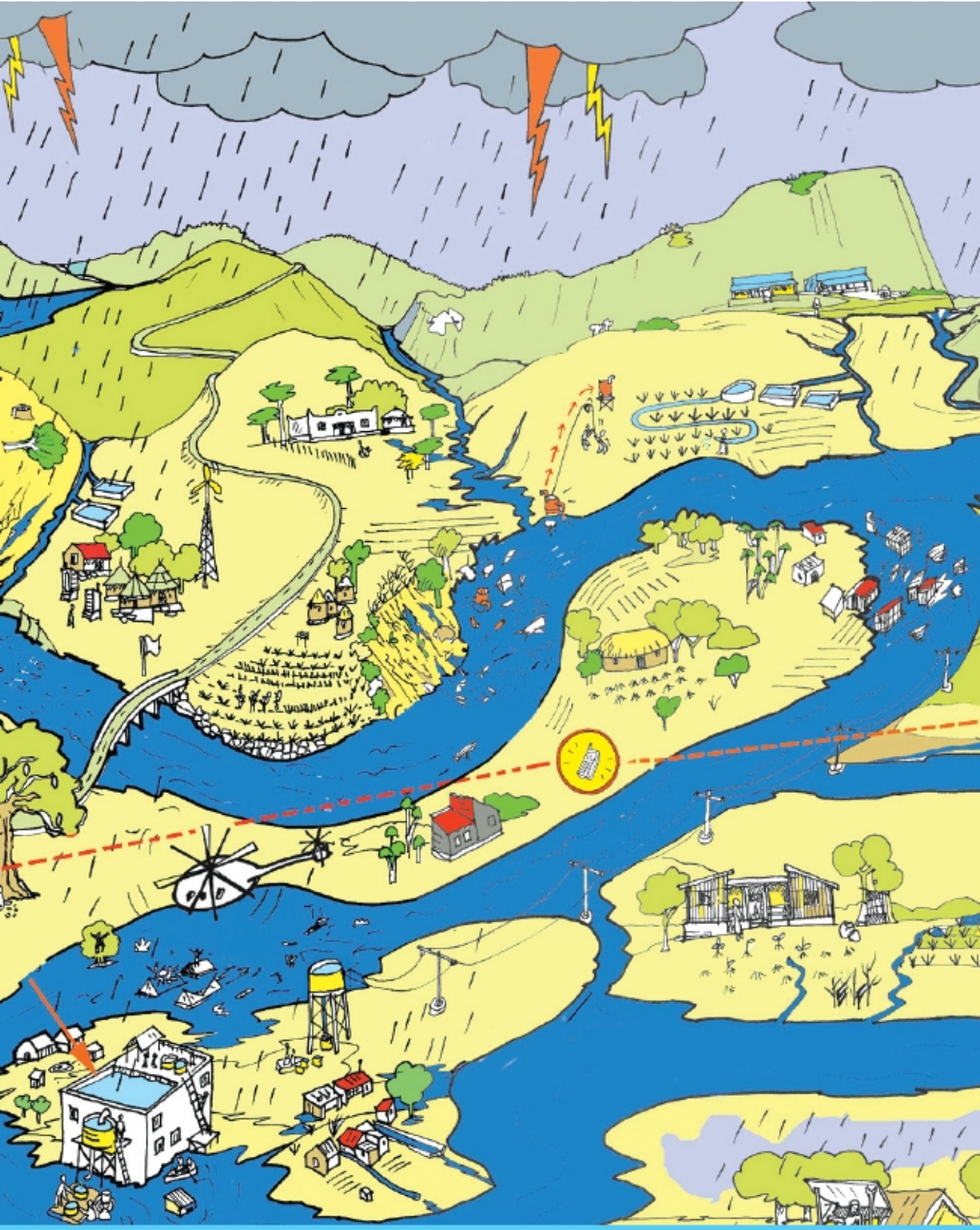


LEARNING HOW TO LIVE WITH FLOODS

LEARNING HOW TO LIVE WITH FLOODS

Republic of Mozambique

Ministry for Coordination of Environmental Affairs (MICOA)
National Directorate of Planning and Territorial Ordination (DINAPOT)

Ministry of State Administration (MAE)
National Disaster Management Institute (INGC)

With the assistance of The United Nations Human Settlements Programme (UN HABITAT)

Funded by the Disaster Preparedness Programme of the European Commission's Humanitarian Aid Department (DIPECHO)

Author of Text and Drawings
Eduardo Feuerhake, Architect - Consultant, UN-HABITAT - efeuerhake@hotmail.com
Collaborators: Manuela Muianga/Eurico Nhampule/Fernando Ferreiro

General Coordination
Mathias Spaliviero, Chief Technical Advisor, UN HABITAT
mathias.spaliviero@unhabitat.org – 4330/RLINLD/2004

Version
4th version (Maputo, June 2009), originally written in Portuguese language.
Translation into English supported by the ***IFRC Global Shelter Programme*** *and the* ***Mozambique Red Cross (Maputo, December 2010)*** .

“We left our homes. We looked at the firmament. And a sudden fear came to us: because the sky was no longer extensive.

A hand was there. The stars were countable; the fingers of a family were enough to point at. And, soon, the rain came, cascading the soil. Immense quantities of water, delayed, each pregnant and avid drop.

And everywhere there were veins, all the corners were converted into a tributary.

And the river got swollen, overflowed and covered the immensity. On the first dawn, the rain had already flooded the road, swallowing the bridge, chewing the fields. God had lost his hand on the water.

The sadness smiled, inside: I always wanted to see the sea. Now, the sea came to see me.”

Mia Couto, Rosita, in “A Berma de Nenhuma Estrada”

INTRODUCTION

This manual presents some important aspects related to floods. They are alternative proposals to be implemented locally, which will allow the populations to better protect themselves from the negative consequences of this cyclic natural phenomenon. The manual is addressed to leaders, local technicians and children.

TABLE OF CONTENTS

1. LESSONS LEARNED

In 2000, Chókwe City was totally flooded. About 700 people died and dozens of hundreds of families were evacuated.

The following satellite images of the 2000 floods show the true dimension of the Limpopo River Basin.

Limpopo River after the floods, May 2000

Limpopo River during the floods, May 2000

2. A NEW APPROACH

Bearing in mind that we do not yet count on safe solutions to protect ourselves from the floods, an alternative is

learning how to live with floods

Prepare our houses and public buildings so that they serve as shelter.

Organize our neighbourhoods, avoid building new houses on the lower lying areas or those which are very close to the rivers.

Elevate reservoirs of potable water in an accessible location and a sufficient height so that it is not contaminated by dirty flood water.

Work together with the community leaders and with the municipality in the early organisation and finding possible solutions (emergency plans) in the event of floods.

Keep the drainage system clean so that the water drains through properly in the event of rain.

Maputo, the main drainage

Drainage without maintenance

3. THE FLOODS:
A NATURAL PHENOMENON

When it rains heavily

the soil and trees are unable to absorb all the water, the water runs through the drains and canals to the lowest areas and, finally, it gets to the rivers.

Chókwè -2000

When the water is too much, the rivers
fill up and overflow their banks, flooding the fields.

This is the phenomenon of floods

When this happens, the population living near the river or in floodable areas is affected and, eventually, forced to abandon their houses.

The floods will always occur

minor when they reach secondary roads,

moderate when the main roads are interrupted,

major when the water floods even the higher lying areas of the city, from the village or from the neighbourhood.

Maputo, Bairro Indígena (neighbourhood), 2000

4. PROBLEMS

Lack of water to drink and consumption of improper water causes outbreaks of diarrhoea and cholera.

Food stocks are unreachable, get contaminated or spoiled.

Crop production in the fields is lost.

Animals die due to drowning or hunger.

People are isolated and the community loses their coordination capacity.

Mosquitoes increase as well as malaria.

Houses and basic services are damaged.

Water contaminates the walls and floors of houses.

Streets and roads are interrupted.

There is a lot of **soil erosion**.

If people try to swim, walk or drive in flooded areas, they may be hit by floating objects dragged on a high speed by the water current.

The water can hide pieces of wood, barbed wire, electrical wires and other dangerous objects (cans, pieces of glass, metals). We never know what is the real deepness of the water because of the holes.

The flood water remains contaminated with dirt from latrines and from dead animals,

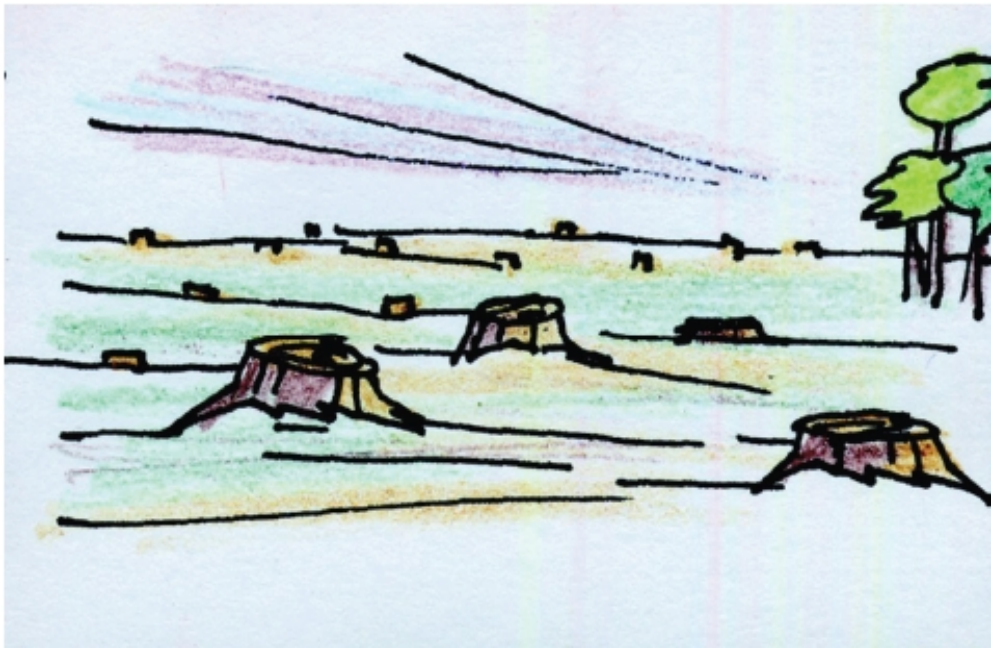
we cannot drink it!

During the floods, latrines are inundated which forces people to defecate or urinate in the water,

thus further contaminating the water.

Sources of potable water are unreachable; the affected populations drink contaminated water from the floods, which causes **cholera, typhoid, diarrhoea** and other diseases that **may lead to death**.

5. HUMAN IMPACT



Trees secure the land and absorb the water.

A soil without trees easily “gets wasted” and cracks where the water passes through more rapidly, destroying houses, roads, bridges and other important infra-structures. In these conditions of erosion, the nutritious layer of the land disappears, thus reducing its fertility.

Building a house in the bed of a river is dangerous and also makes it difficult to drain the water.

Dams help to control floods. However, when they are too full they are a danger since a large quantity of water may discharge within a short time. Drains which are not properly taken care of do not allow drainage of water and are a focus of infections.

6. PREPAREDNESS

Being prepared is the best response to avoid that floods become a disaster.

Monitor the level of the river on a regular basis.

Put the most important objects in elevated shelves

Put signs on the water level that was reached during the previous floods... this keeps memory alive!

7. ALERT

When it rains for a few days without stopping or if the level of the river arises beyond the safety level, we have to activate the flood alert.

Leaders are responsible for good organisation of the community: they should think about **alert** and **contingency** actions, which are presented on the next pages.

The **elderly** are a source of fundamental information about the past events. Therefore, they should **transmit their vivid memory of floods** in such a way that the community feels prepared for future disasters.

8. CONTINGENCY

In case of a major flood, the community with the help of local authorities should rapidly make decisions on which depends the life of many people. In this phase the leaders are a fundamental reference point. Before everything, there is a need to have access to safe drinking water in places which may not be reached by the flood water.

They have to prepare enough food stocks for the affected population to be able to resist during the time it is isolated.

Elevated water reservoirs using sand bags

If the situation becomes very critical, there is a need to evacuate people who are more exposed to the risk. Thus, there is a need to preview vehicles or boats, as well as places for camping with basic services and a first aid post for the affected people.

9. STREET LAYOUT

The most effective way for the population living in informal settlements to be able to mitigate the impacts of flooding is to improve the conditions of their neighbourhood. In other words: re-qualify it!

Living in a healthy physical environment and minimally organized is the basis for social and economic development of each resident.

The first step is to open or make roads

Roads allow:
Access to the ambulance, to the truck carrying rubbish and other vehicles; to easily establish a water supply system and electricity; to build a drainage system with adequate dimensions.

It is important that each plot of land has access to a street, even if it is an irregular and narrow street so as to respect the distribution of already existing buildings.

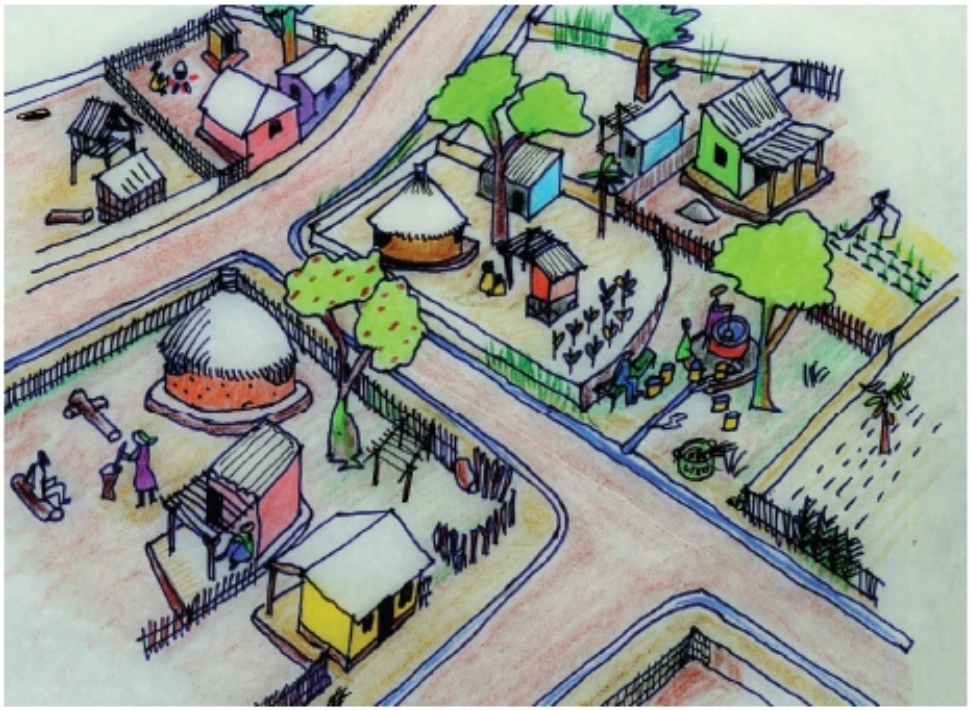
Before street exists

After street exists

The second step is to organise good plot planning

By respecting as much as possible the location of plots of land that have already been allocated, the distribution of land should leave enough space to make roads, drains, to establish water points and rubbish containers.

It is also important to think about free areas where the most important social services can be built such as a school, a health centre, a market, a sports field, without forgetting the green zones where our children can play.



A **good organisation of plots** allows the local authorities to easily register the plot of land for each household in order to **ensure tenure and land use rights**. Thus, the residents will have the necessary security to build or improve their houses, make their crop fields or develop their economic activities.

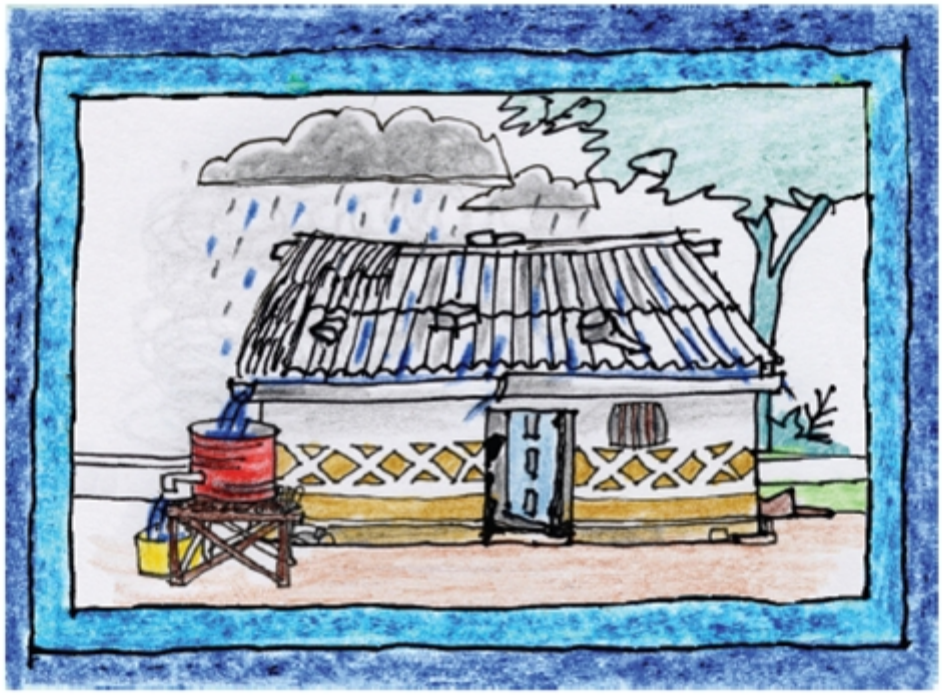
A good organisation of plots is similar to plaits of an African woman; they design a harmonic distribution of the hair on the surface of the head.

10. CLEAN WATER

Water is Life!

Having water to drink, be it during a flood season or a drought season, is fundamental.

In areas which are prone to floods we have to place water points and water pumps above the maximum level reached by the previous floods, or at least foresee elevated taps so that we can have access to clean water in any situation. Even if the elevated water tank has an electric pump with waterproof autonomous circuit, its switches must be in high places to not to get hit by water.



The zinc sheets roof may be used to harvest rain water.
Therefore, it would be enough to put up a gutter pipe and a protected cistern.

A rain water harvesting system with cisterns in Ilha de Moçambique in the 1800's.

11. SANITATION

There is a need to always maintain the drains clean so flooding rain or river water can easily flow off. On the contrary, the water remains stagnant causing the breeding of mosquitoes that transmit Malaria, or it gets mixed with excrements from the latrines thus causing cholera.

When drains are not properly taken care of, even minor rains may become inundation!

Rubbish should be put inside adequate bins and collected on a regular basis. It can also be burned or buried down on pits and covered with sand, and these should be signalised during the floods.

Rubbish is a source of infections and diseases

and it seriously contaminates the environment. But if it is bio-degradable (that is, without plastic bags, metallic objects, etc.), the rubbish may be used as manure for our vegetable-gardens.

When informal settlements are flooded, latrines become the main sanitation problem.

The water gets mixed with excrements, contaminating the environment and causing diseases. Thus, it is very important to keep the latrines closed and clean.

We can place our latrine at a higher location avoiding that becomes inundated during the floods or a rushing of stream water.

Elevated latrine, Tete province – 2003

12. HOUSING

It is possible that we adopt some solutions to protect our houses and our belongings from the floods.

It does not matter which material the house is built; making a land elevation or locating the house in a higher place avoids suffering from moderate floods.

Strengthen the house structure so as to avoid that it is destroyed by the waters. Mud material may be destroyed by major floods, but the structure remains.

An example of an adequate house for floodable areas

Elevating the house is a fundamental measure to get protected from flooding

We can make a false roofing in order to have a place to store water, food, seeds, documents, and other important goods and thus avoid to be affected by floods.

Part of the roofing opens towards outside, becoming a shelter for one or more family members in the event of major floods. If there is enough water and food, one may stay in this shelter for various days.

An elevated house in a situation of moderate floods

An elevated house in a situation of major floods

An example of an elevated house in Beira

An example of an elevated house in Chicualacuala

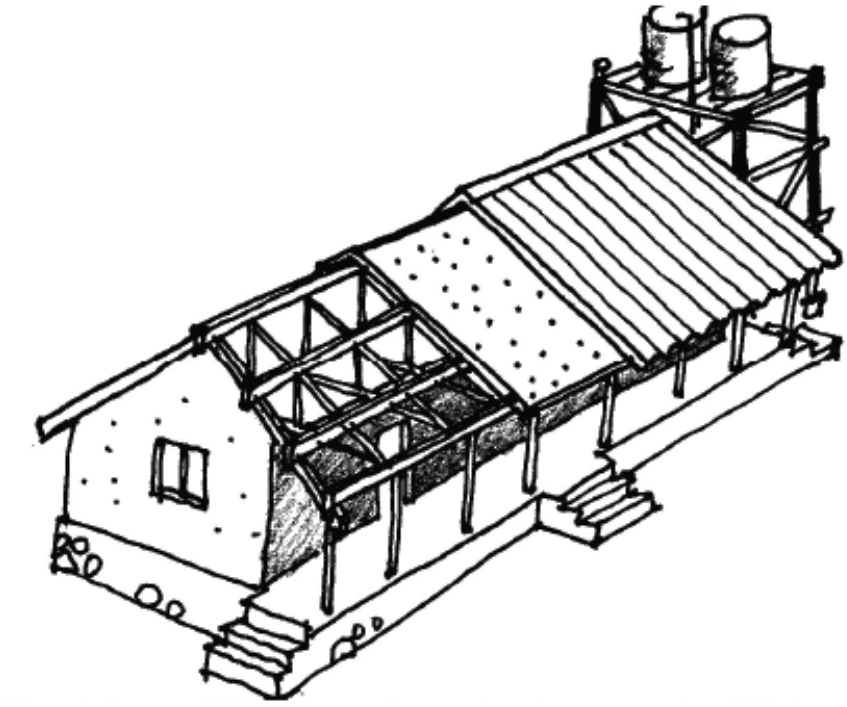
An example of an elevated house in Chinde

Elevated pigsty in Zavala. Excrements of goats are collected from underneath and used as fertilizers in the crop field

13. SOCIAL SERVICES

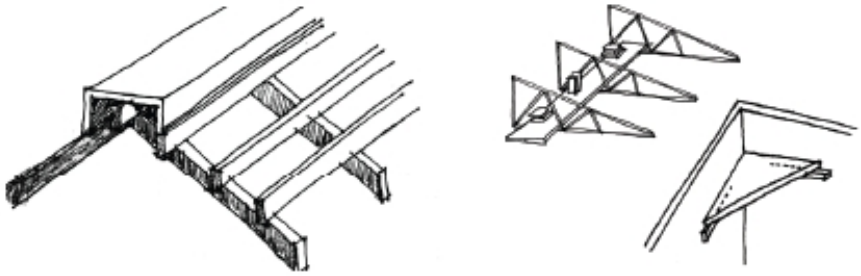
In flood prone areas, public facilities such as schools, health posts, markets, churches, etc., should be built above the maximum level reached by major flood waters, this way also could be used as shelter for the population.

Large roofings have already served as shelter during past floods. Therefore, they should be reinforced!



A school with a water supply system and reinforced roofing

The edge of the roofing of a school may be easily transformed to serve as a seat during the floods. Elevated shelves may easily be placed on the health posts, schools and shops where books and goods can be stored in the event of floods.



Roofing of public facilities may be used to harvest rain water

14. SUPPORTING PLATFORMS

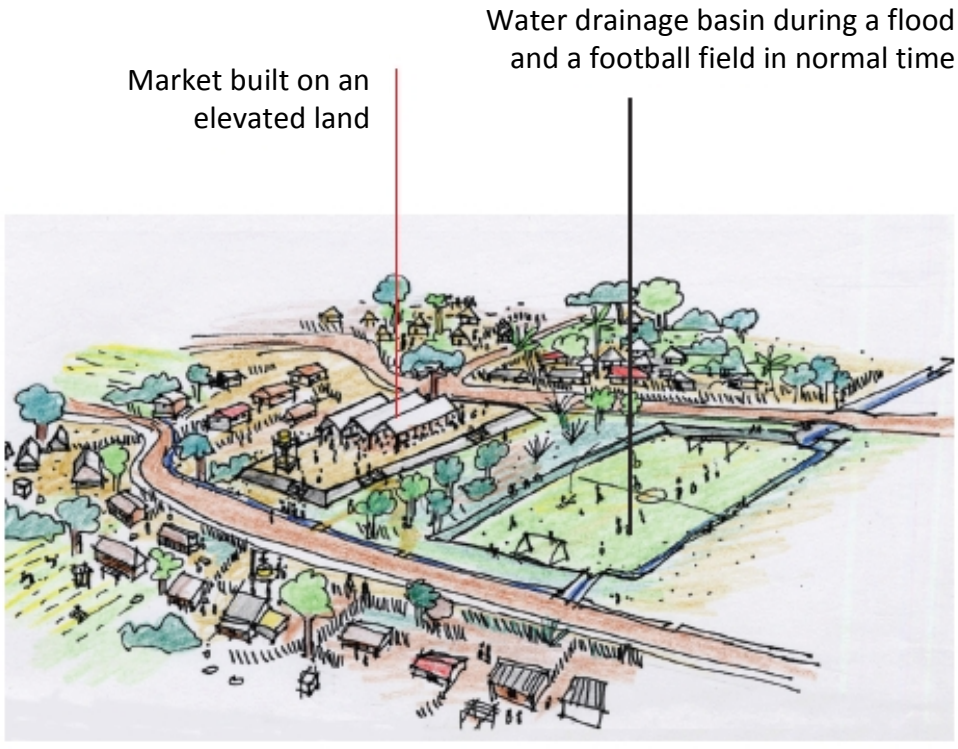
In critical situations, the supporting platform will be the reference point where the affected population will receive support from rescue units.

In an extreme case of evacuation, and only if the platform is sufficiently well equipped, some community volunteers could stay at the platform to secure the goods and houses of the community.

A higher ground sufficiently large as to provide immediate accommodation to the population in the settlement may be a good supporting platform in the event of floods.

In very plain floodable areas, stilt structures or land elevations above the maximum level reached during previous floods may be built as supporting platforms . In the event of major floods, these platforms could be used as immediate shelter for the inhabitants before they are eventually evacuated. In non-flood periods, the platforms would be used to establish a market or other social services.

Thus, the market, school or health centre will present good conditions in normal time, and will be used as excellent supporting platforms during a flood.



In Gaza Province, Chibuto District, Maniquenique Locality, the Ministry for the Coordination of Environmental Affairs in conjunction with UNHABITAT, developed and constructed a building for the community which serves as a shelter in flood periods and as a classroom in normal periods.

The base of the building was elevated above the maximum levels reached in the past floods. There is also a rain water harvesting system. Moreover, in order to provide a last resort of refuge in the event of extreme necessity, the roofing was reinforced so people could go upstairs and stay there safely.

15. ALTERNATIVE SOLUTIONS

In our country, cutting down trees (or deforestation) to obtain wood for construction and firewood for cooking is reaching worrying dimensions. Therefore, we need to think about alternative solutions, for example:

Installing systems to make use of solar energy and Aeolian energy (generated by the wind).

Burning shells of coconuts, sawdust and other vegetable scraps to cook.

Using more bamboo that grows rapidly and may replace wood in various forms.

16. PLANTING

Each person would have to plant and take care of a tree in his/her life! Trees help us! They clear the air that we breathe, they reduce erosion, provide us with food, medicine, shade and construction material or to make objects.

Wood is a precious material that has many applications.

17. CONCLUSIONS

1. The major problem in the event of floods, even if this seems to be incredible, is the **lack of clean water for consumption!** All that is done before, during and after the floods, has to do with water (controlling water from the river, access to potable water, drainage from contaminated water, etc.), therefore there is a need to learn about it and manage it very well.

1. The best strategy to deal with minor and moderate floods is to have an **effective drainage system**. This implies: allowing space to make the necessary drains, covering them with definitive material and, above all, clean them regularly!

1. **People should be aware of the consequences of their actions** which in most cases determine the increase of their vulnerability towards floods: occupation of areas which are easily floodable, destruction of forests, absence of planning, mismanagement of water resources, etc.

1. **It is possible to mitigate the negative effects of floods** by improving preparedness measures, early warning systems, contingency plans, distribution of spaces in your neighbourhood, the quality of basic services, the structure of your house and of social services. **A lot depends on the degree of organisation of the community and the role played by the leaders.**

5. Our country is very prone to floods. Therefore, there is a need to learn how to live with them. We have to be always prepared and adopt strategies to protect ourselves. In this manual there are some proposals that seek to **trigger our creativity in this issue!**

6. Natural disasters may not transform into a disaster if we are well prepared.

“Prevention is better than cure…”

The End

Notes

Notes

Basilio Muchate-2000

REPÚBLICA DE MOÇAMBIQUE
MINISTÉRIO PARA A COORDENAÇÃO DA
ACÇÃO AMBIENTAL (MICOA)

INGC

COMISSÃO EUROPEIA

Ajuda Humanitária

APRENDER A VIVER COM AS CHEIAS

Manual para a Redução da
Vulnerabilidade
em Zonas Susceptíveis a
Inundações

UN HABITAT

PROGRAMA DAS NAÇÕES UNIDAS PARA OS ASSENTAMENTOS HUMANOS