



BEST PRACTICES FOR ADAPTATION AND DISASTER RISK REDUCTION

**CASE STYDY-10: < LOW COST SAND FILTER TO SAVE
PEOPLE FROM WATER BORN DISEASES IN THE FLOOD
PLAINS >**



RURAL VOLUNTEERS CENTRE
VILLAGE+P.O=AKAJAN, VIA-SILAPATHAR
DISTRICT-DHEMAJI (ASSAM), INDIA
PIN-787 059



TITLE: < Low cost sand filter to save people from water born diseases in the flood plains >

ORGANISATION: <Rural Volunteers Centre (RVC)>

1. THEME: PROTECTION OF PEOPLE LIVING IN FLOOD PRONE AREAS FROM WATER BORN DISEASES.

2. STATE/REGION/COMMUNITY: Assam/Upper Brahmaputra River Basin/Flood vulnerable population of Brahmaputra River Basin

3. BACKGROUND

Context: The economic, social and geographical situation:

Geographical context: The geographic area of operation of RVC covers the flood plains of Dhemaji and Lakhimpur District and Majuli Sub-Division of Assam in particular and whole of the 8 North Eastern states of India in general.

The District emerges from the foot hills of Arunachal Pradesh and stretches to the Brahmaputra River with Subansiri one side and the river Siang on the other. Geographically situated between the 94° 12' 18" E and 95° 41' 32" E longitudes and 27° 05' 27" N and 27° 57' 16" N latitudes, the district covers an area of 3237 Sq. Km and is a basically plain area lying at an altitude of 104 m above the Mean Sea Level.

The District Lakhimpur lies on north bank of the mighty river Brahmaputra. It is bounded on the north by Siang and Papumpare District of the state of Arunachal Pradesh and on east by Dhemaji District. Majuli, the largest River-island belonging to Jorhat District is on the south and Gahpur sub division of Sonitpur District is on the West. The exact location of the district is 26°48' and 27°53' northern latitude and 93°42' and 94°20' east longitude (approx.).

Being situated in a strategic location where the steep slope of eastern Himalaya abruptly drops, forming a narrow valley which makes the region, as well as the whole Upper Brahmaputra River-basin, immensely vulnerable to flooding, affecting 50% - 70% population every year for the last 3 decades. The mighty Brahmaputra River, the Subansiri River and numbers of their tributaries originating from the hilly terrain of Arunachal Pradesh account for the perennial flood problem of the region which has already caused irreparable damage to the region. In addition, extensive human interventions (deforestation, river stripping, construction of mega dams etc.) on the Brahmaputra River Basin compounded with probable impact of climate change are gradually making the whole of the Brahmaputra Basin immensely vulnerable to multiple hazards.

Socio Economical context:

- The District Dhemaji and Lakhimpur i.e. the immediate area of working of RVC is of rural character (98.5% populations are rural) and the economy is largely agro based.



- Livestock rearing is the main secondary livelihood practice of the community but the sector is yet to be commercially organized.
- Sericulture, fishing and driftwood business are practiced in smaller scale.
- Sand deposition, bank line erosion, shifting of river course and other adverse effects of chronic floods on fertile agricultural land have made even the affluent farmers land-less.
- Temporary or permanent displacement, crisis of water and sanitation facilities, health hazards are associated features of flood affecting the lives of the people every year.
- The depletion of agro based traditional livelihood practices has resulted in inter-District and inter state seasonal and permanent migration in large.

Rationale/ Justification for being a good practice and potential for scaling up /replication:

Dhemaji and Lakhimpur districts of Assam are suffering from annual flood due to their natural built up and geo-physical location, where all the turbulent rivers emerging from the hilly terrain of Arunachal Himalaya debouches in the plain of Dhemaji and Lakhimpur districts characterized by the in-cohesive soils and sub-soils. Thus both the districts always vulnerable for flood induced disaster. Safe drinking water during flood is a critical aspect as the flood contaminates and damages all the existing drinking water sources in the villages. Though water is available in this situation yet people have to strive for a pot of safe drinking water as the flood water contains heavy amount of suspended materials and sediments. In the extreme distress situation people use flood water for drinking which leads to outbreak of fatal water born diseases. The fastest response in the flood can reach the remote villages after three to four days after the incidence occur, again the normal government relief items do not include provision for safe drinking water. In this pitiable condition the simple sand filter provides 98% pathogen (results obtained from standard water test using Delaguae kit, H₂S strip etc.) and 99.9% suspended materials and sediment free water to the affected people.

Brief on the local condition prior to Project initiation:

Flood is a perennial phenomenon in Dhemaji. Lakhimpur districts and in the adjoining Majuli sub-division of Jorhat district creating untold miseries to the live of the people inhabiting in the riverine villages. A study carried out by the PHP team of RVC in 30 flood prone villages covering Dhemaji and Lakhimpur districts shows that the prevalence rate of diarrheal diseases are above the endemic status of such diseases throughout the year, the study also found that 73% of these diseases are directly related to unsafe drinking water. The general practice of the community to treat water for drinking purpose by boiling which is prevailed in some specific communities which is about 8% of the total population in the flood prone areas of both the districts, but this during flood they also can not follow this practice due to scarcity in space, fuel, utensil, storage and unavailability of sediment free water. The sand filter is used in the villages where the dissolved iron content is very high, but the technology is not used for removal of pathogen. This is also found that the arsenic content in water is also reduced to less than the permissible limit i.e. below 0.05 mg/l (Permissible limit of arsenic in India is 0.05 mg/litre)

Project / Intervention Formulation:

A study carried out the PHP team of RVC to know the traditional methods of water purification found that a normal sand filter without any specification of sand grain size can remove about 70 % of bacteria from water, this finding encouraged the team to more engaged to increase the effectiveness of the filter using the local materials to remove the iron content as well as the pathogen. The increase the effective permeability of the column the coarser sands without mica



particles are used in the top layer followed by the lesser coarser sand grains preferably without or minimum mica particles, this layer was followed by a small layer of charcoal (2 inch thick) and a layer of stone pebble above a plastic screen. The sieve size of the pot at the bottom of the pot made little larger. The discharge from this filter is thus increased to 2.5 litre per minute and the pathogen is reduced by 98% and almost 100% dissolved iron is removed by this process. The public health promotion activities of RVC have promoted sand filter based on this principle in more than 46 villages of Dhemaji and Lakhimpur districts, it is found that the use of sand filter can reduce the prevalence rate of water born diseases by more than 80%. The incorporation of safe water storage and proper water handling with the technology can reduce the prevalence of water born diseases by 95%.

Goal and Objectives:

Goal: Protect marginalized and flood vulnerable families from the water born diseases of Upper Brahmaputra river basin of Assam.

Objective: Provision for safe drinking water throughout the year with improvised sand filter technology using local resources and knowledge for the marginalized flood vulnerable families of Dhemaji and Lakhimpur districts and Majuli sub-division of Jorhat district to reduce the risk of water born diseases caused by pathogen.

4. KEY ELEMENTS

Target Beneficiaries: The initial targeted beneficiaries are the flood vulnerable/affected people inhabiting the Upper Brahmaputra River Basin.

Geographical Coverage: Dhemaji District, Lakhimpur District and Majuli Sub-Division of Jorhat District (Presently).

Key Project Activities/ Key Innovative Features - (capacity building, institution building, awareness, empowerment, etc) and methodologies/practices

- Study on the existing water curing technology among different communities
 - Study on the prevalence of water born diseases directly related to unsafe drinking water sources
 - Test on effectiveness of the existing sand filter to remove the pathogen from water
 - Test of effective permeability, conductivity and filtering capacity of different sand grains having different size and shape
 - Test of effectiveness of the combined column of sand, charcoal and pebbles as filtering materials
 - Test of effectiveness of different sieving nets-durability, effective porosity and chemical resistivity.
- To mobilize the people the existing filters are improved with the new technology and sharing with the families results after and before the modification and installation of continuous water surveillance mechanism with representatives from the communities and sharing the results with the community once in a week. Thus the community helped them to modify the existing filters and new sand filters were installed based on the improved technology.

CASE STUDY:

"I have two sand filters in my house, one for my family attached to the hand-pump in the back-yard and other in the front yard for the guests and my natives" - informed Mrs. Pramila Hazong of Nalbari village of Simenmukh GP under Sisiborgaon development block in Dhemaji district. Nalbari village is located in a high flood prone zone affected by flood caused by river Simen and Brahmaputra. Hazong community as a traditional practice

use boiled water for drinking purpose which they can not manage in the relief camps, they also used the sand filter just to remove the dissolved iron from water collected from the hand pump. "We need two potful (approx. each of 15 litre capacity) of good water for drinking and cooking purpose in our family, we used to filter this water by using the sand filter and boiled the water especially for drinking, we thought this is to be safe for our purpose, in the relief camps we can not manage this amount and practice, we have to compromise with the what is available with us. We tested the water filtered by the new sand filter, it is more safer, it removes the iron, sediment, bacteria and arsenic at the cost of nothing, we can manage this filter in the relief camps also." commented Mrs. Pramila Hazong as her feedback on the new improved sand filter.

Key Technical Inputs:

- Increased the discharge and filtering capacity by layering the sand
- Using the charcoal bed as reducing agent to absorb the oxygen
- Use of uniform size of pebble to facilitate rapid percolation and longer oxidation capillary path
- Use of sieve of appropriate size to avoid frequent blockage of filtering path and to maintain the capillary path in take
- Uniform perforation in the base of the vessel to facilitate the uniform capillary flow.

Impact – Social / Environmental/ Economical/ Policy Changes.

Social impact:

- Water collection is a responsibility of the women of the family, so the quality control of the water is an important role that the women of the family always need to ensure-safe, adequate, having good taste and without any bad smell, the use of sand filter can ensure this water at the homestead of the family even at the time of flood, which is a great help to the women.

Environmental impact:

- The out break of diarrheal diseases have very adverse impact on the immediate environment, the environment itself in turn helped transmission of vector born disease.

Economical impact:

- Lesser or no expenses on the water born diseases.
- Lesser loss of productive days and suffering
- Women can engaged on other livelihood activities out of their time saved lost in collection and curing of water.

Policy change:

- Under school health and sanitation schemes the water filters with candle filter were provided, but due to the low filtration rate and maintenance problems in most of the schools it is now useless, the effectiveness of the sand filter also encouraged the teacher community to keep a sand filter as an alternative.
- The Health and sanitation campaign under NRHM and TSC also focused on the improved sand filter.

5. COST INCURRED:

Almost nil in case of renovation of an existing one, maximum Rs. 30-40 may incur in the plastic sieve, charcoal (if it is not available) and stone (if it is not available locally). For newer unit it may cost Rs. 50-60.



6. MONITORING MECHANISM:

- One water quality surveillance team is formed to look after the proper use and to provide the technical help in each of the intervened villages. The surveillance team is equipped with water testing kit and trained on the technical aspects of the sand filter.

7. CHALLENGES:

1. Mobilizing people to agree with the effectiveness of the sand filter
2. Separation of different grade of sand and pebble

8. LESSONS LEARNT (both Positive & Negative)

Positive:

1. Safe drinking is a real need for the people at the peace and disaster hit time.
2. Arsenecosis is not prevalent in this area as people have been using the sand filter since long.

Negative:

1. Simplifying technical aspects such as effective porosity and permeability, size and shape of pebble
2. Collection of charcoal-charcoal is important in the fire place, for proper charcoal it has to collect half burnt, where a considerable ignition power is loss.

9. CONCLUSION

As an organization working in the field of disaster response and disaster risk reduction RVC strongly feels that small interventions in the life of vulnerable community can make considerable impacts in their life if the community can adopt the technology or if the inputs are as per their proposition. There are other areas like Dhemaji and Lakhimpur districts of Assam where affected communities have to compromise with unhygienic and undignified situation as a compulsion, this does not reflect their coping mechanism or tradition but may be compulsion due to lack of proper developmental interventions.

10. Submission may include photographs, graphs, charts, and other illustrations-

