGDs, some of the respondents reported that floods occurred twice a year, in two consecutive months July-August due to monsoon rains (Kharif season) or during September-October (Rabi season) due to cyclonic depressions.

The community responded that they were affected 4 times due to flood in 2011. As per the survey response, years 2002 and 2010 since 1999 don't have a single response on flood occurrence. All the other years have seen floods in one part or another in the basin. The number of responses was highest for 1999 and 2014, followed by 2013, 2007, and 2008 showing the extensiveness of the flood event.

Floods occur almost every year in the downstream and in some villages it occurs twice a year. The midstream reported lower frequency of floods (once in 2 or 3 years), particularly in the northeastern part of the basin.

4.1.2 Flood event duration and characteristics

During the survey, the communities in the downstream have reported more flood events compared to the rest of the basin. This is also evident from the flood inundation maps published by National Remote Sensing Centre (NRSC) for various flood events (2008, 2011, etc: see Figure 4.2b for 2008 and 2011 flood inundation overlaid on satellite imagery) using remote sensing application. Kendrapada and Bhadrak are the most vulnerable districts both in terms of occurrence of flood events and exposure of life and assets. The downstream is also more densely populated (Figure 4.3a).

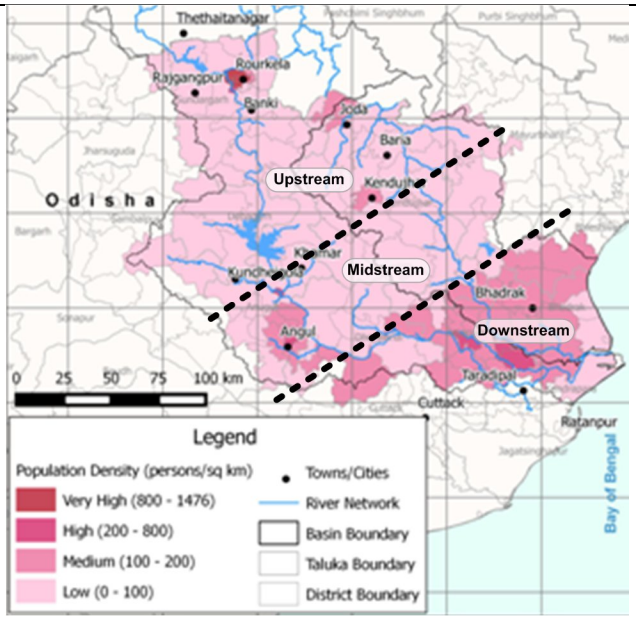


Figure 4.1a: Population density and demarcation of upstream, mid stream and downstream, BB basin, Odisha

Light blue shade in the figure – 2008 flood

Dark blue shade – 2011 flood inundation

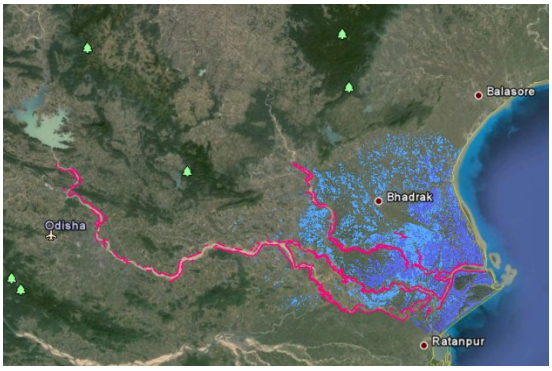


Figure 4.2b: Flood inundation of 2008 flood BB basin, Odisha

Note: the flood inundation often occur in the most density populated part of the basin.

Figure 4.3 shows the responses of households surveyed on flood height at home and in their agricultural fields. About 10% of the households reported that they experience >1 m flood at their houses and 50% of the households responded that they experienced >2 m flood height in their agricultural land.

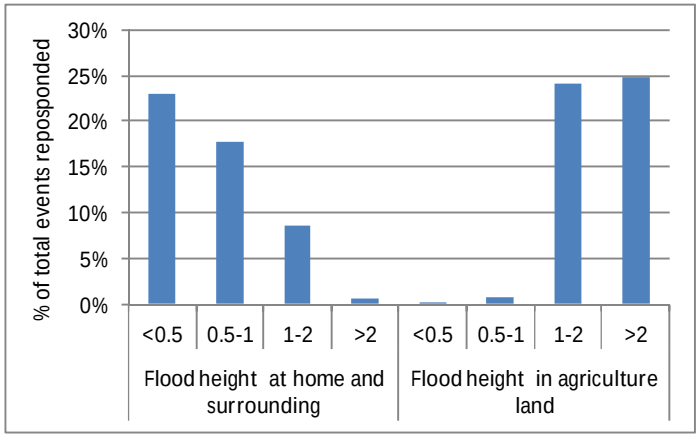


Figure 4.3: Flood height in settlement and agricultural fields

In general, flood water stays in the village for 4-5 days in the midstream and 10-15 days in downstream regions. Both midstream and downstream have water logging problems even though this is more extensive and water stays for longer periods in the downstream (more than 2-3 months) in many places. Figure 4.4 shows that about 60% flood events lasted for <5 days. However, substantial number of events is 6-10 days (30%).

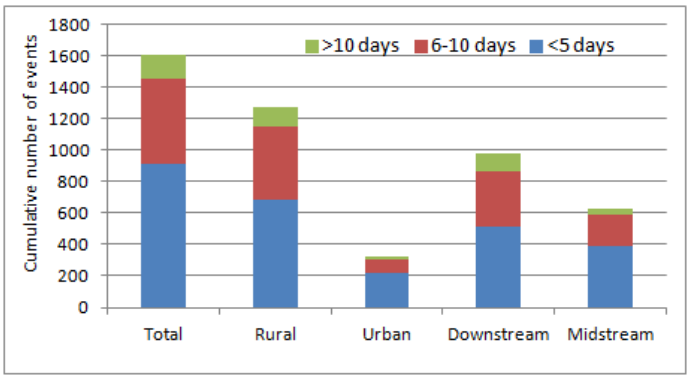


Figure 4.4: Duration of flood reported

4.2 Environmental problems

After flood, water logging is reported to be the most serious and widespread problem in the basin. Water logging is extensive in the downstream but is also reported in the midstream. Upstream villagers living close to the bank of the river have reported bank erosion.

The midstream area experiences water scarcity during the non-rainy season. Access to the river was blocked where there are embankments. Some villages tried to dig bore wells for irrigation purposes on the landward side of the embankments.

Sand casting (heavy siltation) of agricultural land is a serious problem in the downstream after major floods. Saline intrusion is reported only in the estuarine area in the downstream.

4.3 Houses and household assets damaged

4.3.1 Household assets

As per Government of Odisha statistics, the 2008, 2011 and 2013 floods caused extensive damage of houses, public utilities, and household assets (Table 4-1). The household survey reports extensive losses to livestock, damage to crops (particularly rice), and damage to houses.

Odisha is one of the states with the highest reported livestock losses due to floods in the country. The survey reported losses at an average of 4 cattle, 6 goats, and 6 poultry per household happened over the last 10 years due to floods.

4.3.2 Agricultural assets

Agriculture is the main livelihood for the community. As shown in Table 4-1, extensive agricultural areas (mainly under rice) get affected due to floods almost every year as the flood occurs mostly during the Kharif season, which is the main cropping season. Floods during the Rabi season mostly affect pulses and vegetables. During the FGD, farmers reported flood damage to farm machineries including rice crushers, tractors, etc. Apart from physical damage of crops, standing water affect the yield of the crops. Sand casting and saline intrusion cause long term problems and farmer are not in a position to cultivate the crop in the subsequent year.

4.3.3 People affected

In the downstream, community shared that during floods their village looked like a small island surrounded by water on all sides. The nearby National Highway (NH) or the river embankments were the only places to take shelter, which was also not safe because of the traffic. Most of the floods occur along with heavy rain, which makes it difficult to find shelter on roads or embankments. Those who have pucca houses in the village, took shelter on roof tops, but could not go out to buy food and medicines for their families. As part of cyclone mitigation, the State has constructed cyclone shelters within 10 km of the coast and many villages affected by floods in the BB basin are beyond 10 km and don't have access to these shelters. Government has issued notices to open all schools as shelters for the community during floods or other natural disasters.

4.4 Flood related health issues

Health problem is one of the key issues during the flood season and this prolongs for a while even after flood waters recede. Odisha state is one of the malaria prone states of India and several initiatives – such as the malaria control program, were undertaken by the State. The southern districts of the State are more prone to malaria compared to the northern districts. Even though there has been a reduction in the casualties and number of people affected during the last 5 years, Odisha is one of the states in the country with a high incidence of malaria.

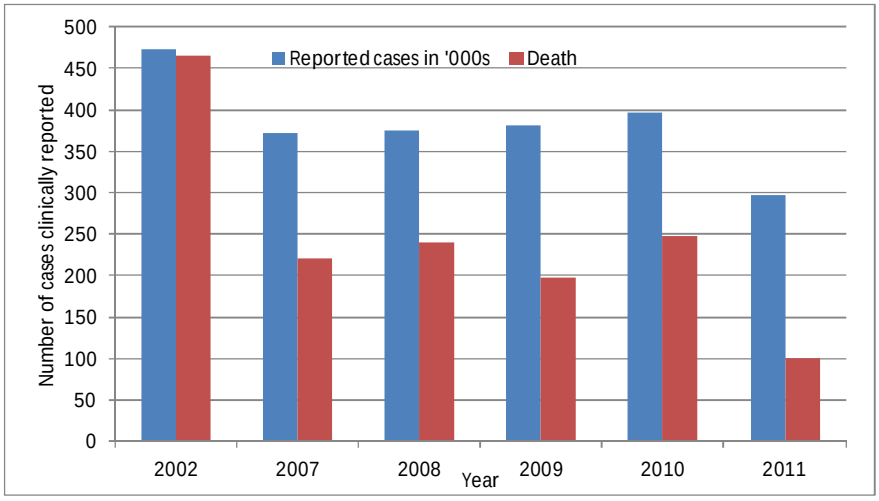


Figure 4.5: Malaria cases reported in Odisha State

During the household survey, a large number of cases of both vector-borne and waterborne were reported (Figure 4.6). We have only consider responses of last 10 years as people's memory on disease events in the family (unless major event) were likely to be forgotten over time. The responses show that there is a high incidence of malaria and waterborne diseases in addition to cold and respiratory diseases, which are common during the rainy season. Twenty-one percent households reported more than once, incidence of malaria in their house.

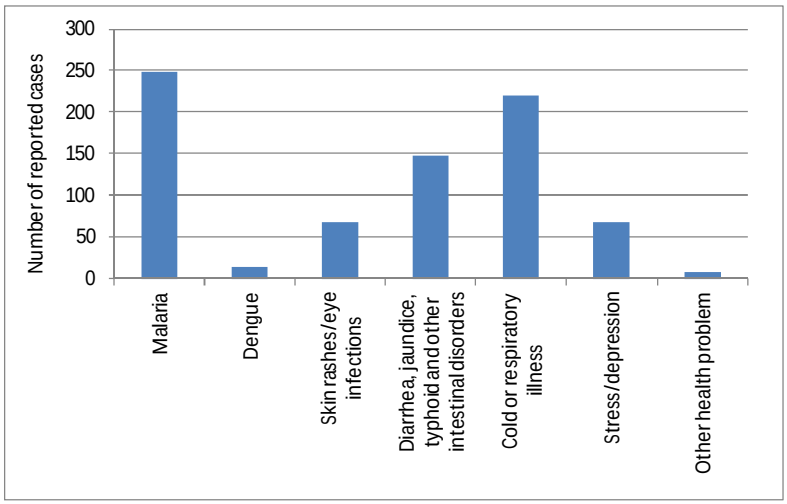


Figure 4.6: Reported health problems, BB basin, Odisha

The data shows high incidence of malaria particularly in the downstream of the basin compared to midstream. The incidence is higher in rural areas compared to urban areas.

The poor access to health facilities in the rural area accentuates the problem. During the rainy season and floods, many villages have poor road access leading to worsen this poor access to health facilities.

4.5 Perception towards flood

Flood is a recurring phenomenon in the basin and communities are well aware of flood risks. The community in the downstream, who are frequently affected by flood, prepare themselves every year.

Traditionally community stocks processed dry foods mainly for rainy season, which are be eaten with out cooking. They also stock fodder for the livestock and firewood for the kitchen. However, during interactions with the community, it emerged that they often ran out of stock during floods, particularly drinking water. Some of the traditional foods stocked by the community in this region include *Chuda* (beaten rice), and *Mudhi* (puffed rice).

Under the UNDP program in 2004, the State has prepared village level disaster management plans and formulated DM committees at village level for all the villages of the State. However, these DM committee is not active in most of the villages soon after the completion of the project. While enquiring about the preparedness almost all responded that they prepare themselves to protect their family from flood. Every year, OSDMA conducts mock drills in all cyclone shelters in the state on June 19th for both flood and cyclone. However, OSDMA has their own volunteers and never attempts to revive the DM committees. Since these shelters are only within 10km from the coast, only a small portion of the flood affected areas of the basin is covered under the mock drill program.

The community is of the opinion that minor floods at the start of the Rabi season are good as they bring in silt to improve the fertility of the soil and help improve the availability of water for Rabi crops since many parts of the basin face water shortages after the rainy season. But long standing floods destroy crops and reduce their yield. It also affects livestock.

Communities prefer to have flood protection structures (construction of dikes) and expect government to support in flood proofing of houses. Awareness on agriculture insurance is poor and only 14% suggested that there should be agriculture insurance to protect their crops from flood.

"*Palli Sabha*" (Gram Sabha – community meetings at local bodies) takes place in most of the villages to discuss the development issues of the village. But these meetings hardly discuss and suggest solutions for flood related issues. During the FGD, the communities conveyed that they were not consulted for any flood management activities in the area. Communities want local government support to avoid the water logging problem. Communities suggested improving the efficiency of the Early Warning System (EWS) and the availability of shelters and basic facilities during floods including drinking water and sanitation facilities for women and children.

4.5.1 Vulnerability assessment

The communities particularly in the downstream of the basin are highly vulnerable to the flood hazard. While analyzing the vulnerability against income groups, it can be seen that lower income groups who live in kutchu houses are more vulnerable. Their assets and capacity to absorb shocks is also low. During the survey, we tried to enquire how the community self-assesses their vulnerability to the flood hazard. For this, almost 96% of the respondents informed that they are vulnerable; with a majority of the respondents in the downstream reporting that they are highly vulnerable.

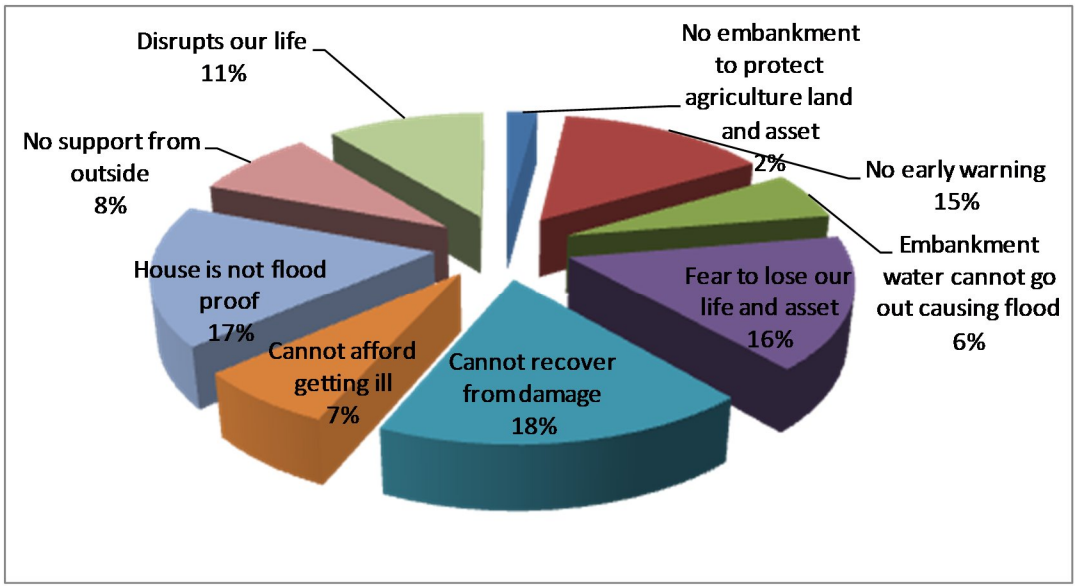


Figure 4.7: Reasons of vulnerability as per household survey

While enquiring among the household what measure they take to cope with flood hazard most of the respondents (91%) informed that they do nothing. Of the rest of the household majority responded that they expect government to take various steps to protect from flood (Figure 4.8)

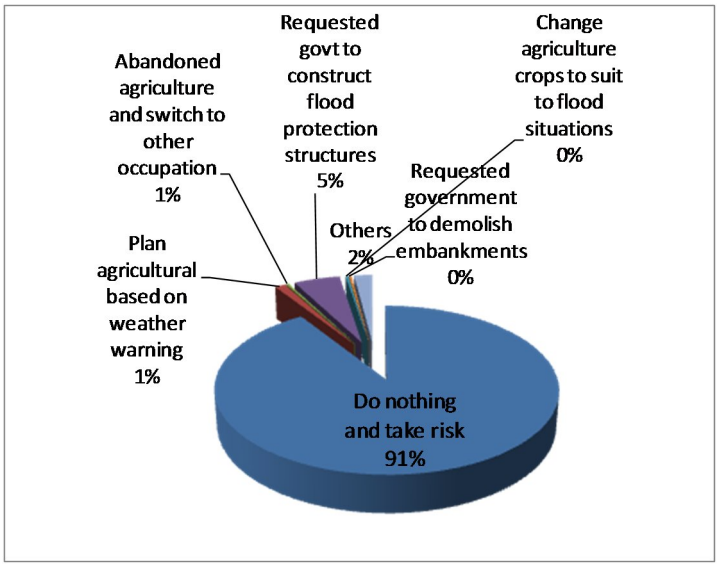


Figure 4.8: Coping capacity as per the household survey

There are no agro-advisories and farmers use their own knowledge and experience on the rainfall to carry out the agriculture activities. The community preparedness is poor and individuals take their own mechanism to protect their family.

Chapter 5 Flood Management in the Community

5.1 Evaluation of flood preparedness measures

Community is aware of the floods and associated risks. However, the level of preparedness is very low, which is reflected in the casualty figures. Although crop damage cannot be avoided completely, the losses can be minimized and the casualty can be reduced to nil through appropriate mitigation and adaptation measures. Traditionally, community practices stocking various rice products, which can be eaten without cooking.

Most of the households responded that they have access to early warning system and the key sources for this include radio and TV. Few respondents mentioned newspaper or village leaders as source of information (Figure 5.1).

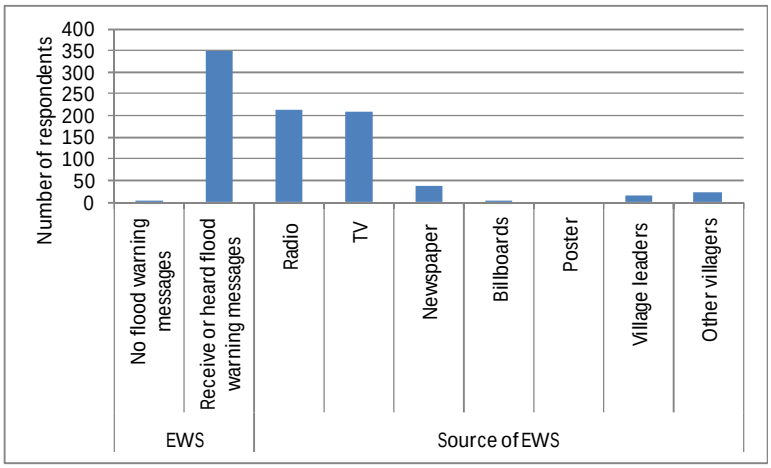


Figure 5.1: Availability of EWS and its source as per household survey

As mentioned earlier, even though there were initiatives by the state and UN organization in developing local DM plans including mobilization of DM committees, these efforts didn't sustain. The state carries out mock drills for cyclone preparedness every year in the cyclone shelters. However, there is no such initiative for flood preparedness. Only NGOs/CBOs working in the community support in keeping the DM committees active and provide community training on various preparedness activities.

Corporate initiatives like that of Reliance Foundation Information Services (RFIS) under its Corporate Social Responsibility (CSR) program are working in many districts on agriculture extension and disaster management. RFIS also has free SMS services as part of the EWS to inform the community and community extension workers on any natural hazards.

5.2 Status of flood preparedness in the community

The housing and living style were assessed to understand the status of flood preparedness of the community.

While analysing the plinth height of houses, it was observed that a majority of the houses are at ground level or even below ground level (Figure 5.2). Location specific analysis shows that there are more houses in midstream which are below ground level compared to the downstream.

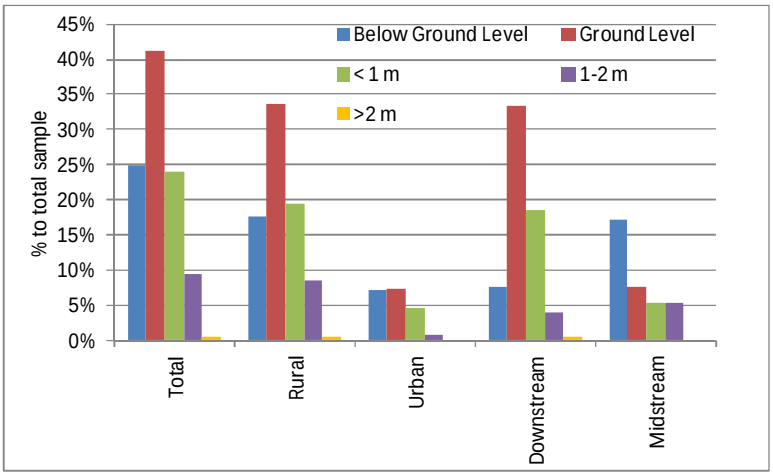


Figure 5.2: Plinth heights of houses, BB basin

It was found that it is the economic affordability that drives the community to decide on increasing the plinth heights as a safety measure rather than the location – like in the flood plain. Figure 5.3 shows the plinth heights of houses in various locations. There is no much relationship between houses in flood plain and plinth height.

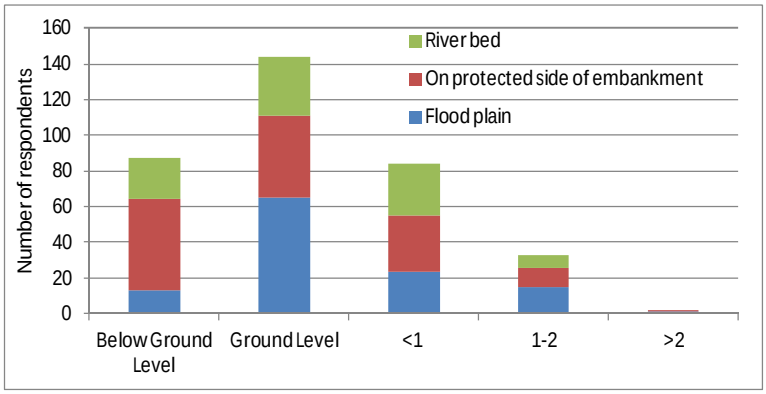


Figure 5.3: Plinth heights and locations of houses in the basin

In some urban areas like Cuttack, people started abandoning the ground flood and living on the first floor of pucca houses to adapt to recurring flood conditions. However, this is not a common practice and this is not affordable for the community.

For livelihood also, community tend to gamble with the flood than opting for flood or saline tolerant rice varieties as yield of these varieties are low compared to hybrid varieties. Almost all the respondents informed that they are aware of the EWS and get this information through radio, TV and local news paper. However, during the FGDs the community opined that the EWS is not very effective as they won't get much time to respond to the flood warning.

There are not sufficient flood shelters for the community and livestock and people take shelter at terrace of pucca houses, schools and elevated roads and embankments.

5.3 Measures recommended

It needs different level and facet of measures that need to be taken to reduce the impact of flood to the communities. This include at local institutional level, and at community level. There need to have a different approach for urban areas as the nature of flooding and problems are different for urban area. The basin is characterized by municipal towns and non-classified towns which have potential to grow and need proper planning to avoid urban flood issues.

5.3.1 Institutional level

- Local administration should coordinate with state agencies for developing and providing weather and climate linked agro-advisory services to be disseminated to the communities to plan the farming practices.
- Agriculture extension workers should regularly visit the rural villages and provide training on new technologies and modern agricultural practices including advisory support for suitable crops based on local conditions. Demonstration plots are best means to promote new crops and adaptation practices.
- Agriculture extension service should coordinate with local administration and local communities for developing drainage channels in water logged areas.
- Promote and provide access to sturdy crop varieties such as drought and flood resistant crop varieties and demonstrate their benefits through demonstration plots.
- Construct multi-purpose additional shelters in the flood prone areas.
- Construct community godowns for stocking harvest and fodders.
- Incentive mechanism like tax rebate for higher plinth area, or for adopting other flood proofing constructions.
- Panchayat development planning need to consider DM particularly flood management activities in local planning and development

5.3.2 Community level

- Mechanism through enforcement and incentives need to be adopted to encourage communities to follow CWC guidelines of avoiding construction of permanent structure on the river side of the embankment.
- Community DM committees need to be revived and need to carry out the defined roles and responsibilities of each DM task force so that during flood events they can support the community.
- Awareness on safe drinking water and sanitation particularly during flood situation.
- Communities should select appropriate crops and cropping patterns suitable for flood prone area like cultivation of water intensive crops like sugarcane in waterlogging areas.
- Communities should explore the possibilities of group crop insurance.

5.3.3 Urban measures

- The municipalities should consider flood hazard in its development master plan and the development zones should consider the flood hazard zones

- There should be strict enforcement of building codes and development control regulation. The building codes need to be revisited by technical experts to accommodate climate change impact and flood risk of the region.
- Develop building codes and guidelines and should be available for the public to develop flood resilient housing.
- Development of storm water drainage taking into consideration of the climate change scenarios
- Creating awareness among the communities not to encroach urban drainage and dumping of solid waste in the urban drainage systems.

5.4 Coping mechanism to protect livelihood

- Follow weather calendar for agricultural activities.
- Adapt cropping pattern and crops to the changing rainfall pattern
- Choosing climate resilient (flood/drought and salt tolerance) varieties in flood/drought/saline prone area.
- Any introduction of new crops to adapt to the new condition need proper mapping of the supply chain and ensure mechanism that the supply chain complete and the new farm products has demand. Then only community will adopt this.
- Selection of appropriate crops types such as short duration crops with high yield varieties to reduce the crop damage due to flood. The length of the growing period is very important towards the adjustment of agriculture in flood-prone areas.
- Avail crop insurance as safety network.

5.5 Participation of community in flood management activities

- Preparedness including reviving of DM committee and local DM plans
- Stocking of medicine and essential facilities before the onset of rainy season
- Training of committee in flood management in different stages (preparedness, response, recovery)
- Work with gram sabha to develop drinking water and sanitation facilities during flood period
- Training of maison for flood proofing of houses
- Training of community for identifying and providing first aid for any injuries and diseases that often affect in livestock (foot rot and mastitis,) and poultry during and after the flood event.
- Training of communities for channel development in water logged areas.

5.6 Strategies of Community involvement in IFM

It is essential to involve community in all stages of the flood management strategies in various stages of disaster management - prepared, response and recovery to limit the extent of damage.

Table 5-1: Strategy matrix for Community involvement in IFM

Stages of disaster management	Involvement type	Activities specific to the BB basin
Planning and implementation of mitigation measures	Consultation to understand the needs and problems of the community and develop strategies that address and solve the community needs and problems	Structural interventions to regulate river discharge Channel improvement to avoid water logging problems Identify and promote suitable alternate livelihood options in the flood prone areas Improve early warning dissemination Awareness and sensitization
	Capacity building and training of local administration	Capacity building and training of local administration to leverage Panchayat Raj Act (73rd constitutional amendment) to mainstreaming DM activities in local level planning
	Agricultural insurance	Promote agricultural insurance through government or cooperative or group insurance mechanism so that farmers can afford availing the insurance as safety net.
Preparedness	Develop local DM plan and committees	Engage Non-Governmental Organizations (NGOs) and Community Based Organizations (CBOs) to work with communities to revive the DM committees and keep them active for preparedness, response and recovery
	Local level landuse planning	Involve communities in development local landuse plan including flood zoning and encourage communities to adhere to this.
Response	Mock drill and awareness development	Conduct mock drill in the communities on flood risk management Develop awareness on dos and don't during flood and post flood. Public announcement system, and display of evacuation route and shelter locations in public places.
Recovery	Training in rescue and recovery	Develop DM task force as part of the DM committee and train them for rescue and recovery operations.

Chapter 6 Conclusion and Suggestions

While structural measures are required for long term flood mitigation, communities need to develop livelihood adaptation strategies and coping mechanism to reduce the risk towards flood hazard. Taking into consideration of the characteristics (nature and periodicity) of the flood in the BB basins, basin-specific adaptation strategies and coping mechanisms are required.

When defining adaptation strategies and coping mechanisms, key elements that need to be kept in mind are mentioned below:

- The intervention should be acceptable to the community and not totally alien to the system for ease of adoption;
- Introduction of alternate crops or livelihood needs market analysis and ensure mapping of the whole supply chain;
- Any introduction of new technology for developing adaptation and coping mechanism should not depend too much on external skills as this will be a threat for the sustainability;
- Identification of locally tested indigenous options for adaptation and coping mechanisms;
- Should have net benefits independent of any hazard. Some adaptation options may yield net benefits even without occurrences of any hazard (i.e., no regret adaptation option);
- Analyse the barriers for implementing strategies and work effectively to address the same.

Following are the key summary points based on the analysis of the community survey and consultations.

- Floods occur almost every year and cause heavy loss of livelihood and asset. There is high casualty of human and livestock. Flood occurs more than once a year in some villages in the basin.
- There is high population density in the downstream of the basin which is highly vulnerable to flood.
- It takes about 10 -12 days for flood water to recede from the agricultural land. The settlements are mostly in elevated area but still get affected by flood.
- The community needs and problems are distinctly different in the up-, mid- and downstream sections of the basin.
- Basin level coordination is required for effective flood management.
- Waterlogging is a key problem in the midstream and downstream parts of the basin. Other than that the downstream is characterised by sand casting and saline water intrusion while midstream area face water shortage after rainy season.
- Poor sanitation, lack of drinking water, availability of fodder and shelters are the key issues community face during flood season.
- The community preparedness to manage the flood risk is poor even though the level of awareness on flood risk is reasonably high.

Following are the key suggestions for developing strategies for community involvement in IFM activities:

Planning and implementation of mitigation measures

- As community needs and problems are very specific to river basin. The State WRD and CWC should carryout community need assessment priority to any major intervention projects
- The State WRD and CWC should make it mandatory to conduct community consultations to ensure acceptance of community before finalisation of any project to implement.
- SDMA should prepare flood hazard map and publicise so that community will have a good understanding of the flood risk of area they are living of investing for businesses.

Preparedness

- SDMA with the support of local administration and DDMA should empanel local NGOs/CBOs and should engage them for awareness (for preparedness) and for sensitizing on flood risk at local level. The NGOs/CBOs can be effective means for mobilising communities and community based activities for flood management at local level.

  SDMA with the support of local administration and rural development departments should devise incentive mechanism and ensure that local DM committees are active and follow the defined roles and responsibilities. The local administration representative should be part of the DM committee and should ensure that this committee meet at least once a month.

Protect livelihood to improve resilience (adaptation measures) specific to BB basin based on existing issues

- State agricultural department through its extension services and NGOs/CBOs should promote use of flood/salt tolerant varieties of rice in high flood/saline affected areas.
- State agricultural department should provide locations and crop specific agro-advisories with sufficient lead time for farmers to follow rainfall calendar for the farming activities and choosing right crops. In high flood risk area, encourage farmers to switch to other crops which are water intensive such as sugarcane.
- State agricultural department through agricultural extension service should support farmers to identify suitable crops (e.g., water intensive crops) or provide alternate livelihood options suitable in waterlogging areas. However, while identifying alternate crops, supply chain of crop produce needs to be mapped and ensure that the suggested alternate crop produce has adequate market.
- State agricultural department through farmer cooperatives and agri-business companies should promote crop insurance as safety net for the community in case of any flood/drought event.
- WRD in coordination with CWC and IMD should improve the effectiveness of early warning system to reduce the flood induced risks. Real time flood forecasting system should be established.
- WRD should enforcement strict landuse practices on the river side of the embankment (no permanent structures) to reduce casualty and loss.
- State Revenue Department in coordination with WRD should enforce strict landuse practices on the river side of the embankment (no permanent structures) to reduce casualty and loss.

- The local administration should utilise the development funds along with community contribution and participation to construct drainage channels to resolve localised waterlogging issues.

Appendix A: FDG Summary Reports

Date: 31st Dec 2014 **Place:** Village Mandap, **Village:** Pandua, **GP:** Pandua, **Block:** Ghasipura, **District:** Keonjhar, Odisha

Village Profile	
Population	3500 (Approx), 360 Household
Area	Home land: 100 Acres (Approx) Agriculture land: 500 Acres (Approx) Paddy cultivation: 250 Acres (Approx)
Location of the River	Adjacent to the village Pandua, River Kusei tributary of Baitarani is flowing. River Kusei and Baitarni meet around 3 to 4kms away from the village.
Major Occupation/livelihood	Agriculture Kharif season: Paddy Rabi season: Mostly no cultivation due to water scarcity
Flood hazard profiling	
How often do you have a flood? How long does a flood normally last? To what height the water reached?	Community face flood almost once in every 2-3 years. But flood never entered the settlement area mostly affect the agricultural low lands. But the water remains 3 to 4 days in the agricultural fields.
What are the major disasters occurred in this village?	Flood in 1955, 1969, 1964, 1999 (super cyclone), 2011 (Phailin) and the recent one in 2013 affected the village. During Phailin, heavy wind along with heavy rain fall affected the village. Even in the 2014, HUDHUD cyclone cause heavy rain and affected the agricultural crops.
What is the most devastated disaster occurred in the recent past say last 10 years in your area?	Flood of 1999, and 2011 were the devastating for the area in the recent past. Basically the crop and livestock losses are more due to flood. Human casualty was not there.
How it affected the village and in what extent? What was the health impact? What was the extent of damages on the crop and livestock? Did it affect the soil?	Due to flooding, the crops got damaged water remained in the field for several days. About 250 acres of land is under paddy crops in the village and was completely damaged in the year 2011. Agriculture is the key livelihood and if flood affect the crops means it seriously affect the village. The village also face problem during rabi season due to lack of water, and irrigation facility. Villagers only go for one crop a year - kharif-paddy.

	Villagers think that irrigation is one of the most important need of the village. The villagers never experienced flood inside the village but when there is a flood in Baitarani river then their paddy fields (15 to 20 % of total agricultural land) get submerged. They completely depend upon the rainfall or monsoon. There is no advisory from the Government regarding agricultural measures to be taken in case of flood or forecast on monsoons or heavy rain. In summer, there is acute drinking water scarcity in the village.
What was the major loss in terms of lives and assets due to that devastated disaster? Did you receive help from outside in terms of relief funds, equipment, housing material etc. to recover from the losses? How long did it take to be back to the situation before the disaster (in terms of assets such as livestock, house, and in terms of income)?	The major loss due to disaster were damage to the kutcha houses, damage to the corps, death of livestock, unavailability of fodder for the livestock etc.
Flood benefit if any	
Understand the perception of community towards flood. Whether they believe flood is a problem or a phenomenon which also bring in benefits? If so what?	There is a mixed opinion received from the villagers about the benefits of flood. Sometimes the flood is beneficial to the villagers and sometimes it affects them severely. Basically it depends when the flood occurs; if it is before the cropping start then it is beneficial otherwise not.
Compare a situation with regular flood and without flood due to flood protection measures. Which is a preferred one?	Excess rain cause water logging in the area which is not good. So flood protection measures are important to save the crop fields. Similarly when flood water flows in the river sometimes it overtops. Though their flood water does not enter where houses are located, their livelihoods get affected – crops and livestock. So living with flood protection measures is the preferred.
Does flood has any beneficial effect on the crops? Whether flood in one season (say during Kharif season) is beneficial for the crops during next cropping season (i.e., Rabi season crops) in terms of water availability or soil moisture availability for the crops?	It is beneficial if the following points considered: Easy drainage of flood water from the agriculture fields. Sluice gates for drain of water to the river. Awareness on flood resistant crops to the farmers. Training on new advanced farming.
Changes over the last 20 years (Flood, pattern of Rain, etc)	
Did you observe any changes in the	As per the villagers there is a visible change in the climate which is

rainfall distribution pattern and flood characteristics in your region? Please ask with example of increase/decrease in rain and duration of rain during particular month/season or monsoon reaching early/late, etc.	as follows: Deviation in monsoon (normally starts from 10th June earlier but now by the end of July) Increase in temperature Change in rainfall pattern, rain due to low pressures only Decrease in normal rain fall Extreme events of rain, heat wave, cold, etc. Drinking water scarcity in summer for human as well as livestock
If the answer towards this is 'yes' continue on this topic asking questions like – Are you taking any adaptation measures to adjust to the changes in the rainfall. If so what are they? (Some of the measures are moving away from flood affected area to the safer place, changing in the cropping pattern, changing in the cropping calendar, etc)	There is no much measures taken at the villagers end. They still depend upon the rain for their farming. As 90% of the villagers depend upon agriculture, during discussion it was found that there is a gap for technical knowhow. It need agricultural extension services for adaption practices like alternative cropping, flood tolerance crop, developing drains for drain flood waters, etc.
Flood Mitigation measure	
With the help of the community identify flood affected areas, flood control measures in the village (embankments, improvement in the drainage system, sluice gate, etc.) and its present conditions. In case the community is suggesting for new structural mitigation measures take the discussion further to understand the cost benefit of the measures, issues that can happen, any limitation, to understand whether the community foresee all aspects before suggesting such thing. And how to organise implementing such measure: who should take the lead, government or community?	Basically two sahis / padas of the village affected by the flood which are nearer to the river. There is embankment in the river but sometimes it overtops. The major problem is water logging. Also the canal excavated earlier now contributes a lot to the flooding in the area.
Planning and decision making	
Do villagers know who to approach	The villagers urged the local Government officials to take steps for

at the government with regard to flood management issues? Is there regular communication with local government on flood issues, mitigating measures? Are ideas and local knowledge appreciated by government? Are you in general content with the communication with government?	drainage of water from the agricultural fields but no result. It needs a much higher level intervention. As per the villagers there is a need for stone patching of the canal situated nearer to the river, because the canal itself contributes seepage causing flooding in the nearby area.
Are local villagers consulted or involved when government prepares measures for flood mitigation, such as embankment construction or rehabilitation? If so, how is this organised. If not, what do you think of this? How should this be changed?	The villagers were not consulted for any kind of flood management practices of the village. But here is a provision of "*palli sabha*" for discussion of other development issues of the village. Villagers used to sit and finalise the developmental projects of the village. Villagers demanded flood management must be a part of all developmental activities.
Community flood mitigation and adaptation initiative	
What is the present mechanism of informing the community on flood alert, frequency and its effectiveness?	Government use to announce the flood warning through public address system. But often the floods are flash floods, there is hardly any time for warning dissemination. While discussing about the disaster management aspects, the villagers expressed that there is no early warning before onset of flood, even though there were warnings issues before the cyclone particularly in 2013. As the village is not coming under flood prone area, the information dissemination is less effective here. They get information from local news paper as well.
Whether community wait for information or take own decision?	Community has its own coping mechanism for flood. They use to take their own decision without waiting for any warning from the department. As per the villagers, there is no harm to the human due to flood because the village is having good numbers of pucca houses and they used to manage with that. Regarding the crops they could not do anything unless until the water recedes.
What kind of initiative government has taken to help the flood management in your village?	No steps have been taken by the Government to resolve the flood issues in the area.
What kind of initiatives communities and community	No DM Committees, NGOs or CBOs functioning in the village to help the community to tackle the flood situation in the area.

based organisation are taking to manage the flood – like awareness where to live, and how to protect assets, how to protect the crops (standing/harvested), how to reclaim the soil if soil health has been deteriorated due to the silt carried along with flood water, village level DM committees/village committee to inspect embankment/sluice gate before monsoon/rainy season, etc.?	
Effectiveness of government mechanism in response, rescue, and relief operations?	As the district as well as the village is situated in the upper catchment of Baitarani, there is no need of rescue operations. As the houses never get affected the relief activities won't come to these villages. Livestock get affected due to lack of fodder.
Steps needed for protecting from flood	
What Govt. should do to minimise the flood induced negative impacts in the area such as human lives, house, crops, livestock, etc?	Govt. should take the following steps as per the villagers: Stone patching of the canal walls. Drainage for draining the flood water from the agriculture fields. Sluice gates to regulate the flow of water in and to the river. Enhancement of the embankment height. Proper irrigation facility. Provision of drinking water particularly during summer. Access to seeds, fertilizers for farmers. Training farmers on alternative cropping mechanism. Effective early warning system.
What community can and should do for flood risk management to avoid lives and assets (house, crops, and livestock) losses from floods?	Community assured to support and co-operate the Government. functionary in any flood management and development activities.

Date: 15th Feb 2015 **Village:** Nakhara, **GP:** Patalipura, **Block:** Betanoti, **District:** Mayurbhanj, Odisha

Village Profile	
Population	2000 (Approx) in 175 Household
Area	Land for houses: 100 Acres (Approx) Agriculture land: 800 Acres (Approx)
Location of the River	Adjacent to the village Nakhara. River Budhabolang flows just 0.5 (approx) km away from the village.
Major Occupation/livelihood	Agriculture Kharif season: Paddy (100%) Rabi season: Groundnuts, Black Gram, Green Gram (40%)
Flood hazard profile	
How often do you have a flood? How long does a flood normally last? To what height the water reached?	Flooding is a regular phenomenon in the village. Every year, village gets affected by flood but varying intensities. Flood water remains for about a week particularly in agricultural fields. Some time the flood depth is 7 feet. The nature of flood is like flash flood, comes all of a sudden. There is no warning or alert given by the Government.
What are the major disasters occurred in this village?	Village faced flood in the year 1971, 1999, 2010, 2012, 2013, and 2014. In 2010, the village has experienced flood 7 times. During the 2010 flood almost all houses in the village got submerged.
What is the most devastated disaster occurred in the recent past say last 10 years in your area?	The 2010 and 2013 floods were devastating. Though there was no human casualty, about 200 cows and 1000 goats were killed. More than 100 kutcha houses were damaged. Village suffered huge crop losses. The villagers cooked the food at the nearest upland and distributed it among the villagers.
How it affected the village and in what extent? What was the health impact? What was the extent of damages on the crop and livestock? Did it affect the soil?	The recent floods of 2010, 12, and 13, has affected almost whole village. The water reaches up to roof top and the flood occurred at night which did not give time for villagers to respond. Since cooking was not possible, the villagers were fully dependent on the foods from air-dropping and flood water was used for drinking purposes. All the tube wells were submerged. Even the relief could not come to village due to poor road access. There are three rivers named Budhabolang, Gangahar and Sono, which flow near to the village. As schools were used as shelter, education also gets affected during flood season. There is a need of flood shelter in the village.

	Women in the village told drinking water and sanitation are major issues during flood season. There were instances of water borne diseases in the area during flood season as people drink flood water. Group shared that they used to keep food stuff in their houses before the flood season but in 2013 those were also submerged in water which created a big problem for them to manage their family's food requirement.
What was the major loss in terms of lives and assets due to that devastated disaster? Did you receive help from outside in terms of relief funds, equipment, housing material etc. to recover from the losses? How long did it take to be back to the situation before the disaster (in terms of assets such as livestock, house, and in terms of income)?	The major loss due to disaster were damage to the kutcha houses, damage to the crops, death of livestock, unavailability of fodder for the livestock, school books, school uniforms, etc. The major problem in the area was the non-availability of fodder. As the area completely submerged with water, so there will be virtually nothing available for the livestock even after flood. Due to high current in the water and disruption in the communication, the government agencies could not reach to the village to provide relief including fodders. Villagers received rice, polythene sheet for damaged kutcha houses and house damage repairing support from the Government after the flood. Villagers started constructing their houses on a raised platform based on past flood heights. But, this is not solving the problem as recent flood was much severe. After the flood, it took lot of time to clean mud from their houses. It took about 30 to 45 days to come to the normal condition. Unanimously everybody said that the flooding problem was acute because of the construction of new roads like NH 60 and other national highways which has obstructed the natural flow of water. One side of the river does not have embankment and flood enter the village through this bank.
Flood benefit if any	
Understand the perception of community towards flood. Whether they believe flood is a problem or a phenomenon which also bring in benefits? If so what?	There was mixed opinion about the benefits of flood. Basically when there is a small flood and it only submerges the agricultural area then it is beneficial because it brings fertile soil. But when there is a massive flood then it brings sand with it which affects the agricultural field.

Compare a situation with regular flood and without flood due to flood protection measures. Which is a preferred one?	Farmers depend of rain for agriculture. Excess rain causes water logging in the area which is affecting them. So flood protection measures are equally important to save the crop fields. So people want flood protection structures.
Does flood has any beneficial effect on the crops? Whether flood in one season (say during Kharif season) is beneficial for the crops during next cropping season (i.e., Rabi season crops) in terms of water availability or soil moisture availability for the crops?	Due to lack of irrigation facility only 40% of the farmers do Rabi crops. Small flood occurring during rabi season is beneficial to farmers.
Changes over the last 20 years (Flood, pattern of Rain, etc)	
Did you observe any changes in the rainfall distribution pattern and flood characteristics in your region? Please ask with example of increase/decrease in rain and duration of rain during particular month/season or monsoon reaching early/late, etc.	As per the villagers there is a visible change in the climate which is as follows: Deviation in monsoon rainfall Increase in temperature Most of the rainfall comes during Sept-Dec due to depression in Bay of Bengal Decrease in normal rainfall Extreme events of rain, heat wave, cold, etc. Drinking water scarcity in summer for human as well as livestock
If the answer towards this is 'yes' continue on this topic asking questions like – Are you taking any adaptation measures to adjust to the changes in the rainfall. If so what are they? (Some of the measures are moving away from flood affected area to the safer place, changing in the cropping pattern, changing in the cropping calendar, etc)	There are not much adaptation measures taken at the villagers end. They still depend upon the rain for their farming. As 95% of the villagers depend upon agriculture, during discussion it was found that there is a gap for technical knowhow. Agricultural department needs to take appropriate steps to propagate the alternative cropping mechanism among the farmers so that they can go for it. Even women groups shared that there are four self help groups in the village growing vegetables. There is a need for new technologies and technical supports for them for better farming.
Flood Mitigation measure	
With the help of the community identify flood affected areas,	The village is completely affected by the flood as it is adjacent to the river and does not have any embankment.

flood control measures in the village (embankments, improvement in the drainage system, sluice gate, etc.) and its present conditions. In case the community is suggesting for new structural mitigation measures take the discussion further to understand the cost benefit of the measures, issues that can happen, any limitation, to understand whether the community foresee all aspects before suggesting such thing. And how to organise implementing such measure: who should take the lead, government or community?	Community suggested the following: Community flood shelter in the village Embankment on river side near to the village Storage of the food stuff in the village before the rainy Provision of boat for transport as well as carrying the patients to the nearest hospital Manitri (5 kms) and Baisingha (7 kms) Provision of Irrigation facility to the farmers for farming
Planning and decision making	
Do villagers know who to approach at the government with regard to flood management issues? Is there regular communication with local government on flood issues, mitigating measures? Are ideas and local knowledge appreciated by government? Are you in general content with the communication with government?	The villagers urged that the local Government officials should take for providing irrigation system for the village and construction of flood protection structure to protect the village.
Are local villagers consulted or involved when government prepares measures for flood mitigation, such as embankment construction or rehabilitation? If so, how is this organised. If not, what do you think of this? How should this be changed?	The villagers were not consulted for any kind of flood management issues in the village.
Community flood mitigation and adaptation initiative	
What is the present mechanism	Government use to announce the flood warning through public

of informing the community on flood alert, frequency and its effectiveness?	address system. But at the time of flash flood there is hardly any lead time. The group shared that they used to get information regarding cyclones but not for floods. Villagers suggested that there should be an effective warning dissemination mechanism for flood from the State level to the grass root level.
Whether community wait for information or take own decision?	Over the years the community has developed their own coping mechanism for flood. They used to take own decision without waiting for alert from the government.
What kind of initiative government has taken to help the flood management in your village?	No steps have been taken by the Government to resolve the flood issues in the area.
What kind of initiatives communities and community based organization are taking to manage the flood – like awareness where to live, and how to protect assets, how to protect the crops (standing/harvested), how to reclaim the soil if soil health has been deteriorated due to the silt carried along with flood water, village level DM committees/village committee to inspect embankment/sluice gate before monsoon/rainy season, etc.?	Earlier one NGO called FORD has done some activities but now a day there is nothing happening. There is no DM committee or any grass root organization working in this village
Effectiveness of government mechanism in response, rescue, and relief operations?	Rescue operation becomes very challenging as the current in water and water level remains very high during the flooding period. But as stated by the villagers by themselves saved a person drowning in the river during flood. But they do not have enough expertise and equipments for that. Livestock get affected severely, there is no provision of fodder for them at the time of need.
Steps needed for protecting from flood	
What Govt. should do to minimise the flood induced	Govt. should take the following steps as per the villagers & the women group:

negative impacts in the area such as human lives, house, crops, livestock, etc?	Stone patching of the river walls. Community flood shelter in the village with facilities for water and sanitation. Provision for easy discharge of flood water from the agriculture fields through developing drainage. Provision access to seeds, fertilizers to the farmers. Training to farmers on alternative cropping mechanism. Effective warning dissemination. Provide free kitchen and dry foods for the children and old aged persons during flood Provide safe drinking water during flood. Provision of training on first aid and rescue operation to the women groups to protect their children and family members from snake bite and other flood related problems. Storage of food stuffs in the village before rainy season in a specially constructed house to protect from damage due to flood.
What community can and should do for flood risk management to avoid lives and assets (house, crops, and livestock) losses from floods?	They expect Government to help to resolve the flood problems in the village.

Water level reached in the year 2013

Water level reached in the year 2013

Date: 6th Feb 2015 **Village:** Goradia, **GP:** Dighi, **Block:** Bhuban, **District:** Dhenakanal, Odisha

Village Profile	
Population	5000 (Approx) in 500 Household
Area	Land for Houses: 100 Acres (Approx) Agriculture Land: 500 Acres (Approx) Paddy Cultivation: 250 Acres (Approx)
Location of the River	Adjacent to the village Goradia. River Brahmani flows 1.5 (approx) kms away from the village.
Major Occupation/livelihood	Agriculture Kharif season: Paddy, Sugarcane Rabi Season: Groundnuts, Black Gram, Green Gram
Flood hazard profile	
How often do you have a flood? How long does a flood normally last? To what height the water reached?	Flooding and water-logging in rainy season are the regular phenomena in the village. Previously village faced flood in 1955, 1964, 1969, 1999, and 2011. Water level in agricultural field remains above 1 metre during flood events. Flood situation in the village remains relatively for longer period of 10 to 15 days especially in agricultural fields.
What are the major disasters occurred in this village?	Floods in 1955, 1964, 1969, 1999, and 2011; Super cyclone in 1999; and Phailin in 2013. Phailin brought high wind speed followed by heavy rainfall leading to flood. Even in 2014, during HUDHUD cyclone heavy rainfall occurred in the village submerging agricultural fields in the village.
What is the most devastated disaster occurred in the recent past say last 10 years in your area?	Floods of 1999 and 2011 devastated the village badly causing large scale crop and livestock damages apart from 1955 and 1969 floods. Casualty to human beings was not reported as the villagers were well acquainted with recurring flooding events.
How it affected the village and in what extent? What was the health impact? What was the extent of damages on the crop and livestock? Did it affect the soil?	Water remained in the low-lying agricultural field for several days after the flooding which lead to severe crop damage. In 2011, the farmers in the village cultivated paddy in 250 acres of land (locally they call it pata in which they used to do paddy cultivation) which was completely damaged due to submergence of land. Regarding the health hazards, there were instances of water borne diseases in the area during flood. Villagers were of the

	opinion that skin diseases occurred at the time of flood in the village. Health centres are quite far away from the village. River at the time of flood brings sand in large volumes and deposits onto the fertile land of the village posing serious threat not only to the fertility of land but also the carrying capacity of the river. For agricultural purposes, a canal (Balipada to Dighi) was laid down but somehow it failed to solve its purpose. Moreover, during rainy season water directly enters into the village from that canal as there is no spur along the canal. There is also one more irrigation canal passing through the village but that is not helpful at all for agricultural activities in the village.
What was the major loss in terms of lives and assets due to that devastated disaster? Did you receive help from outside in terms of relief funds, equipment, housing material etc. to recover from the losses? How long did it take to be back to the situation before the disaster (in terms of assets such as livestock, house, and in terms of income)?	The major losses due to disaster were damage to the kutcha houses, damage to the crops, livestock losses, unavailability of fodder for the livestock etc. Villagers shared that less relief materials were provided by Govt. or from any NGOs. Usually it takes nearly a month for the villagers to come to normalcy after any massive flood incident. There was no scope for labour intensive works after the flood. It was seen that the village is having good interconnectivity concrete roads, schools and pucca buildings. There are two sahis / padas which are nearer to the river embankment having more kutcha houses and poor road connectivity. Basically these roads and houses got damaged during the flood.
Flood benefit if any	
Understand the perception of community towards flood. Whether they believe flood is a problem or a phenomenon which also bring in benefits? If so what?	Mixed opinion was received from the villagers about the benefits of flood. Sometimes the flood is beneficial to the villagers and sometimes it affects them severely. Basically it depends on the timing of flood occurrence.
Compare a situation with regular flood and without flood due to flood protection measures. Which is a preferred one?	As the farmers of the village completely depend on the rainfall for farming, the rain is beneficial for them in this context. But not the excess rain. Excess rain causes water logging in the area which is not beneficial for crop as well as human being. So, flood protection measures are equally important to save the crop fields. Similarly, when flood water flows in the river sometimes it spills over the embankment. Even if flood water does not enter into their houses but their livelihoods and livestock get affected. It is always better to have flood protection measures to check

	flood and livelihood loss.
Does flood has any beneficial effect on the crops? Whether flood in one season (say during Kharif season) is beneficial for the crops during next cropping season (i.e., Rabi season crops) in terms of water availability or soil moisture availability for the crops?	It is beneficial if the following points considered: Proper drainage facility for flood water from the agriculture fields. Sluice gates for proper drainage of water to the river. Awareness of flood resistant crops to the farmers.
Changes over the last 20 years (Flood, pattern of Rain, etc)	
Did you observe any changes in the rainfall distribution pattern and flood characteristics in your region? Please ask with example of increase/decrease in rain and duration of rain during particular month/season or monsoon reaching early/late, etc.	As per the villagers there is a visible change in the climate which is as follows: Deviation in monsoon (normally starts form 10th June earlier but now it starts by the end of July) Increase in temperature Rain due to low pressures only Decrease in normal rainfall Extreme events of rain, heat wave, cold etc. Drinking water scarcity in summer for human as well as livestock
If the answer towards this is 'yes' continue on this topic asking questions like – Are you taking any adaptation measures to adjust to the changes in the rainfall. If so what are they? (Some of the measures are moving away from flood affected area to the safer place, changing in the cropping pattern, changing in the cropping calendar, etc)	There are not much adaptation measures taken at the villagers end. They still depend upon the rain for their farming. As 90% of the villagers depend upon agriculture, during discussion it was found that there is a gap for technical knowhow. Agricultural department needs to take appropriate steps to propagate the alternative cropping mechanism among the farmers so that they can go for it.
Flood Mitigation measure	
With the help of the community identify flood affected areas, flood control measures in the village (embankments, improvement in the drainage system, sluice gate, etc.) and its	Basically two sahis / padas of the village affected by the flood which are nearer to the river. There is embankment in the river but sometimes it spills over. The major problem is water logging in the area. Also the canal excavated earlier now contributes a lot to the flooding in the area. The photos given in the gallery can be viewed for the present

present conditions. In case the community is suggesting for new structural mitigation measures take the discussion further to understand the cost benefit of the measures, issues that can happen, any limitation, to understand whether the community foresee all aspects before suggesting such thing. And how to organise implementing such measure: who should take the lead, government or community?	scenario of the village.
Planning and decision making	
Do villagers know who to approach at the government with regard to flood management issues? Is there regular communication with local government on flood issues, mitigating measures? Are ideas and local knowledge appreciated by government? Are you in general content with the communication with government?	The villagers urged the local Govt. officials to take steps for draining of water from the agricultural fields but no results achieved. It needs a much higher level intervention. As per the villagers there is a need for stone patching of the canal situated near the river, because the canal itself contributes more to the flooding in the area.
Are local villagers consulted or involved when government prepares measures for flood mitigation, such as embankment construction or rehabilitation? If so, how is this organised. If not, what do you think of this? How should this be changed?	The villagers were not consulted for any kind of flood management measures in the village by the Govt. But there is a provision of "*Palli Sabha*" (Gram Sabha) for other development issues in the village. Villagers used to sit and finalise the developmental projects of the village. Villagers demanded flood management must be a part of all developmental activities.
Community flood mitigation and adaptation initiative	
What is the present mechanism of informing the community on flood alert, frequency and its effectiveness?	Govt. used to announce the flood warning through public address system. But at the time of flash flood there is hardly any time for communicating timely warnings and alerts.
Whether community wait for	Community has its own coping mechanism for flood. They used

information or take own decision?	to take the decisions without waiting for any warning from the Govt. department. Villagers were of the opinion that no harm to the human happened due to flood as village is having good number of pucca houses and they used to manage with that. Regarding the crops, they could not do anything unless until the water recedes.
What kind of initiative government has taken to help the flood management in your village?	No steps have been taken by the Govt. to resolve the flood issues in the area.
What kind of initiatives communities and community based organisation are taking to manage the flood – like awareness where to live, and how to protect assets, how to protect the crops (standing/harvested), how to reclaim the soil if soil health has been deteriorated due to the silt carried along with flood water, village level DM committees/village committee to inspect embankment/sluice gate before monsoon/rainy season, etc.?	No Disaster Management Committees, NGOs or CBOs functioning in the village to help the community to tackle the flood situation in the area.
Effectiveness of government mechanism in response, rescue, and relief operations?	As the district and the village are situated in the upper catchment of Brahmani, so there is no need for rescue operations. But with respect to relief that is also not there for the community because the water does not enter into their houses. As livestock get affected, but there is no provision of fodder for them at the time of need.
Steps needed for protecting from flood	
What Govt. should do to minimise the flood induced negative impacts in the area such as human lives, house, crops, livestock, etc?	Govt. should take the following steps as per the villagers: Stone patching of the canal walls. Proper draining of flood water from the agriculture fields. Sluice gates for proper drainage of water into the river.

	Enhancement of the embankment height. Proper irrigation facility. Provision of drinking water at the time of need. Easy availability of seeds, fertilisers to the farmers. Training to the farmers on alternative cropping mechanism. Communication of timely warning and alerts to the grass root level.
What community can and should do for flood risk management to avoid lives and assets (house, crops, and livestock) losses from floods?	Community should assure the Govt functionaries for their support and co-operation in each flood management and development aspects.

Date: 06th Feb 2015 **Village:** Penthapal, **GP:** Penthapal, **Block:** Pattamundai, **District:** Kendrapada, Odisha

Village Profile	
Population	8000 (Approx)in 1000 Household
Area	Land for Houses: 100 Acres (Approx) Agriculture Land: 670 Acres (Approx)
Location of the River	Brahamani – 0km from the village Kharasrota – 1km from the village Kani – 3 kms from the village
Major Occupation/livelihood	Agriculture Kharif season: Paddy Rabi Season: Groundnuts, Black Gram, Green Gram
Flood hazard profiling	
How often do you have a flood? How long does a flood normally last? To what height the water reached?	Flooding is a regular phenomenon in the village. Every year the village gets affected by the flood may be of small one. Water remained for 10 days in the village and the height was more than 5 feet.
What are the major disasters occurred in this village?	Flood: 1955, 1960, 1975, 2011, 2013 Cyclone: 1982, 2013 (Phailin) Super Cyclone: 1999
What is the most devastated disaster occurred in the recent past say last 10 years in your area?	In the year 2011 the devastation was more due to flood. Though there were no human casualty reported from the village during that period but livestock and agriculture damaged severely.

How it affected the village and in what extent? What was the health impact? What was the extent of damages on the crop and livestock? Did it affect the soil?	As the village is low lying area flood water directly enters into the village from the rivers nearby. Even water enters into the houses of the people. Women groups shared that they faced the following problems during the flood: No place for cooking No place for defecation as all the areas were submerged in water Taken shelter in nearby pucca houses. Though there is a flood shelter constructed by OSDMA which is 2kms away from the village but approach is difficult at the time of flood No food for the children, old and ill person of the family Communication disrupted completely Water enters into the nearest PHC (500m from the village) and CHC (3 kms from the village) Often has to drink flood water during flood Snake bite cases reported during the flood Children affected most during flood
What was the major loss in terms of lives and assets due to that devastated disaster? Did you receive help from outside in terms of relief funds, equipment, housing material etc. to recover from the losses? How long did it take to be back to the situation before the disaster (in terms of assets such as livestock, house, and in terms of income)?	The group shared that: Houses damaged Utensils washed away in flood or damaged due to the wall collapse Large number of livestock killed Received relief materials in terms of dry food from the Government. It took more than 60 days to get back to normal condition. Livelihood completely destroyed. Getting the fodder for the livestock was a great problem.
Flood benefit if any	
Understand the perception of community towards flood. Whether they believe flood is a problem or a phenomenon which also bring in benefits? If so what?	As shared by the group, flood used to be a blessing for the villagers especially for the farmers in earlier years. But now it is a curse of nature for the villagers. The frequency of flood event and water level increasing day by day which is a matter of worry.
Compare a situation with regular flood and without flood due to flood protection measures. Which is a preferred one?	Regular flooding pushes back the villagers but living with the flood protection measures is the preferred one.
Does flood has any beneficial effect on	Flood is beneficial for agriculture. But the frequent flooding

the crops? Whether flood in one season (say during Kharif season) is beneficial for the crops during next cropping season (i.e., Rabi season crops) in terms of water availability or soil moisture availability for the crops?	does not allow the crops to grow and impact the yield.
Changes over the last 20 years (Flood, pattern of Rain, etc)	
Did you observe any changes in the rainfall distribution pattern and flood characteristics in your region? Please ask with example of increase/decrease in rain and duration of rain during particular month/season or monsoon reaching early/late, etc.	As per the group there is a visible change in the climate which is as follows: Change in rainfall pattern particularly the onset date of monsoon Increase in temperature Heavy rain during cyclonic depression Extreme events of rain, heat wave, cold etc. Earthquake tremors Lightening deaths are occurring more in these days
If the answer towards this is 'yes' continue on this topic asking questions like – Are you taking any adaptation measures to adjust to the changes in the rainfall. If so what are they? (Some of the measures are moving away from flood affected area to the safer place, changing in the cropping pattern, changing in the cropping calendar, etc)	There is not much adaptation measures taken by the villagers. Farmers are discouraged and are giving up on farming due to frequent losses. A local NGO, Vaarat intervened and provide technical support and training to farmers for doing agricultural activities.
Flood Mitigation measure	
With the help of the community identify flood affected areas, flood control measures in the village (embankments, improvement in the drainage system, sluice gate, etc.) and its present conditions. In case the community is suggesting for new structural mitigation measures take the discussion further to understand the cost benefit of the measures, issues that can happen, any limitation, to understand whether the community foresee all aspects before	The village is completely affected by the flood as it is adjacent to the river and does not have any embankment on river Brahmani and Kharasrota. As the area is low lying area, in rainy season due to heavy rain also the water logging occurs in most of the places.

suggesting such thing. And how to organise implementing such measure: who should take the lead, government or community?	
Planning and decision making	
Do villagers know who to approach at the government with regard to flood management issues? Is there regular communication with local government on flood issues, mitigating measures? Are ideas and local knowledge appreciated by government? Are you in general content with the communication with government?	The villagers urged the local Govt. officials to take up steps for drainage of water from the agricultural fields but no result. It needs higher level intervention.
Are local villagers consulted or involved when government prepares measures for flood mitigation, such as embankment construction or rehabilitation? If so, how is this organised. If not, what do you think of this? How should this be changed?	The villagers were not consulted for any kind of flood management issues in the village.
Community flood mitigation and adaptation initiative	
What is the present mechanism of informing the community on flood alert, frequency and its effectiveness?	When water releases from the dam, local administration used to announce the flood warning through public address system and ask the people of low lying areas to go to the safer places. The group shared that they used to get the information regarding Cyclones.
Whether community wait for information or take own decision?	Community has its own coping mechanism for flood. After seeing that the water level increase and the rainfall, they used to take their own decision without waiting for any warning from the department level.
What kind of initiative government has taken to help the flood management in your village?	No steps have been taken by the Govt. to resolve the flood issues in the area. Only at the time of heavy flood, Govt. used to do the relief operation and that is also not immediately. As the communication completely fails during the time of flood, after receding of water only Govt. intervenes. To take shelter at the time of flood one Community flood shelter has been constructed but during actual flood it was found that the shelter is inaccessible. So approach to the shelter is needed immediately.

What kind of initiatives communities and community based organisation are taking to manage the flood – like awareness where to live, and how to protect assets, how to protect the crops (standing/harvested), how to reclaim the soil if soil health has been deteriorated due to the silt carried along with flood water, village level DM committees/village committee to inspect embankment/sluice gate before monsoon/rainy season, etc.?	There is no DM committee in the village but there is a committee called FSMMC formed at the shelter level. Shelter is well equipped with rescue materials and utensils for free kitchen at the time of flood for evacuees. NGO Vaarat is conducting some training programmes on Disaster preparedness and agriculture related issues.
Effectiveness of government mechanism in response, rescue, and relief operations?	Govt. response is effective but community should be involved in the rescue, response and relief management.
Steps needed for protecting from flood	
What Govt. should do to minimise the flood induced negative impacts in the area such as human lives, house, crops, livestock, etc?	Embankment on River Brahmani Provision of boats for communication and relief operation at the time of flood Stock piling before the flood season as the communication completely disrupts Flood shelter with facilities especially for women, children, and old people.
What community can and should do for flood risk management to avoid lives and assets (house, crops, and livestock) losses from floods?	Communities with the support of local NGO is trying to do farming practice which can adapt to the flood situation. This include us of flood resilient varieties.

Interaction with the Women group

Interaction with the Women group

Multipurpose shelter facility constructed by OSDMA

ANM sharing her experience of flood

Group Photo of the participants

Group Photo of the participants

Date: 7th Feb 2015 **Village:** Kankili, **Block:** Talcher, **District:** Angul, Odisha

Village Profile	
Population	2000 Household and 7000 Population (Approx) 12 Wards
Area	Land for Houses - 100 Acres (approx) Cultivated Land – 500 Acres (approx) 100 Acres of agriculture land already captured by the river as per the villagers.
Location of the River	0.5 km from the village
Major Occupation/livelihood	Agriculture and labour in the coal mines
Flood hazard profiling	

How often do you have a flood? How long does a flood normally last? To what height the water reached?	Flood was a regular phenomenon in the village before construction of Samal Barrage. The frequency of flood has decreased after the construction of this Barrage (since 2005). After that due to controlled and regulated flow of water, the flood incidents have deceased. As the elevation of village is higher compared to river bed, river water does not enter the houses affect agricultural land. Normally flood water remains for 4 to 5 days in the agricultural land.
What are the major disasters occurred in this village?	In the year 1955, 1960, 1965, 1969, 1975, and 1982 flood occurred in the area. In the year 1999, Super Cyclone affected the area. In the year 2013 and 2014, Phailin and Hudhud also impacted in the area.
What is the most devastated disaster occurred in the recent past say last 10 years in your area?	No major disaster has occurred in the area for last 10 years. But in the year 2013 and 2014 due to phailin and Hudhud, the village received substantial amount of rainfall which caused water-logging in the agricultural fields and some of the house also got damaged mainly due to heavy rain. The problem gets aggravated when the barrage releases water and along with heavy rain.
How it affected the village and in what extent? What was the health impact? What was the extent of damages on the crop and livestock? Did it affect the soil?	Rainfall accompanied with cyclonic wind affects kutcha houses in the village. Nowadays except few, people constructed semi-pucca houses which minimizes damage. Hospital of the village is not well equipped. Good facility hospital is 7 km away from the village.
What was the major loss in terms of lives and assets due to that devastated disaster? Did you receive help from outside in terms of relief funds, equipment, housing material etc. to recover from the losses? How long did it take to be back to the situation before the disaster (in terms of assets	The major losses due to flood includes cops, livelihood, damage of Kutcha houses and casualties of livestock During the flooding the Government interventions is mainly in the form of relief materials. Now Mahanadi Coal Limited (MCL) is

such as livestock, house, and in terms of income)?	doing some developmental work under its CSR programme. They constructed a community centre for the villagers. At the time of Hudhud, Government provided polythene sheets but was not sufficient.
Flood benefit if any	
Understand the perception of community towards flood. Whether they believe flood is a problem or a phenomenon which also bring in benefits? If so what?	There is a mixed opinion received from the elders of the village about the benefits of flood. Sometimes the flood is beneficial to the villagers and most of the times impact negatively by damaging the crops. Villagers used to grow both Kharif (30%) and Rabi (100%) season depending on rainfall. As the district is situated in upper catchment, so water from the river does not affect them much but the water logging is creating problems.
Compare a situation with regular flood and without flood due to flood protection measures. Which is a preferred one?	As the farmers are completely dependent on the rainfall as there is no irrigation facility available, the rain is beneficial but not floods. Flood also cause water logging in the area which affect negetively. So flood protection measures are equally important to save the agriculture. So, living with flood protection measures is preferred for the villagers.
Does flood has any beneficial effect on the crops? Whether flood in one season (say during Kharif season) is beneficial for the crops during next cropping season (i.e., Rabi season crops) in terms of water availability or soil moisture availability for the crops?	Nowadays, flood water brings sand instead of silt which is not good for crop field. This is not good for agriculture.
Changes over the last 20 years (flood, pattern of rain, etc)	
Did you observe any changes in the rainfall distribution pattern and flood characteristics in your region? Please ask with example of increase/decrease in rain and duration of rain during particular month/season or monsoon reaching early/late, etc.	Villagers observed visible change in climate which are as follows: Deviation in monsoon (Normally starts from 10th June earlier but now by the end of July) Decrease in normal rainfall Rain due to low pressures only Increase in temperature

	Extreme events of rain, heat wave, cold wave, etc. Drinking water scarcity in summer for human as well as livestock
If the answer towards this is 'yes' continue on this topic asking questions like – Are you taking any adaptation measures to adjust to the changes in the rainfall. If so what are they? (Some of the measures are moving away from flood affected area to the safer place, changing in the cropping pattern, changing in the cropping calendar, etc)	There are not much adaptation measures adopted by the villagers. The river course is changing and some people from the village shifted to the upper land nearby. The new sahis are: • Satyasia sahi • Kankili nuasahi • Sainali sahi • Katamali sahi • Similipal sahi
Flood mitigation measure	
With the help of the community identify flood affected areas, flood control measures in the village (embankments, improvement in the drainage system, sluice gate, etc.) and its present conditions. In case the community is suggesting for new structural mitigation measures take the discussion further to understand the cost benefit of the measures, issues that can happen, any limitation, to understand whether the community foresee all aspects before suggesting such thing. And how to organise implementing such measure: who should take the lead, government or community?	Village is situated on the river embankment. People have built their houses there. The village is vulnerable to flood and soil erosion. There is an urgent need to take measures to reduce the soil erosion in the village due to recurring flood. Suggestions from the villagers: • Protection of river bank from erosion • Drainage to avoid water logging in agricultural fields • Irrigation system
Planning and decision making	
Do villagers know who to approach at the government with regard to flood management issues? Is there regular communication with local government on flood issues, mitigating measures? Are ideas and local knowledge appreciated by government? Are you in general content with the communication with government?	Villagers are not much aware about the departments who are dealing with the flood management still they approached the local authority i.e. block development officer to address the issue. The Water Resource Department has taken some steps to protect the village from the river bank erosion but not adequate.
Are local villagers consulted or involved when government prepares measures for flood mitigation, such as embankment construction or	The villagers were not consulted for any kind of flood management issues in the village. But there is a provision of "*Palli Sabha*" for

rehabilitation? If so, how is this organised. If not, what do you think of this? How should this be changed?	other developmental issues of the village. Villagers used to sit and finalise the developmental projects of the village. But this meeting never discuss on flood issues.
Community flood mitigation and adaptation initiative	
What is the present mechanism of informing the community on flood alert, frequency and its effectiveness?	Villagers shared that they used to get the flood alerts from the local news paper and news channels. Still, there is a gap in information dissemination with regard to water release from the reservoir.
Whether community wait for information or take own decision?	Community has its own coping mechanism for flood. They used to take decisions without waiting for any warning from the department at the appropriate time.
What kind of initiative government has taken to help the flood management in your village?	This includes construction of samal barrage which has apparent difference in the flooding in the village. In addition to this the Government has construction protection walls to protect the bank erosion.
What kind of initiatives communities and community based organisation are taking to manage the flood – like awareness where to live, and how to protect assets, how to protect the crops (standing/harvested), how to reclaim the soil if soil health has been deteriorated due to the silt carried along with flood water, village level DM committees/village committee to inspect embankment/sluice gate before monsoon/rainy season, etc.?	No Disaster Management Committees, NGOs are working in the village to help the community to tackle the flood situation in the area. One youth club in the village is helping the community of the village at the time of need.
Effectiveness of government mechanism in response, rescue, and relief operations?	Govt. mechanism is effective for flood response.
Steps needed for protecting from flood	
What Govt. should do to minimise the flood induced negative impacts in the area such as human lives, house, crops, livestock, etc?	Govt. should take the following steps as per the villagers: Stone patching of the river banks. Protection for the soil erosion in the river side Easy discharge of flood water from the agriculture fields.

	Proper irrigation facility. Supply of seeds, fertilizers to the farmers. Training to the farmers on alternative cropping mechanism. Warning dissemination to village specially while discharging water from the reservoir.
What community can and should do for flood risk management to avoid lives and assets (house, crops, and livestock) losses from floods?	As such community is not doing much to mitigate flood risk. It is important to develop awareness among communities to ensure less damage and casualties.


Khirod
Mili


COMMUNITY CENTER

Appendix B: Questionnaire format English version

Form number:			

Operational Research to Support Mainstreaming of IFM under Climate Change - Phase II
Community household survey questionnaire

1. Identifiers

1.1 State		**1.7** Date of interview	
1.2 District		**1.8** Name of enumerator	
1.3 Block		**1.9** Interviewee	
1.4 Village		**1.10** Relation to HH Head	

2. Household information

2.1 Name of Head of household:	**2.2** Sex: M/F	**2.3** Number of members living in the house: Male: Female:	
2.4: Group: SC/ST/Others		**2.5** Number of Age <6: **2.6** Age > 60 **2.7** Disabled/chornic disease person:	
2.8. Number of adult with highest education in HH (living in the location)	Iliterate	Below 10th	Graduate
	Post graduate	Techinical (diploma/degree in engineering etc)	

2.9 Housing materials

Roof material:	grass ☐	Palm leaves ☐	Plastic sheet ☐	Wood ☐	Concrete ☐	Tile ☐	Iron sheet ☐
Wall material:	grass ☐	Palm leaves ☐	Plastic sheet ☐	Wood ☐	Brick-Cement ☐	Brick-Mud ☐	Mud ☐
Floor material:	Mud ☐	Brick ☐	Bamboo ☐	Wood ☐	Cement ☐	Tile ☐	

2.10 Location of the house: (a) River bed, (b) flood plain, (c) elevated land on flood plan, (d) On embankment, (e) on the protected side of embankment, (f) Others specify:

2.11 Age of the house: **2.12** Cost of construction of the house:

2.13 Plinth height: (a) ground level, (b) <1 mt, (c) 1-2 mts (d) > 2 mts

3. Household Assets

3.1 Please indicate which of the following assets you own *[Enumerator: Use questions and observation. Mention quantity applicable. If not available mark 'x'. Don't leave any blanks.]*

Asset	Number	**Asset**	Number	**Asset**	Number	**Asset**	Number
Flush toilet		Bicycle		Fishing net		Cattle	
Pit Latrine		Motorbike		Water tank		Buffalo	
TV		Car/truck		Dug well		Goat	
Landline phone		Tractor		Drill well:handpump		Poultry	
Mobile phone		Ox cart		Drill well:electric		Pigs	
Fridge		Boat with no engine		Irrigation equipment			
Airco		Boat with engine		Rice mill		Money on bank	
				Thresher		Jewelry	
				Water pump		Capital lend out	

3.2 Details of agriculture land

S. no.	Agriculture use	Area	Number of crops a year	Crop (Kg)	Own consumption or sale	Average income from crops

1

3.3 Main source of income of household in the order 1 to 5

Sale of Crop produce		Main source = 1 Second source = 2 Third source = 3 Fourth source = 4 Fifth source = 5
Sales livestock		
Fishing		
HH member has a job		
HH has a business		
Income Casual Labor		
Other		

3.4 Average monthly household income in Rs:

<1000	1001-3000	3000-5000	5000-10000	<10000

3.5 Approx. amount spent per month:
3.6 Approx. amount saved per annum:
3.7 If you have loan/debt amount Rs.

4. Access to (public) facilities

4.1 Please indicate if you have actual access to the following facilities:

	Y	N		Y	N
Do you have at your home:			**If you need, can you make use of:**		
Piped water supply (in house)			Micro-credit facilities		
Private well			Credit from money lender		
Electricity from grid			Credit from bank		
Electricity from communal generator			LP school		
Electricity from private generator			UP school		
			Other school:…..		
Do you have access to:			Doctor		
Communal tap			Agriculture training/extension		
Communal well					
Other water source (rain, river, pond)					
Public latrine					

4.2 What is the distance from your home to nearest health post / health centre: <1 Km, 1-2 km, 2-5 km > 5Km

4.3 What is the distance from your home to nearest (referal) hospital: <1 Km, 1-2 km, 2-5 km > 5Km

4.4 What is the distance from your home to the year-round (metalled/ concrete) road: <1 Km, 1-2 km, 2-5 km > 5Km

5. Problems and issues related to environment

5.1 According to you what is the main problem in the village (top two and mark in the order of prioity as 1 and 2)

Flood		No water		Sand casting in field		Other:	

5.2 What need to be done to minimize flood problems (Y is applicable). Answer atleast three.

Strengthening of Embankments		Lift irrigation for irrigating field in summer	
Water regulators to control intake and discharge of water		Provide training in agriculture to cope with floods	
Proper drainage facility		More relief funds	
Proper water discharge mechanism from the low lying areas		Mechanism to remove sand cast from agriculture fields	
Weather forecast and warning dissemination		Agriculture insurance:	
Involvement in Flood management planning		Others:	
Construction of flood shelters		Others:	

6. Flood hazard

Nr.	Hazard characteristic				Duration of flood event	Cause of flood	Houses		Agriculture				People								
	Year / month	Flood – F	Flood height at home	Flood height in agri land			House damaged (P – partial, C – complete)	Assets destroyed	Livestock died		Crops destroyed		Nr of people affected	Injured - Child, Elder, Disabled, Other (provide numbers)				Died - Child, Elder, Disabled, Other (provide numbers)			
									Type	Nr	Type	Area Hectre		C	E	D	O	C	E	D	O
1													M								
													F								
2													M								
													F								
3													M								
													F								

Cause of flood – R: Heavy/continous rain, C: cyclone rain, O: overflow of embankment, B: breach of embankment, D: People delibrately break embankment, FF: Flash flood, T: tidal flood

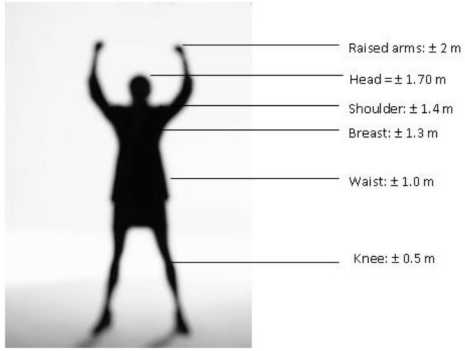
C: cattle, B: Baffalo, G: Goat, H: Poultry, P: Pig, Others specify

3

Nr.	Hazard characteristic						Houses		Agriculture				People								
	Year / month	Flood – F	Flood height at home	Flood height in agri land	Duration of flood event	Cause of flood	House damaged (P – partial, C – complete)	Assets destroyed	Livestock died		Crops destroyed		Nr of people affected	Injured - Child, Elder, Disabled, Other (provide numbers)				Died - Child, Elder, Disabled, Other (provide numbers)			
									Type	Nr	Type	Area Hectre		C	E	D	O	C	E	D	O
4													M								
													F								
5													M								
													F								

Cause of flood – R: Heavy/continous rain, C: cyclone rain, O: overflow of embankment, B: breach of embankment, D: People delibrately break embankment, FF: Flash flood, T: tidal flood

C: cattle, B: Baffalo, G: Goat, H: Poultry, P: Pig, Others specify



7. Health impacts of floods

7.1 How many household members experienced the following flood related health problems in the **last major flood**?

Direct Impact	**How many members?** 0=None	**Approx. number of days lost to activity (Total for all members)**
a. Malaria		
b. Dengue		
c. Skin rashes and/or eye infections		
d. Diarrhoea, jaundice, typhoid and other intestinal disorders		
e. Colds or respiratory illness		
f. Stress, depression or other mental problems		
g. Other water related health problem		

8. Preparedness and Early warning system

8.1 Do you observe any variation in tempearture or rainfall over the last 10-15 years: Yes/No

8.2 Do you recive or heard flood warning messages? Yes / No

8.3 If *yes*, what is the source (see codes below) (*more than answer is posible*)?

Message codes: 1. Radio 2. TV 3. Billboards 4. Poster 5. Leaflets 6. Newspaper notices 7. Village leaders 8. Other villagers

9. Other (specify)_____

8.4 Whether you get weather advisory before the cropping season start? Yes / No

8.5 If yes source:

Message codes: 1. Phone 2. Agriculture extension officer 3. Village head 4.

9. Other (specify)_____

8.6 Does your village has a community preparedness plan? Yes / No

8.7 Do you prepare yourself and your family when flooding is imminent? Yes / No.

8.8 If yes, what do you do?
[Enumerator: Don't read list. But prompt three times to check for other measures.]

Measure	**Yes**	**No**
a. Strenghten the house		
b. Store water in safe place		
c. Store food in safe place		
d. Put valuable assets in safe place		
e. Put animals in safe place		
f. Warn others for the flood		
g. Help others with preparations		
h. Help strenghtening the embankment (if there is one)		
i. Other:		
j. Other:		
k.Other:		

9. Coping mechanism and flood management

9.1 What coping mechanism you adapt safegaurd your livelihood (can mark more than one)

Do nothing and take risk		Abandoned agriculture and switch to to occupation	
Plan agricultural activities based on weather warning		Change agriculture crops to suit to flood situations	
Requested government to construct flood protection structures (embankments)		Requested government to demolish embankments	

Others:		Others:	
Others:		Others:	

9.2 Involvement of community in flood management activities

Involvement in flood management meetings along with govt. dept.		Involve in construction of flood protection structures	
Member of local response and emergency group		Others:	
Others:		Others:	

10. Flood risk measures

10.1 Which measures in your opinion should be taken by the community or government to reduce the flood vulnerability? *[Enumerator: Read list first]*

First priority: ____ Second priority: ____ Third priority: ____

Measure codes: 1. Better warnings 2. Constructing dikes 3. More safe areas 4. All weather roads 5. Preparedness plan
6. More relief funds 7. insurance against losses 8. Better medical facilities
9. Other(Specify) _____

11. Self-Assessment of vulnerability.

Thank you very much for all the time you have given. To conclude how would you say the vulnerability to flood of your household is.
11.1 Would you consider your family vulnerable to flooding? ☐ 1. Yes: High; 2. Medium; 3. Low; 0. No, not at all

11.2 If '*High*', please give the major reasons for your vulnerability (tick max. 3 reasons, min. 1 reason):
[Enumerator: wait for reply first. Then check with interviewee the table together]

Because…	**Tick if Yes (max. 3)**
a. there is no embankment to protect my agriculture land and asset	
b. because of the embankment water cannot go out causing flood	
c. we fear to lose our life and asset	
d. we cannot recover from the damage	
e. we cannot afford to getting ill	
f. our house is not flood proof	
g. we do not get support from outside	
h. there is no early warning	
i. it disrupts our life	
j. Other:	
k. Other:	
l. Other:	