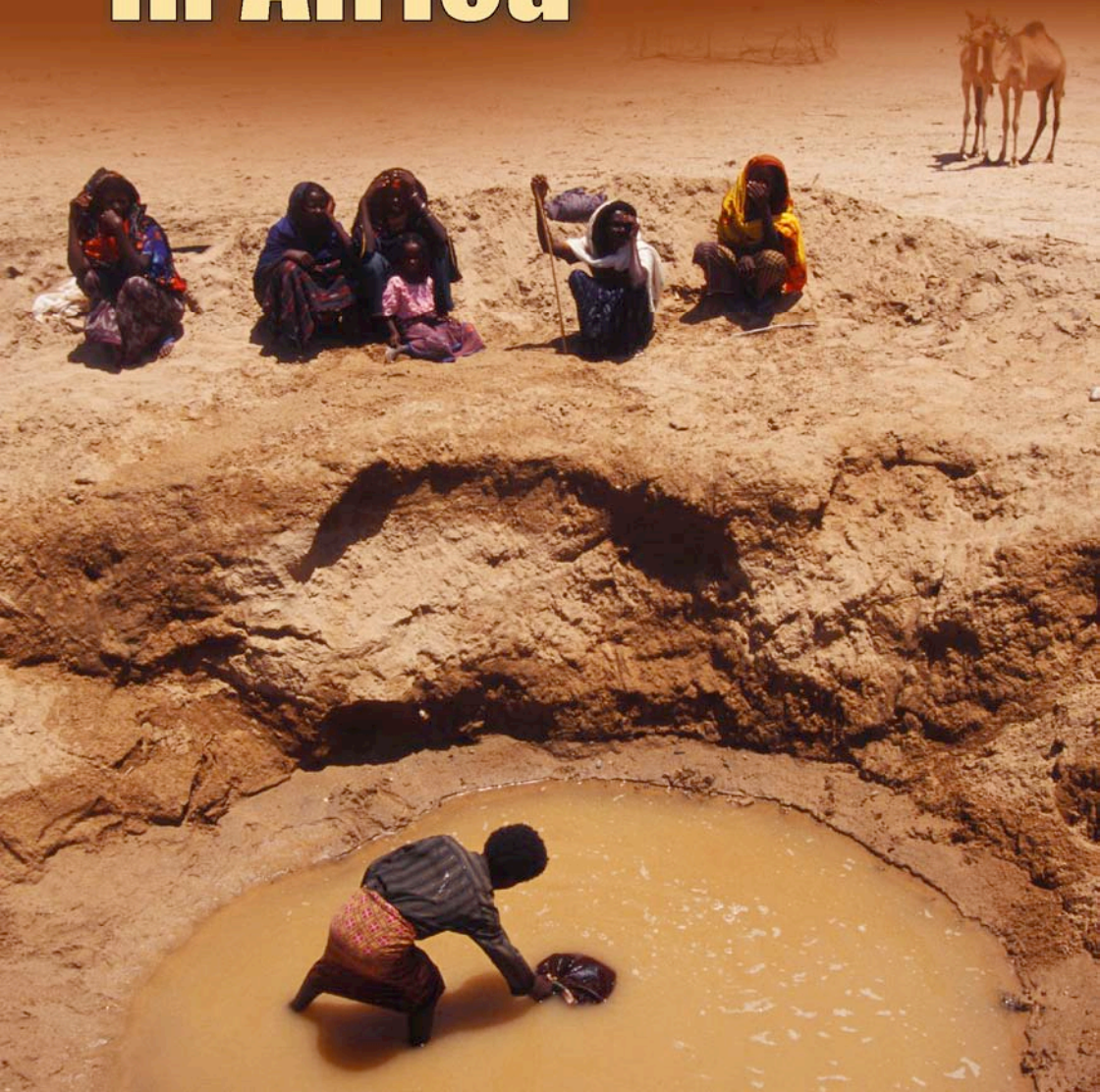


Water & Risk in Africa



Water & Risk in Africa

A community leader's guide



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FOREWORD

Dear community leader,

Water and Risk... The combination of these two words may, at first sight, strike us. Indeed, it is true that water is life. But it is also true that water is risk: too little water is risk of drought, too much water is risk of flood, water - too scarce - is risk of conflict, water - impure - is risk of disease.

Worse, if no action is taken, these risks can lead to disasters. They can destroy property and ... life.

Action can indeed be taken. You, me, each of us, wherever we are in our diverse communities, we can take action. In fact, we should take action because when it comes to our own survival, we should not expect others to do it for us.

It is in the light of the above concern that the present booklet entitled Water and Risk in Africa - A Community Leader's Guide has been produced.

This booklet seeks to help you to know more about water-related risks, water-related disasters and what to do to protect lives and property.

Still better, it seeks to help you, as a community leader, to help others to protect their own lives and property.

Sálvano Briceño,

Director,

UN Inter-Agency Secretariat

for the International Strategy for Disaster Reduction (UN/ISDR)

1. SETTING THE SCENE

1.1 Water - the key to life

Water is the key to all forms of life. It is in our blood. It is in the liquids we drink and in the foods we eat. It keeps us alive and healthy. It is vital for economic development and it provides a means for travel. Its value is universally recognised and it is a powerful symbol in all cultures and faiths.

Water is essential to our survival but on the other hand, it is also one of the most destructive elements on our planet. Too much water in the form of floods can spell disaster, death, and destruction; too little water can bring about drought, famine, and economic depression.

Natural hazards and risks are an everyday part of our lives. However, poverty, population growth, lack of infrastructure, and the ineffective management of resources are resulting in many communities becoming increasingly vulnerable to the impact and after-effects of natural disasters such as drought and floods.

We are not entirely at the mercy of nature, we do have choices, and we can do something to reduce the risks associated with water.

“Better decision-making, improved planning, effective risk management, innovation in development and environmental protection activities – these are the human activities that can reduce the vulnerability of communities. To this end, risk assessment and disaster reduction should be integral parts of all sustainable development projects and policies.”

Mr. Kofi Annan; UN Secretary General,

Message for the International Day for Disaster Reduction,

8 October 2003.

This booklet is written to help you, as a leader in your community, to have a better understanding of the complex nature of water and its influence on our lives. Empowered with this knowledge, you can become pro-active in initiating steps within your community which can reduce the risks from water-related disasters.

1.2 Water and its associated risks

Floods, droughts, and landslides are the most common form of natural disasters experienced in the world and the African continent suffers from almost a third of them. This is often due to the many extreme weather events that we experience, especially storms with high winds and torrential rain, cyclones, heat waves and sustained droughts. Another factor is that today, more people are living on marginal lands which are especially vulnerable to floods and drought.

Natural disasters are a part of life everywhere and much of the devastation associated with these events in Africa can be avoided by common sense planning and taking proper precautionary action. Unfortunately in many areas too little is being done to reduce the impacts that water-related disasters can have on communities, and this book is written to help community leaders find African solutions to African problems.



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Did you know?

70% of the earth's surface is covered by water.

97% of the earth's water is in the ocean.

3% of the total global water is fresh.

2.1% of all water is locked up in the popular ice caps or in glaciers.

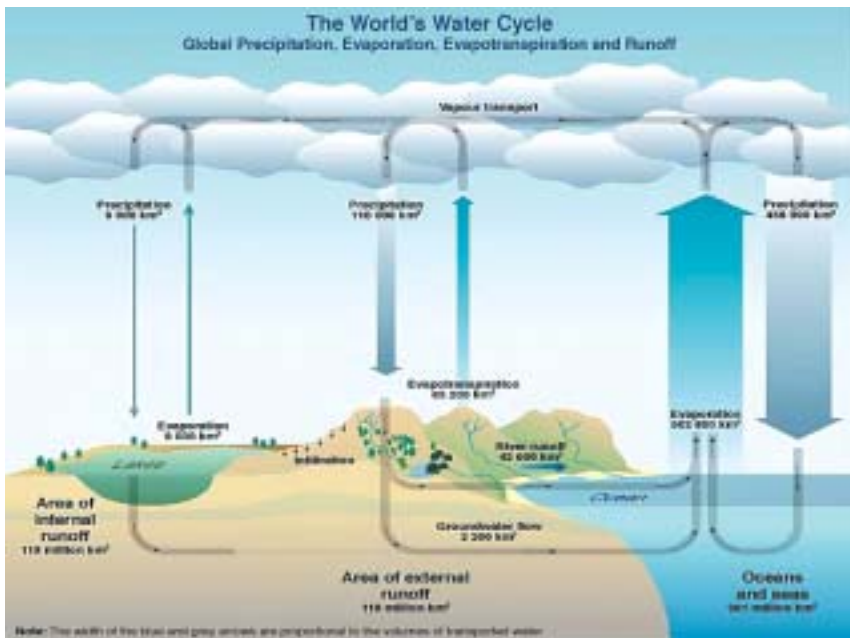
0,6% of all water is in aquifers, most of which is more than 800 m below the surface.

1.3 Global water system

The saltwater in the oceans and seas that cover almost three-quarters of the surface of our planet, accounts for almost all the water present in the world. Under natural circumstances saltwater cannot be used to sustain life. Further, more than half of the available freshwater is either contained in the ice caps and glaciers of the North and South poles or lies too deep underground to be extracted. This leaves only a small amount available, in fact only about 0.3% of all the water in the world, to sustain life on the surface of our planet, whether it is human, animal, or vegetation.

Evaporation occurs over the oceans and the global weather systems gather this atmospheric water and carry it over the land masses before releasing it as precipitation, or rain as it is commonly called, mostly within the equatorial and temperate belts in the northern and southern hemispheres.

The water balance in any area depends on the local climate, vegetation cover and the manner in which the land is used. When vegetation is limited or degraded through land clearing, overgrazing and urbanisation then surface evaporation and rainwater runoff is increased allowing less moisture to be absorbed and retained by the soil.



1.4 African water situation

Sadly, Africa has only about 9% of the world's water resources with which to meet the needs of 13% of the world's population. The arid countries in Africa rely heavily on irrigation for agriculture, which places the greatest demand on our scarce water resources. Almost a million hectares of land is under irrigation in Morocco, and all of Egypt's agricultural land is irrigated. In South Africa, agriculture uses as much as 50% of the available water.

It is predicted that within the next 20 years as many as 25 countries will suffer water shortages but in the same period farming will need 30% more water than what is available at present. As a result, Algeria, Egypt, Libya, Morocco, South Africa and Tunisia – are using desalinated water (seawater from which the salt has been removed) to supplement their water supplies. Desalinating water is very expensive and therefore not an option for inland regions.

Did you know ?

The annual availability of water per capita in Africa is well below that of the world average of 7,113 m³. At 5,157 m³ per capita per annum it is higher only to that of Asia [3,159 m³].

Africa's population was 785 million in 2000. It has the highest population growth in the world at 24% per year.

Africa is home to about 13% of the world's population, but has only 9% of the world water resources.

In 2000, only 38% of Africa's population lived in an urban environment.

Some countries are beginning to use desalinated water to supplement their water supply [e.g. Algeria, Egypt, Libya, Morocco, South Africa and Tunisia].

25 countries in Africa are expected to experience water scarcity over the next 20-30 years.

Africa uses only about 3% of its annual river flow.

2. DROUGHT

Drought is the most common disaster occurring in Africa. It develops gradually and often lasts for long periods of time - inevitably with disastrous and extensive impacts of all forms of life.

2.1 Consequences of drought



Droughts lead to:

- Environmental degradation including deforestation and loss of land cover, overgrazing, soil erosion, bush, and forest fires, and a reduction in biodiversity.
- A build-up of toxic chemicals in slow moving or static waters.
- Increased drudgery, mainly for the women who have the task of searching for and collecting water for household use.
- A shortage of useable drinking water and a decline in it's quality, with negative health and sanitation consequences.
- Food shortages due to crop failure and animal losses which in turn leads to malnutrition and hunger.



These diverse consequences of drought place an enormous burden on the economic viability of a region and seriously retard sustainable development.

2.2 Famine

Famine is the most serious consequence of drought and is defined as “...a protracted total shortage of food, in a restricted geographical area, causing widespread disease and death from starvation”.

Famine leads to a breakdown of communities as people leave their homes to seek food and water elsewhere. Many find their way to refugee camps, which often become overcrowded with poor water supplies and inadequate health care. As a result, many people, mostly children and the elderly die of diseases such as Cholera and Malaria.

Did you know?

Most death to famine occur in the semi-arid areas of sub-saharan Africa. The UN has estimated that between 1968 and 1985, famine killed as many as 250,000 people and 12 million cattle in the Sahel, with a further 10 million people having to abandon their homes to search for food and water.

2.3. Causes of drought

Drought occurs when unreliable or a persistent lack of rainfall leads to reduced stream flows and groundwater levels which in turn results in insufficient soil moisture to sustain crop growth.

Most of the African continent has experienced an increase in arid conditions. The average annual rainfall declined by up to 10% between 1931 - 1960 and again between 1968 - 1997. Lake Chad has now shrunk to 5% of its size 35 years ago. Global Climate Change predictions for the near future reveal that many parts of southern Africa will experience increasingly less rainfall in the years to come, particularly in those areas which are already arid and under stress.

The rapid increase in the human population is outstripping food production in some areas and this shortfall will increase with the anticipated future droughts. Population growth increases the need for land and often leads to poor land-use practices, which in turn worsen the impacts of drought.

Deforestation, overgrazing, and over-cultivation lead to soil erosion and reduced soil moisture, which results in lower crop yields and fewer livestock that can be sustained in a given area.

The end result is that less food is produced.

Did you know?

Drought accounted for 31 % of all natural disasters events in Africa during 1975-2002.

The worst drought disaster in Africa killed 300,000 people in Ethiopia in 1984.

Agricultural use of freshwater is predicted to rise by more than 30% over the next 20 years.

Water losses through leaking pipes, faulty taps and evaporation are as high as 50% in South Africa alone.

UNEP estimated that over 70% of Africa's agricultural dry lands are degraded as a result of over-cultivation, mismanagement of irrigated croplands, overgrazing, and deforestation.

2.4. What can you do?

Each of us has a responsibility to conserve water, which means we should use it sparingly and not pollute it. At a community level we can:



- Educate people about the damage caused by bad land practices.
- Appoint a management team to protect and manage the community's water supply to ensure that no water is wasted.
- Introduce sustainable dryland farming wherever possible and improve production by way of careful soil conservation and rejuvenation; for example, planting grass and legumes improve the nitrogen content of the soil, whilst mulching helps to keep the moisture in soil. Cultivating along the contours reduces water erosion.
- Grow drought-resistant plants and crops.

- Be prepared for a drought by growing extra food in case the next crop fails, and building up fodder reserves for livestock.
- Introduce herd diversification; keeping different types of animals with different grazing habits and breeding cycles reduces the demands on grazing lands.
- Collect rainwater in rainwater tanks, recycle 'grey' water (for example use washing water for irrigation).
- Eliminate water losses by immediately repairing leaking pipes and ensuring that taps are not left running.



Did you know ?

Between 1990-1992, Zimbabwe experienced extensive crop failure. Yields were 30 - 80% below normal. An estimated 86 million people were affected. Other economic impacts in southern Africa included \$3 billion in reduced GDP, increased unemployment, additional government expenditure, and reduced industrial production due to curtailed power supplies.

The 1992 - 2001 La Nina-related drought in east Africa cost the Kenyan economy alone about \$2.5 billion.

Cultivation of hybrid maize under imported fertilizer regimes can create grain shortages. Traditional crops such as sorghum, millet, and cassava are drought resistant and adapted to arid African conditions.

3. FLOODS

3.1 Flooding and floods

Flooding has been a feature of life in Africa for thousands of years. Seasonal flooding helps by keeping the soil fertile. It does this by depositing fresh silt and flushing out the salts which accumulate in the surface layers of the soil. For example, the higher agricultural output on the floodplains of west Africa is due to seasonal flooding and not irrigation. The flood cycle helps sustain the health and productivity of wetland habitats and maintains their biodiversity. In the past, these annual floods provided enormous benefits as the floodplains created were amongst the most productive ecosystems on earth.

More recently, however, floods have become associated with loss and devastation as almost every year we learn that somewhere in Africa, floods are destroying infrastructure, livelihoods, and property.

Did you know ?

Floods accounted for 26% of total disaster occurrences in Africa from 1971 - 2001.

The single worst episodes of floods in Africa killed 2,311 people in Somalia in 1997.

In 2001, flooding in northern Algeria resulted in about 800 deaths and economic losses about \$400 million.

In east Africa, the El Nino-related flood in 1997/98 destroyed infrastructure and property worth about \$1,8 billion in Kenya. At least 600 people were killed and 50,000 were displaced.

In 2000, most of the arable land in Mozambique was under water as a result of flooding. Floodwaters were said to have risen by as much as 8 metres in a matter of days. The flood reduced the annual economic growth rate from 10% to 4%, caused 800 deaths, affected almost 2 million people, of whom about 1 million needed food, displaced 329,000 people and destroyed valuable agricultural land.

In 1999, flood waters released from large dams on the Niger, inundated at least 200 communities, killing more than 1000 people. The inhabitants were warned too late to evacuate.



3.2 Causes of floods

Flooding is a natural consequence of both global and local weather conditions. Parts of east Africa lie in the paths of the powerful cyclones generated over the Indian Ocean. These tropical storms sweep in over Africa, and the accompanying heavy rains often cause extensive flooding over a wide area. As mentioned earlier, it is predicted that changes in the global climate patterns over the coming decades will result in more severe storms and cyclones with a greater risk of floods.

Many parts of Africa are subject to severe thunderstorms and torrential rains during certain seasons, which results in more localized, rapid-onset flash floods, often accompanied by devastating landslides on steep slopes.

For centuries, people lived on floodplains because of the abundance of water and the fertile soil. The annual floods were predictable and the people moved out before the first big rains and then returned to farm as the waters retreated. In recent years, the damming of rivers has changed this pattern. Regulated river flows mean that people no longer see the need for retreating from floodplains during the rainy season. Overcrowding also restricts such seasonal migration and unexpected releases of floodwater from dams have added to flood disasters.

Vegetation and soils are both important for soaking up water. Flooding will be slower if the soil is permeable and there is good plant cover. Deforestation, overgrazing, and fires, especially on steep slopes, greatly increase runoff and erosion which in turn increases the silting up of rivers

and increase the risk of flooding, since shallower rivers overflow their banks more easily.

In urban areas, the clearing of vegetation and paving or “surface hardening” of roads and residential areas leads to an increase in storm water runoff.

3.3 What can you do?

The following is a list of suggestions from which you can select those most appropriate to your local conditions.

- Assess where and how your community is at risk from floods;
- Involve the community in finding solutions to the risks identified;
- Disaster response plans should be developed within the community, which include an early warning system, evacuation plans for people and livestock, temporary accommodation, emergency food and water stocks;
- Develop physical flood control structures such as overflow channels and river diversions;
- Avoid setting up permanent structures (for example houses) in areas vulnerable to flooding, these include:
 - (i) the low-lying parts of floodplains
 - (ii) the low-lying parts of coasts and deltas
 - (iii) areas below unsafe or inadequate dams
- Educate people about correct land use.

4. WATER AND HEALTH RELATED ISSUES

We cannot survive without water - but it has to be clean water because many life-threatening diseases are carried in contaminated water. The biggest cause of contamination is human waste that has not been disposed of correctly - usually because of inadequate sanitation. The resultant diseases are spread through poor hygiene putting entire communities at risk.



Disasters such as drought or flooding increase the risk of disease by disrupting a community's water supply and in so doing, creating the sanitation and hygiene problems that lead to contaminated water.

Some of the other ways in which water can affect our health are:

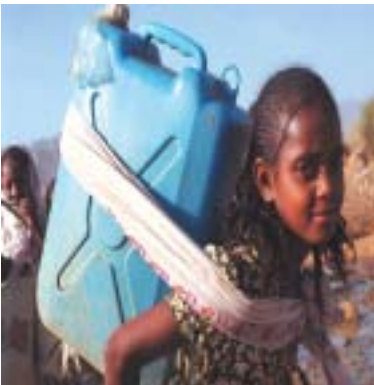
- An increase in malaria and bilharzia because both the malaria-carrying mosquito and the bilharzia carrying snails love dirty, stagnant water – these diseases pose some of the greatest health risks to people throughout Africa;
- Malnutrition – without water, our crops would die and we would not have enough food to keep us healthy. Diseases such as kwashiorkor occur in children who do not receive enough protein;
- Skin and eye infections (trachoma) and tuberculosis;
- Water-borne diseases such as cholera, typhoid, viral hepatitis, dysentery, and diarrhoea;
- Water supply projects like dams and reservoirs can become a breeding ground for 'vectors' (carriers) of water-related diseases.

4.1 *Water, sanitation and health*

Research has shown that good hygiene and proper sanitation are the most important factors in reducing the risk of death from diarrhoea and parasitic infections.

For a community to dispose of its waste safely, a good sewage system is needed. This would involve waste and water being piped from household latrines to sewage treatment plants rather than being dumped into the river. Because much of Africa has either poor or no sanitation facilities, improper disposal of human and animal waste is common. Diarrhoea-causing diseases such as cholera, typhoid, and dysentery spread quickly in these conditions, which makes poor sanitation in Africa a cause for great concern.

Water contamination is not the only problem. Inadequate hygiene contributes significantly to health issues – for example, investigations have shown that hand washing with soap or ash reduces the incidence of diarrhoea by as much as 35%. Obviously, the better the supply of water the more chance there is of people practising good hygiene. Unfortunately, Africa has the worst rate of water supply in the world as well as low sanitation levels, which makes its people very vulnerable to water-related diseases.



4.2. What can you do?

- Personal hygiene is vital, but do not use contaminated water for this purpose.
- Hands should always be washed after going to the toilet and before preparing food.
- Fruit and vegetables should be washed in clean and uncontaminated water before eating – use cold, boiled water if you are unsure about the water.
- Make sure water is handled and stored in such a way that it cannot be contaminated.
- If latrines are not available, dispose of waste safely – do not dump it in nearby rivers and wetlands.

- Promote public health by educating the community about health issues, especially the need for hand washing.
- It is important to include traditional hygiene practices and beliefs in education programmes.



4.2 Water and contamination

Human waste is not the only pollutant of water. Pollution from agriculture, waste dumps, mining and industry can find its way into surface and ground water, and when it does, the health risks are severe:

- High concentrations of nitrates (from agriculture) in drinking water result in oxygen-starvation in the brain. This is especially dangerous for babies (Blue Baby Syndrome).
- Benzene, a component of petrol, is carcinogenic (causes cancer).
- Most heavy metals are toxic. For example, arsenic is carcinogenic, lead damages the nervous system, cadmium results in kidney problems, and chromium causes severe skin reactions.
- Most organic components of products like pesticides, tar and solvents are toxic; they can lead to kidney and liver problems, heart problems, damage to the nervous system, cancer, and skin problems.

Did you know?

After a malnutrition, lack of clean water and sanitation are the most important risk factors in terms of the global burden of disease.

There are about 4 billion cases of diarrhoea each year causing an average of 1.5 million deaths (mostly children under the age of 5).

Roughly 6 million people are blind from trachoma and about 500 million people are at risk. About 300 million people suffer from malaria each year.

200 million people are infected with bilharzia, 20 million of whom suffer severe health issues.

What can you do?

- Do not use water for washing or drinking from a source that is polluted;
- Do not dump your waste near a water source – use official waste deposits;
- Do not use water from a borehole that is sited close to an industrial area;
- Avoid contaminating the environment (especially water sources), with any kind of chemical substances.

4.3 Water-related diseases

Some of the worst parasitic diseases are transmitted by creatures that live in or near stagnant, contaminated, or slow-moving water. Malaria and Bilharzia pose the greatest health risk to the people of Africa.

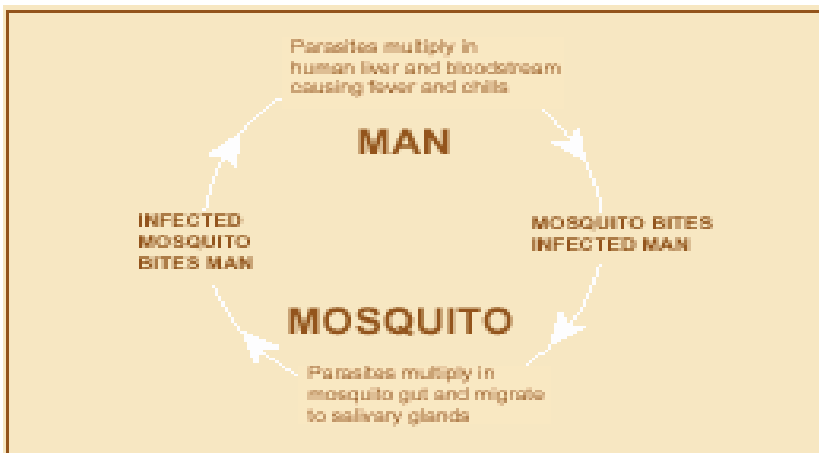
Malaria

Each year 1.5 – 2.7million people die of the disease of whom 90% are children under the age of 5. In everyday terms, Malaria kills an African child every 30 seconds.

It is a matter of great concern that Malaria is on the increase in Africa.

Malaria

The malaria parasite enters the human host when an infected Anopheles mosquito takes a blood meal. The female mosquito requires blood for energy, and in order to absorb nutrients to mature her eggs. If she takes in infected blood from someone suffering from Malaria, she becomes parasitized. In the mosquito, the parasites develop and find their way to the mosquito's salivary glands. The next time she takes a blood meal about 10-14 days later; these parasites infect the next human host. Once inside the human body, the parasites develop and infect the liver and red blood cells. Malaria symptoms usually appear 9-14 days after infection. Symptoms include fever, headache, vomiting and other flu-like symptoms. Untreated, Malaria can cause death by infecting and destroying red blood cells and by clogging the capillaries that carry blood to the brain and other vital organs.



Man and mosquito play complementary roles in the malaria cycle.

There are several reasons for this:

- Changing climatic conditions are creating more favourable conditions for mosquitoes. Flooding, in particular, creates additional mosquito breeding areas;
- There is a rapid spread of malaria parasites which have grown resistant to the present range of anti malaria medication;
- Armed conflicts often force large numbers of people to flee their villages and settle in malaria-prone areas under poor conditions. It is estimated that up to 30% of all malarial deaths occur in areas of political strife;
- Some water development projects create new breeding sites for mosquitoes.

Bilharzia

Africa has about 82%, of all bilharzia cases in the world. This disease, often called schistosomiasis, is endemic in 74 countries, and infects more than 200 million people, mainly in rural and peri-urban areas. About 20 million people are severely infected. The disease mostly affects children under the age of 14.

It is ranked second after Malaria as the most serious human parasitic disease.

Bilharzia

Parasitic flatworms live part of their lifecycles in bilharzia snails. As larvae they escape from the liver of bilharzial snails into the water. When these flatworms come into contact with humans, they penetrate the skin and find their way into the blood vessels of the intestine or bladder where they find a partner. Such a pair mates constantly with each female producing hundred of eggs daily. The only escape for these eggs is through the rupturing of the bloods vessels. If egg-infected urine and faeces escapes directly into freshwater, the eggs can hatch into larvae and find their way back to bilharzial snails to repeat the cycle.

Poor sanitation is therefore central issue to the control of this disease.

Key factors

Contaminated water is a serious health hazard.

Water becomes contaminated through poor sanitation and poor hygiene.

Always wash your hands and dispose of sewage safely.

Malaria and Bilharzia are the two most widespread diseases in Africa.

Hope for the future

In 1998, leaders from throughout Africa demonstrated a political commitment to take actions against the malaria epidemic by founding the "Roll Back Malaria" global partnership. Two years later, the African Heads of States and their representatives met in Abuja, Nigeria to translate Roll Back Malaria's goal of halving the malaria burden by 2010 into tangible political action. They intend to focus on the following:

- Prompt access to effective treatment and up-to-date medicines;
- Promotion of insecticides-treated nets and improved vector control. Already, nearly 20 African countries have reduced or eliminated taxes and tariffs on insecticide-treated nets to make them affordable;
- The prevention and management of malaria in pregnant women;
- Improving the prevention of, and response to, malaria epidemics and malaria in complex emergencies.

5. ENVIRONMENT FACTORS

Our survival is inextricably linked with that of the environment

When the environment becomes degraded, all forms of life become threatened. We need to ensure that our activities do not damage the diversity and integrity of nature and that resources are harvested in a sustainable manner. Effective management of the environment is essential if we are to reduce the impacts of natural disasters and the risks associated with water in Africa. An area with a thriving and diverse eco-system is better able to absorb the impact of natural disaster than a degraded environment, and can recover more easily.

5.1 Wetlands

Wetlands are one of the most important natural habitats for plants and animals in Africa. They are also one of the most threatened. Wetlands provide essential resources to water-dependent animals such as the African buffalo, hippopotamus, and crocodile, especially in times of drought. They are also home to many endangered animals such as the Black Lechwe and the Shoebill Stork as well being the natural habitat of hundreds of different kinds of birds, fish, and amphibians. These in turn form important sources of food for nearby communities.

Wetlands act like large sponges, absorbing water and then slowly releasing it. This process slows down water flow and erosion potential, and helps in controlling floods. They also recharge groundwater and are a source of water to rivers during dry periods. Wetlands are excellent filtration systems, cleaning the water as it flows through of excess nutrients and sediments.

Conserving Africa's biodiversity

Africa has a rich natural heritage with more than 1,150 species of mammals, 2,000 species of fish, 2,300 species of birds and more than 45,000 documented plant species found within our continent. To conserve this heritage for our children 1,200 Nationally Protected Terrestrial and Marine Areas have been proclaimed as well as almost International Areas.

Regrettably, many of these are highly threatened with over 2000 animal species, and close to 2000 plant species being endangered.



Did you know ?

Wetlands cover about 1% of Africa's surface area. They are found in almost every country. The largest African wetlands are the Sudd in the upper Nile, Zaire swamps, Lake Victoria basin, Chad basin, Okavango delta, Bengweulu swamps, and the floodplains, and deltas of the Niger and Zambezi rivers.

Of the 23 global freshwater biodiversity hotspots, 7 are found in Africa.

An acre of wetlands can store up to 6,8 million litres of water.

Lake Malawi has more fish species than any other lake in the world.

Lake Victoria is the second largest lake in the world. The introduction of the Nile Perch into the lake has depleted or eradicated many of the natural fish species.

The floodplains of Senegal, Niger and Chad support over a million waterfowl.

The wetlands of Djoudji National Park in Senegal and the Dawling National Park in Mauritania provide a habitat for more than 3 million migratory birds belonging to nearly 400 different species.

The Bengweulu swamps in Zambia are home to 30 000 black lechwe antelope.

Fish provides more than 50% of the animal protein consumed by people in Zambia, and up to 75% of the protein consumed in Malawi.

The floodplain fisheries around Lake Chad and the inland delta of the Niger are the dominant livelihood in those regions.

The floodplains of the inland delta of the Niger River are used by over 550,000 people for the post-flood dry season grazing of their at least 2 million sheep and goats.

Threats

Many wetlands are severely threatened by human activities resulting from:

- An escalating population seeking land space for settlement;
- Industrial expansion and poor control of waste discharge leading to contamination;
- Poor land-use management such as land reclamation, draining and filling;
- Inappropriate agricultural development in the vicinity of the wetlands;
- Poorly sited dams;
- Introduction of alien vegetation.

5.2 Alien plant invaders

Certain plant species introduced from other parts of the world have become highly invasive and a significant threat to the natural plant life. The impacts of wattle species such as *Acacia cyclops* and *Acacia saligna* include:

- Significant reductions in available water due to their excessive absorption of groundwater leading to loss of productive land and livestock production;
- Increased risk of bush fires due to their combustible nature and the high costs involved in creating fire breaks, fire fighting and subsequent damage following a fire;
- Erosion following fires in heavily invaded areas;
- Increased impacts of flooding, especially after fires;
- Silting up of dams, rivers and reservoirs.

Aquatic plants such as water hyacinth (*Eichhornia crassipes*) form into dense mats which float on the surface of open waters. They have the following impacts:

- Modification of wetland environments by absorbing water-borne nutrients;
- Blocking navigable channels and making access by boat difficult or impossible;
- Release of toxins;

- Reduction in water quality;
- Providing ideal breeding areas for disease carriers such as mosquitoes.

Success story

'Working for water' is a South African environmental and social-development initiative whose aim is to clear invasive alien plants such as black wattle and water hyacinth. More than R440 million per year is spent on the removal of 300 invasive alien plants and on wetland rehabilitation projects. Approximately 15,000 short-term jobs a year are created for the purpose. This multi-departmental programme is internationally recognized as one of the most outstanding environmental conservation initiatives on the continent. The spin-off of job creation in the fight against poverty has earned the programme local political support.

6. DAMS



Did you know?

More than 45 000 large dams (greater than 15m in height) exist throughout the world.

Nearly half of all the rivers in the world have at least one large dam along their course. Large dams generate about 20% of the planet's electricity and provide up to 40% of the water used in irrigation.

An estimated 40-80 million people have been displaced by the construction of dams and reservoirs worldwide.

The world's largest storage dam is the Owen Falls Dam on the River Nile in Uganda. Africa has at least 1,272 large dams with 539 situated in South Africa, 213 in Zimbabwe and 107 in Algeria.

Dams provide as much as 60% of drinking water to Morocco's urban population. Hydroelectric power accounts for 80% of total electricity production in 18 African countries.

Dam construction has provided roads, promoted the allocation of land for wildlife sanctuaries and in some cases created thriving lake fisheries such as in the Kariba Dam. Roughly, 57,000 people were resettled along the Zambezi valley due to the construction of the Kariba Dam, and many farming settlements were badly affected by the reduction in the water flow below the dam.

Fish stocks have declined in several rivers as a result of dams, such as in the Niger below the Kainji dam, the Zambezi in Mozambique, and the Nile Delta.

Fisheries in the Mediterranean have declined since the Aswan Dam was built. Instead of depositing their loads of silt along their deltas, rivers such as the Nile and the Volta are now. Causing annual erosion of up to 15m along the coast.

Lake Kariba has caused many earthquakes, 20 of which have been in excess of 5 on the Richter scale, a significant concern for dam safety.

People have been building dams for thousands of years as a means to store water. In more recent times, large dams have been built not only to store water but also to provide hydroelectric power to serve the growing urban populations and industry and as a means to control flooding.

The following table shows some of the advantages and disadvantages associated with large dams.

Advantages	Disadvantages
Water storage for large volumes of water and are major source of water for irrigation	The social disruption caused by the displacement of communities from the flooded area to alternative sites
A means to regulate river flow and reduce downstream flooding	Possible decline in downstream fish stocks
Provision of Hydroelectric power	Altered patterns of flooding, erosion and sedimentation
Stimulation of regional development and job creation	Environmental degradation in areas no longer benefiting from seasonal flooding
Creation of a medium to develop a fishing industry and tourist/recreational facilities	An increased incidence of water-related diseases
	Possible increase in seismic hazard due to the sheer weight of the water mass on the earth's crust
	Potential flood hazard in any case of overflow
	Loss of water through evaporation
	An increase in water-borne alien plant infestations

During the last century, many large dams were constructed in developing nations in the belief that they were the best way in which to meet the water and energy requirements of growing populations as well as stimulate regional development, job creation, and economic growth.

More recently, the growing awareness of environmental and social issues has shed light on the significant social and environmental impacts of dams.

Many experts now seriously challenge the belief that large dams stimulate economic growth and provide a cheap source of water and energy.

Dam construction is extremely costly and can increase national debt burdens with little guarantee of long-term socio-economic advantages. They argue that it is the poor communities who bear most of the social and environmental costs but who derive very little economic benefit. Some people contend that cheaper and better options exist, options that have fewer social and environmental impacts.

This debate led to the establishment of the World Commission on Dams in 1998. Its aim is to ensure that decision-making on water and energy development:

“reflects a comprehensive approach to integrating social, environmental, and economic dimensions of development, creates greater levels of transparency and certainty for all involved; and increases levels of confidence in the ability of nations and communities to meet their future water and energy needs.”

(WCD, 2000).

7. WATER AND CONFLICT

Unlike oil and most other strategic resources, fresh water has no substitute in most of its uses. Within some nations water scarcity already causes conflict and violence enough to threaten social and political stability. Water disputes that spill over borders between countries might not lead directly to war, but still provoke enduring regional tensions that may thwart economic development. Water is so important to life that provision for water needs and demands can never be entirely free of politics, at whatever scale.

The complex interactions between water resources, water supply systems, and international security concerns provide a rich source for regional and inter-state conflict.

In the Nile Basin, shared by ten countries, hostilities broke out between Egypt and Sudan in the late 1950s over Egypt's plans for the Aswan High Dam. Although a 1959 treaty settled this development dispute before the dam was built, no similar agreement exists with Ethiopia, where most of the Nile's flow is sourced. The inhibition of Ethiopia's water development by verbal threats from a downstream regional power, in addition to the civil war and poverty, has made the Horn of Africa more vulnerable to disasters by drought and famine.

Apart from the Nile, there are eight other river basins in Africa that are at risk for the onset of tensions or conflict, five of which (Kunene, Okavango, Zambezi, Limpopo, Incomati and Orange) are in the relatively arid south. The 1996 resurrection of a colonial plan for diversion of Okavango water to Windhoek, the capital of drought-prone Namibia, provoked strong opposition from Angola and especially Botswana, which is home to the vast and highly biodiverse inland Okavango Delta. In 1997 the delta was declared a Ramsar Site of International Importance. In early 2003, Namibian announcements about a proposed 6-8m high weir and hydropower plant above the Popa Falls rapids again aroused vocal Botswanan opposition. The Permanent Okavango River Basin Water Commission (OKACOM) was created in 1994 to coordinate development plans so as to ensure environmental integrity of the whole ecosystem, and is the main institution through which simmering disputes can be peacefully resolved.

7.1 Causes of conflict

The fundamental cause of water-related conflict is population growth because it leads to water stress in arid-zone countries that already have difficulty obtaining enough water to satisfy the domestic, food, and industrial demands of its citizens. The result is heightened competition between urban centres and the surrounding rural areas, between neighbouring states and provinces, and occasionally between nations.

The urban-rural divide is clearly a source of water-related tensions. Whether caused by the demands of modern mega-cities or not, loss of irrigation water and the consequent deterioration of agricultural livelihoods is a cause of forced migration to restive and already overcrowded cities and to other provinces or states, leading to outbreaks of ethnic violence. In turn, a decrease in agricultural output may impact on national self-sufficiency in food. Those nations with little foreign exchange to import food, notably those in sub-Saharan Africa, will then experience greater hunger and/or dependence on humanitarian aid, possibly accompanied by civil protest and violence.

Unrest and/or civil disobedience in the form of widespread water theft or non-payment for services, is also provoked by a relatively new cause of water-related social tensions, namely the transfer from public authorities to private and multinational corporations of water-system ownership and/or management. Such water privatisation schemes are motivated by:

- Inability of national and regional authorities to raise the necessary capital to fund water service expansion;
- Escalating costs and the political liability of providing effective urban services;
- Pressure on governments to reduce public sector debt and water subsidies;
- Some private corporations seeking to profit from the sale of water and related services. Profiteering in the presence of poverty and inequality may have highly inflammatory effects.

7.2 Recommendations

Community leaders throughout Africa should lobby their governments and international bodies to:

- Promote efforts to increase the productivity of water use, particularly that of irrigation water, through water-thrifty conservation measures and more efficient technologies for delivery, wastewater treatment and recycling;
- Institute stronger national policies and management reforms for the regulation of groundwater use, the pricing of irrigation and urban water so as to encourage thriftiness and discourage waste, and the protection of rivers and lakes from environmental degradation;
- Establish a process of constructive cooperation early in the course of water disputes, long before the onset of serious confrontation. In this regard, the establishment of international river basin commissions is a major step towards co-operative sharing of water resources and avoiding conflict. Through devolution of responsibility to national, regional and local levels, problems could be addressed at source before they escalate to armed conflicts.



Perhaps more important than any top-level governmental reaction is to find practical and community-specific ways of initiating a perception shift from:

“seeing water as a commodity to be exploited, often at the expense of one’s neighbours and the environment, to seeing a region’s water as a shared and fragile resource to be used for the benefit of all peoples and as an avenue towards greater cooperation and trust” .

UNESCO/Green Cross International programme From
Potential Conflict to Co-operation Potential: Water for Peace

Flexible and innovative planning is needed if we are to safeguard Africa's water supply, water security and biodiversity as well as reduce the potential for water-related conflict - all against the backdrop of rapidly changing socio-political circumstances and variable climatic and hydrological regimes, particularly drought cycles. Within the context of the fast-developing socio-political circumstances in Africa that influence the use of water and its impact on biodiversity, water security and a lessening of water related tension requires flexible and innovative planning that can adapt to the variable climatic and hydrological regimes, particularly drought cycles. Such planning must also anticipate the longer-term adverse conditions that will arise from global climate change.

Conflict resolution depends firstly on a community's capacity to cope with and adapt to water stress and secondly, upon the existence of national forums and authorities to deal fairly and equitably with the inevitably competing demands between regions and nations for the limited water resources available.

Peaceful resolutions can be found

In 1999-2000 a watercourse dispute involving Botswana and Namibia over the international border around Sedudu/Kasikili Island on the Chobe River, reached the International Court of Justice. The finding in favour of Botswana was gracefully accepted by Namibia, which then received praise for its mature handling of the issue.



8. CONCLUSION

For all the benefits of water to life, its downside to life in general, and to human society in particular, include hazards of all possible classes. Water can be a dominant factor in many different kinds of disasters:

- It can become a hazard, either in the form of a rapid-onset event, such as a flood, or as a slow-onset event such as a drought;
- It is the primary medium through which many a Biological Hazard operates, in the form of poisons, bacteria and viruses;
- Because of its critical value to modern human civilization, it can also become a military or terrorist target;
- It can become a formidable destructive force in the event that a dam wall is breached from whatever cause.

Under some circumstances, steps taken to reduce vulnerability to water-related disaster of one type may have the unintended consequence of causing, or at least increasing the likelihood of disaster from a different kind. Through unforeseen interactions, a risk-reduction measure focused exclusively on just one aspect, could itself turn out to be a new hazard.

- The dam built to control floods or provide an assured supply through drought cycles may aim at risk reduction, but at the same time it can also provide new breeding grounds for malaria-carrying mosquitoes or bilharzia parasites and thus enhance the public health risk.
- Alternatively a large dam, through its sheer weight on the Earth's crust could induce earthquakes and thereby expose surrounding communities to a new form of risk.
- Groundwater wells, intended to reduce vulnerability to drought may, if unwisely sited, introduce toxic trace elements, such as arsenic or fluorine, into a community's water supply.

These examples of unintended consequences clearly indicate:

- The need for community leaders to gain insight into the complexities of water and its associated risks and to initiate public awareness programmes;
- The need for regional authorities to adopt an holistic approach to water-related hazard and risk assessment as well as establishing Integrated Water Management Plans.

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Bibliography

Ashton, P.J. 2002. Avoiding conflicts over Africa's Water Resources. Groundwater Division, Western Cape Conference: Tales of a hidden treasure, Somerset West, 16 September, 2002.

BirdLife International: Africa Programme. <http://www.birdlife.net/worldwide/regional/africa/index.html>

Chenje, M. 1995. Programme takes lead in environmental training. Southern Africa News Feature SARD, Harare.

Chenje, M., and Johnson, P. (eds). 1996. Water in Southern Africa. SADC/IUCN/SARDC, Maseru/Harare.

Davies, B., and Day, J. 1998. Vanishing Waters, University of Cape Town Press, Cape Town. Soils Incorporated (Pty) Ltd and Chalo Environmental and Sustainable Development Consultants. 2000. Kariba Dam Case Study, prepared as an input to the World Commission on Dams, Cape Town, www.dams.org Regional Consultation of the World Commission on Dams. 1999. Large Dams and their Alternatives in Africa and the Middle East. Experiences and Lessons Learned. Summary Report. www.dams.org World Commission on Dams. 2000. Dams and Development. A New Framework for Decision Making. The Report of the World Commission on Dams - An overview. <http://www.dams.org> Parasuraman, S. Water and Dams: Rivers of contention. In: IUCN. 2003. World conservation. Moving Water. Vol. 1. <http://www.iucn.org/bookstore/Bulletin/water-1-2003.htm>

Fakir, S. 2003. Finding future water in southern Africa: avoiding conflict and war. South African Water Crisis (SAWAC). <http://www.sawac.co.za/articles/waterwar.htm>

Gleick, P.H. 2003. Water Conflict Chronology. <http://www.worldwater.org/conflict.htm>

Hails, A.J. (ed) 1996. Wetlands, Biodiversity and the Ramsar Convention: the role of the convention on wetlands in the conservation and wise use of biodiversity.

ISDR. 2002. Living with Risk. A Global Review of Disaster Reduction Initiatives. <http://www.unisdr.org/Globalreport.htm>

IUCN, 1997. IUCN Red List of Threatened Plants. IUCN, Gland, Switzerland. Available on <http://www.unep-wcmc.org.uk>

Kabii, T. 1996. An Overview of African wetlands. In: Hails, A.J. (ed) 1996. Wetlands, Biodiversity and the Ramsar Convention: the role of the convention on wetlands in the conservation and wise use of biodiversity.

Kovach, R.L. 1995. *Earth's Fury. An introduction to natural hazards and disasters*. Prentice-Hall Inc. Englewood Cliffs, New Jersey.

McNeely, J.A. 1999. *Freshwater management. From conflict to cooperation*. IUCN. <http://www.iucn.org/bookstore/bulletin/1999/wc2/content/conflict.pdf>

Mitchell, A. 2003. *Botanists: thousands of plant species under threat in Africa*. Planet Save.com <http://www.planetsave.com/ViewStory.asp?ID=4327>

Postel, S.L. and Wolf, A.T. 2001. *Dehydrating conflict*. Global Policy Forum, UN Security Council. <http://www.globalpolicy.org/security/natres/water/2001/1001fpol.htm>

SARDC, 2001. *Twenty years of Development in Southern Africa. A sectoral review of regional integration in SADC*. REDI and SARDC, Harare, Zimbabwe. <http://www.sardc.net/editorial/sanf/2001/iss9/redi%20policy%20papers.pdf>

Smith, K. 2001. *Environmental Hazard. Assessing and reducing disaster*. 3rd Edition. Routledge, New York.

Stuart, S.N., Adams, R.J., and Jenkins, M.D. 1990. *Biodiversity in Sub-Saharan Africa and its islands: conservation management and sustainable use*. IUCN, Gland, Switzerland.

UN/WWAP (United Nations/World Water Assessment Programme). 2003. *UN World Water Development Report: Water for People, Water for Life: Executive Summary*. Paris, New York and Oxford, UNESCO (United Nations Educational, Scientific and Cultural Organization) and Berghahn Books.

UNEP. 2002. *Africa Environment Outlook -Past, present and future perspectives*. United Nations Environmental Programme, Nairobi.

UNEP. 2002. *Africa Environmental Outlook. Past, Present and Future Perspectives*. Earthprint Limited, UK.

UNESCO and Green Cross International. 2003. *From Potential Conflict to Co-operation Potential: water for peace. Prevention and resolution of water-related conflicts*. http://www.unesco.org/water/wwap/pccp/pdf/brochure_2.pdf

US Environmental Protection Agency. 2003. *Functions and Values of Wetlands*. http://www.epa.gov/owow/wetlands/facts/fun_val.pdf

The United Nations Inter-Agency Secretariat for the International Strategy for Disaster Reduction (UN/ISDR)

Within the United Nations system, the Secretariat for the International Strategy for Disaster Reduction is responsible for co-ordinating disaster reduction strategies and programmes.

Its mission is to help people withstand disasters by making them aware of the importance of disaster reduction measures and providing support to help reduce human, economic and social losses. The Secretariat also provides backing for an Inter-Agency Task Force on Disaster Reduction headed by the Under-Secretary-General for Humanitarian Affairs and comprising representatives of several United Nations agencies, regional institutions and non-governmental organisations. Within the United Nations system, the Task Force is the chief body responsible for the design of disaster reduction policy.

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International Strategy

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