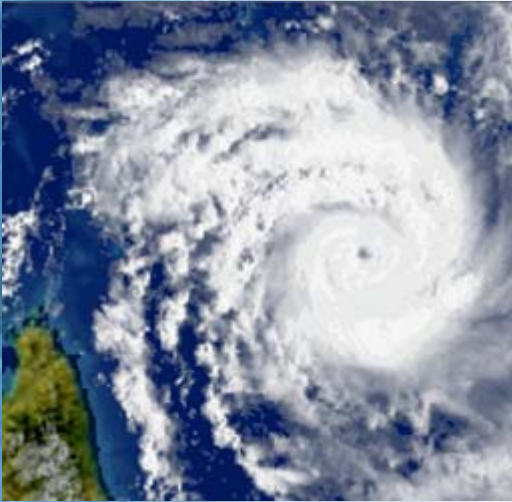


# Household water provision in emergencies

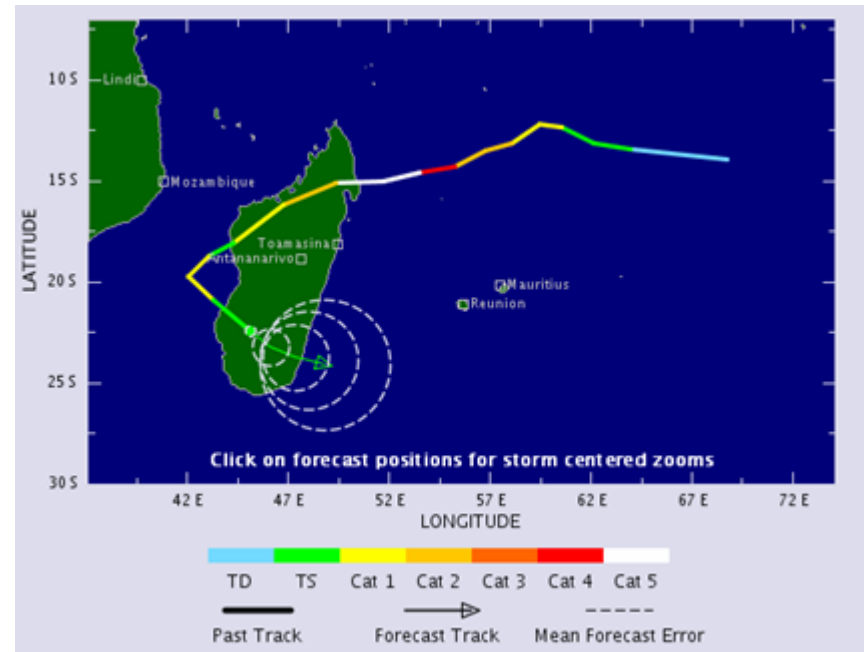


**Distribution of chlorine solution,  
rapid well jetting  
and bio-sand filtration**

# Context: cyclone emergency

## March 2004: Cyclone Gafilo hits Madagascar:

- Wind speeds over 300 km/hr
- Massive wind damage to villages, bridges, forests and infrastructure
- Severe damage to crops
- Widespread flooding in non-wind affected areas
- Tens of thousands of people without shelter, medical assistance, drinking water, etc



BushProof provides technical support to an emergency project by NGO Medair

# Context: overview of disaster

## Effects of wind damage:

The port of Antalaha...

Severe destruction of forests and crops...

Whole villages wiped from the face of the earth.

Here, only a cyclone-proof school was left standing...

Most public infrastructure destroyed.

Here the administrative buildings...



# Context: overview of disaster

## Effects of extreme rainfall:

The large Maroantsetra valley was almost completely inundated.

Many villages remained flooded for several weeks...

The people were forced to drink the heavily contaminated flood water



# Context: overview of disaster

## Situation in Maroantsetra town:

- 20,000 inhabitants
- Inundation lasted only a few days, in contrast to the surrounding villages
- However, great risk of outbreak of water borne disease, because...



# Context: overview of disaster

## Risk of disease outbreak in Maroantsetra:

- Cholera reported after previous cyclones;
- Very poor sanitation situation: only 6% use latrines. Open defecation is practised
- No treated piped water supply: drinking water is drawn from thousands of poor quality open wells
- All wells were grossly contaminated during the flooding



# Context: overview of disaster

## Risk of disease outbreak in Maroantsetra:

Local prison hotspot for disease outbreak:

- Severe crowding;
- High levels of disease including diarrhoea
- Half-destroyed buildings
- No latrines (open defecation in the compound)
- Disgusting water supply



# Emergency Response

Medair, the NGO who requested BushProof's support, listed the following objectives for their programme:

**Primary Objective:** prevent an epidemic, notably cholera

**Secondary Objective:** mitigation of effects of future cyclones on the water & sanitation situation

# Immediate emergency phase

The following actions were undertaken:

- Rapid clean-up and disinfection of ALL shallow open wells in town
- Distribution of buckets and Sûr'Eau chlorine solution in villages that were still flooded
- Provision of safe water and latrines in the prison, repair and disinfection of buildings, medical care for inmates



# Emergency well disinfection

- Large number of open wells in town shared by small family-groups
- Cleaning and pumping out wells proved too time-consuming
- Using a shock-dosage of 100 mg/l chlorine, 1400 wells were disinfected in 11 days in town and villages



# Emergency chlorine distribution

Sûr'Eau is a safe water chlorine solution marketed in Madagascar by PSI. It is commonly available, but not widely used in the bush.

## Methodology used:

Thousands of bottles of Sûr'Eau and buckets dropped by helicopter in inundated villages

- Distribution accompanied by radio messages and letters sent by canoe
- Actual distribution implemented by village authorities (majors, chiefs, etc).



# Emergency chlorine distribution

## Constraints encountered:

- Lack of knowledge regarding proper use of Sûr'Eau amongst villagers;
- NGO insufficiently prepared with suitable instruction materials (pre-recorded radio messages, printed instruction flyers, trained socio-mobilisers, etc);
- Insufficient stocks of Sûr'Eau available to cover all villages;
- Opportunity of emergency introduction of Sûr'Eau not followed up with promotion campaign to encourage permanent use;
- Logistics: Sûr'Eau is 99% water, which is heavy and costly to airlift. Powdered products (e.g. PUR or WaterMaker) are more practical, but would require even more effort to ensure correct use (product not known, no instructions available in local language, etc).

# Emergency chlorine distribution

## Evaluation of effectiveness of Sûr'Eau distribution:

- Sûr Eau and buckets were all used, although in some villages not as rapidly as hoped;
- Use of helicopter drop: the distribution went orderly and all items were shared out equally. The people seen grabbing the bottles after the drop had not kept them – therefore the distribution method was appropriate in that respect;
- Measuring short-term effectiveness of Sûr'Eau in reducing diarrhoeal incidence was not possible due to emergency context (no proper health impact evaluation carried out before or after the distribution).  
Comparison of health records between villages with and without Sûr'Eau showed no proof of impact.

# Mitigation phase

The mitigation phase consisted of:

- Rehabilitation and flood-proofing of public open wells in Maroantsetra town
- Introduction and promotion of bio-sand filters in town to improve water from private open wells
- Very rapid construction of flood-proof jetted wells equipped with Canzee hand pumps in villages



# Mitigation: well jetting

## Remarks on the well jetting concept:

- Very rapid construction (100-200 per month possible);
- Simple, low-cost technology (3-10 times cheaper than conventional water supply techniques);
- Flood-proof wells;
- Use of maintenance-free Canzee pumps (spares made at village level);
- Technique suitable for sandy soils with high water table.



# Mitigation: well jetting

## Evaluation results:

- 204 new wells in 3 months
- High density of wells per village (low intensity of use, longer life, water very close to the home)
- Ownership at semi-household level (3-5 family/neighbour groups share 1 pump)
- Large quantities of safe water available at household level



# Mitigation: bio-sand filtration

BSF introduced in rural situation:

**Rural:** 600 filters sold for very low price by project staff:

- High demand, despite little marketing;
- Source water turbid;
- Construction and installation problems (no suitable sand, sand not washed).
- Poorly functioning filters, until sand problem was recognised and rectified.



# Mitigation: bio-sand filtration

BSF introduced in urban area:

**Urban:** 70 filters sold for a profit by artisans.

- Lower demand, despite some marketing;
- Source water not turbid;
- High quality filters producing excellent drinking water;
- Local workshops continuing building and selling filters for profit, albeit in low numbers (no continued marketing support by NGO).



# Mitigation: bio-sand filtration

## Evaluation BSF performance post-emergency:

- Freely given filters were not much valued. The commercial sale of lower numbers might be more effective in the long term;
- Mitigation: correctly used filters are an effective means to treat flood water;
- Rapid introduction of BSF post-emergency should be followed with dedicated support project to ensure sustainability.



# Mitigation: bio-sand filtration

## BSF in prison:

- The installation of an emergency BSF with high output (made from oil drum) proved a suitable short-term solution until a jetted well could be constructed;
- The only problem encountered: BSF used by escaping inmates to scale the wall...



# More information

For more information on bio-sand filters:

[www.biosandfilter.org](http://www.biosandfilter.org)

More information on jetting:

[www.bushproof.com](http://www.bushproof.com)