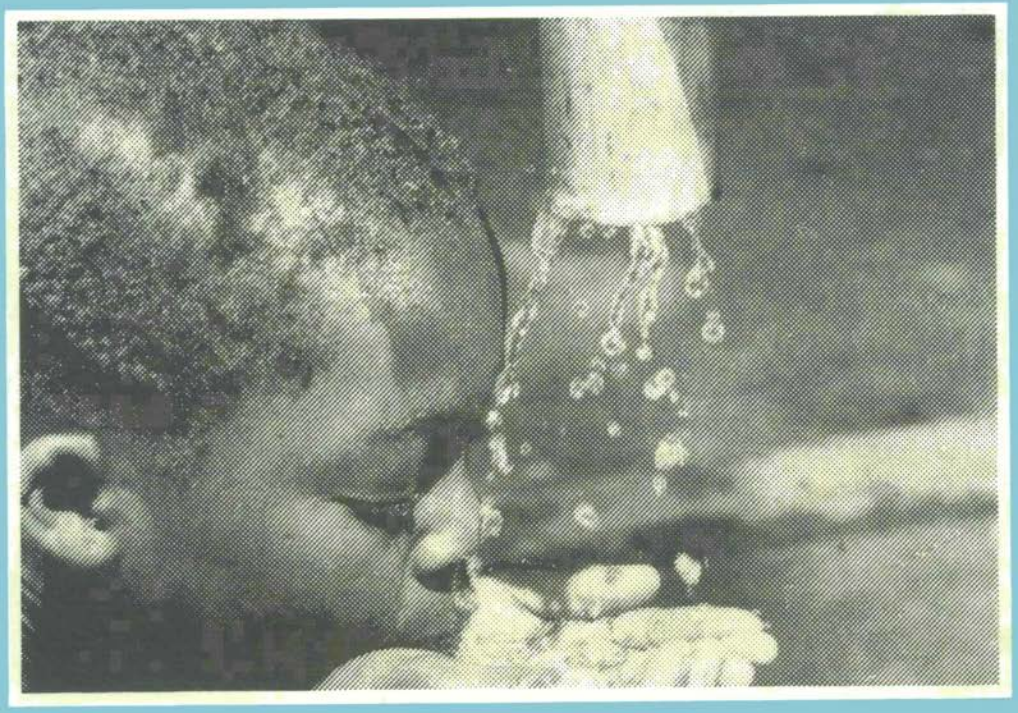
WATER IS LIFE



VOLUME I
FACTS AND INCENTIVES

A
JOINT UNEP / WAGGGS ENVIRONMENT PROJECT
ON THE
PROTECTION OF FRESHWATER RESOURCES THROUGH ACTION AND BY CREATING AWARENESS AMONG WOMEN YOUTH AND CHILDREN

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Prepared for UNEP and WAGGGS
by Dr. Helen Vretta-Kouskoleka, Soil Chemist

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CONTENTS

FOREWORD

This book is the first of two volumes produced by WAGGGS and UNEP and dealing with the dependence of man and other living things on water, its conservation and distribution. It also addresses the problems of water, of water pollution, its forms, implications and need for controls.

Based on UNEP and other relevant publications as well as on every day experience it is aimed primarily as a reference book for Leaders and other young women in the Movement. It is packed full of factual information under specific headings and can be dipped into as a resource, e.g. for background information for talks, discussions, practical projects, poster making etc., and for general information for girls working on badges.

More specific ideas for use in units as discussion topics, research or activities are given on pages 26, 29, 30, 40, 46, 55, 67, 82.

The final chapter indicates how to plan a project and in the second volume there are numerous ideas of activities along with technical knowledge for all age groups, for the use of Leaders with their units and/or other public bodies.

MESSAGE FROM THE EXECUTIVE DIRECTOR UNITED NATIONS ENVIRONMENT PROGRAMME

Since its inception in the early years of this century, the World Association of Girl Guides and Girl Scouts (WAGGGS) has made one of its ideals the care of the environment. WAGGGS concerns on this issue match UNEP's objectives for sustainable development and environment.

Cleaner and safer water for everyone by the year 2000 is one of UNEP's top priorities, for the pollution and shortage of fresh water resources is a serious threat to human survival.

Approximately five million children under five years die of diarrhoea each year, two thirds of the total rural population in the developing countries and more than a third of the world's population of 5000 million people do not have access to safe drinking water. And with less than 1 percent of the world's supply of fresh water available for human use (the rest is locked away in glaciers and the polar ice-caps), the number of thirsty and dirty cities around the world is increasing while the number of garden towns decreases.

UNEP therefore applauds WAGGGS's initiative to involve its million members in conserving and improving this very precious resource on which life on Earth depends.

We congratulate WAGGGS on the decision it made at the 27th World Conference held in Singapore in June 1990, which was attended by UNEP, to institute a world proficiency badge on water awareness and conservation as a follow up to the WAGGGS/UNEP water project.

Still fresh in our memory is the colourful ceremony at your triennial Conference in Kenya in 1987 when WAGGGS received the global 500 award from UNEP in recognition of its outstanding achievements in environmental protection. More recently WAGGGS took an active part in the Second Roundtable Meeting of UNEP regional youth focal points, held at UNEP headquarters in Nairobi, Kenya in December 1990.

We at UNEP value greatly this dynamic and successful cooperative relationship with WAGGGS. Through this joint WAGGGS/UNEP publication, WATER IS LIFE, we hope that WAGGGS will reach out not only to its primary constituencies, but to other young people as well, to inspire them to care for and protect the earth's fresh water resources.

Young people such as the Girl Guides and Girl Scouts are the major shareholders in the future. They have the right and the duty NOW to ensure they have a future in which fresh water will bound and creatures, of all kinds, will continue to flourish, because WATER IS LIFE.

I hope very sincerely that this publication will contribute to this goal.

Mostafa Kamal Tolba
Executive Director, UNEP
December 1990

In 1987, during the opening ceremony of the 26th World Conference in Kenya, the World Association of Girl Guides and Girl Scouts was given the title of honorary member in the special «Global 500» list for the high standard of their work in the field of environment education.

During the Conference each member Organisation pledged to incorporate with their programme the proposals from the latest report of the United Nations Committee for the Environment and Development.

So the Girl Guides and Girl Scouts Associations adopted a certain number of projects and, most important of all, they have undertaken, after a UNEP proposal, a common UNEP-WAGGGS project on a world-wide scale on the subject «Water is Life».

Many aspects of the environment are important – clean air, prevention of soil erosion, and the correct treatment of the sewage. As a Movement concerned with the education of girls, and young women – who are often more responsible for the home, the well – being and health of the family, the cultivation of the crops etc. – we believe the question of water to be of utmost importance. That is why it is the central theme of this project.

This book, which is the result of the project, and which I have great pleasure in presenting to you aims to help as many Girl Guides and Girl Scouts as possible, and also young people of all ages, to understand the importance of water in our lives and communities (volume I). The next step is then to help them take definite action to insure the quality of water and to use it in a responsible way (volume II).

The author is a responsible Guide still actively involved in her Association while continuing as a researcher of high merit in the field of Soil Science. She has involved various Girl Guide and Girl Scout Organisations in her research and, as can be seen, has collaborated with the experts of UNEP to whom we are deeply thankful.

Now it is up to you: Girl Guides and Girl Scouts, young and old, to put all these words into action. Spend some time thinking how seriously water is endangered. Make the effort to see a project through, to invent, to be creative. Talk to the people around you and persuade your friends to get involved.

Yes, Water is Life and we are all responsible for this life. So let us do whatever is within our power to make this world, our planet a better place for all.

Dr Odile Bonte
President World Committee WAGGGS

The implementation of this work, as far as I am concerned, has gone through many stages.

After having been appointed to undertake it, my first feeling was hesitation along with excitement because nothing was clear. I was fascinated with the idea of a cooperation with UNEP and of producing a work on which WAGGGS would invest many hopes for a World Project, which would bring the Girl Guides and Girl Scouts from all over the world together through a common task. I was excited at the thought of my participating in a Project on WATER - this vital element of our Planet.

In the course of the required research I was amazed and taken by the so multiple aspects of FRESHWATER, as well as by the marvellous cooperation with the UNEP Staff.

I am grateful to the WAGGGS, namely to Dr. Odile Bonte, Chairman of the World Committee, for offering to me this unique experience along with her original and constructive ideas.

My gratitude to UNEP is expressed, namely to Mr. T. Brevik, Chief Information and Public Affairs, to Mr. Atchia, Chief Environment Education and Traning Unit, to Mr. G. Sanderson, Deputy Chief IPA, to Mr. D. Kinnear and to Mrs. H. Kiplagat for all their practical and moral support without which the present document would not have been realized.

The productive comments on the book of Dr. Kathryn Benson-Evans were precious and I am deeply thankful to her.

Finally I would like to point out the constructive and pleasant cooperation with Odile Laumaille, resource person on environmental work with Les Guides de France, who contributed substantially to the educational material of the second volume, and has translated both volumes into French.

Dr Helen Vretta - Kouskoleka
Soil Chemist

THINK GLOBALLY
ACT LOCALLY

INTRODUCTION

Let not a single drop of water
that falls on the land, go into
the sea without serving the people

Parakrama Bahu I
King of Sri Lanka (1153-1186)

THIS IS OUR HOME

«The Blue Pearl». These were the words used by the early astronauts to describe our planet as seen from the space. The Planet Earth is perhaps wrongly named, since only 26% of its surface is earth or, as we usually say, land. The rest is covered with water. A visitor from the space might ask why we do not call it Oceania.

Yet the water is not confined to the o c e a n s :

- some is drawn up as water-vapour into the a t m o s p h e r e
- some of this condenses and falls as rain on the l a n d

Thus water – in the oceans, in the atmosphere, in the soils of the land – is present everywhere on our unique planet.

THE MIRACLE OF LIFE

It is said that life emerged from water, at the water's edge, and this watery environment – marsh, estuary, river, stream, lake, pond – provides our planet with the most fertile land, supporting flora and fauna, which cannot live elsewhere.

The miracle of g r e e n - l i f e , the flora, is related to the existence of f r e s h w a t e r .

The miracle of m o v i n g - l i f e , the fauna, depends on f r e s h w a t e r too.
More than 97 per cent of the water on the Earth is sea water protecting both green and moving hidden-life.

The total quantity of water on the earth is stable

The total volume of water on the earth is about 1,400 million cubic kilometres or 10^{18} tons

Globally freshwater supplies are at best fairly stable on an average annual basis due to the Water Cycle

Freshwater is not only a renewable natural resource, for which no substitute exists, it also forms an important part of ecosystems and landscapes, which it sustains.

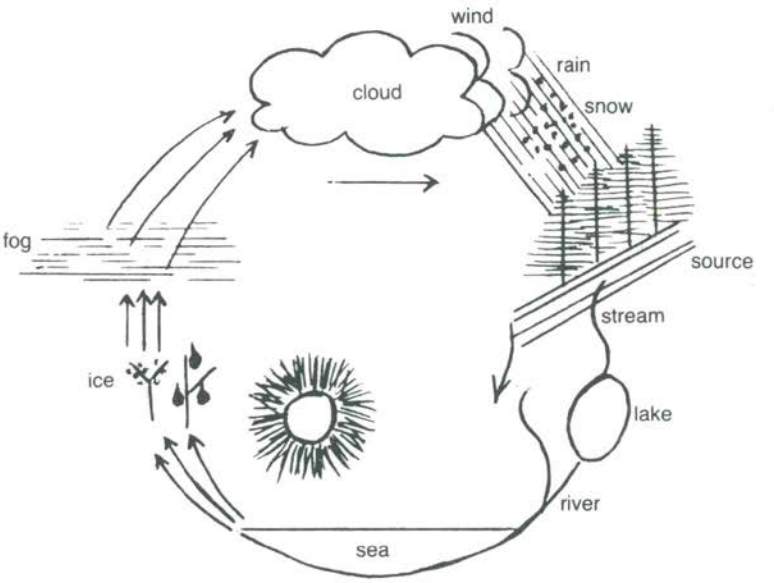


Fig. 1. The water cycle

The ultimate goal of water resources development and management is to serve water users, and to satisfy this goal provision must be made for sufficient water of an acceptable quality for each type of use to be available, at the right location, at the right time, and at the right price, now and in the future.

WATER, OUR ASCENT

A fast review of Man's history reveals that his evolution started at the earth's points where water existed.

- The Greek civilization developed along the endless coasts of the mainland as well as along the Asia Minor coast and South Italy.
- The Egyptian civilization flourished along the river Nile, which is still worshipped as a God, because of the fertile plains He created, on which life depends.
- The legend of the Yellow River dominates the East, while
- Intervention by man in the Amazon basin is a great threat to the balance of ecosystem on Earth.

Water can be considered as the symbol of patience and determination. What better example could one find than the formation of stalactites and stalagmites?

But above all, water has a special meaning and importance in all great religions. It is and it has always been the symbol of

- purity
- purification
- rebirth
- creation

In almost all the traditions and in the very ancient documents of the so called «Ageless Wisdom», water is given special spiritual and mystic importance.

According to the Japanese Bibles Kojinki and Mihongi, Gods Izanaki and Izamaki were stirring the liquid matter of the chaos, when a drop of this liquid, which was water, dropped down and created the first land, the island Onokoro.

In the Indian Vedas water is indispensable for the movement of the universe since amsty, which means immortality, is found in this water. The rivers Ganges, Kisthna, and Indus have a common source: they all spring from the Spring of Truth.

The universe was born from water according to the Assyrian-Babylonian Genesis. Ea, the principle God of the Soumeric belief, had water as his emblem, which meant the «Houses of Waters» and it was supposed to be located at the junction of the Tiger and the Euphrates rivers.

According to the Bible, water pre-existed all matter and the Creation of living things. God placed the First Man in the fertile land framed by four rivers: Phison, Geon, Tiger and Euphrates.

In ancient Egypt they worshipped Isis as the water element and the Nile was worshipped as a God.

According to the teachings of the ancient Greek philosopher Thales of Milissos water is the primary substance, from which every thing in nature was derived.

In the northern countries, such as Germany, and in their mythological Genesis, Ginnungagap was the creator of the world of mist, the Niflheim. From this, the powerful spring Hwergelmir was created from which twelve rivers sprang.

In Finland they call Pyhâfârvi the sacred lake, Pyhâjoki, the sacred river, and Pyhâvesi the sacred water.

According to the commandment of the Koran people should wash their hands before a meal. In case of lack of water they must rub them with clean sand or soil which has not been contaminated with animal filth.

In a Moslem tribe in south Iraq the marriage ceremony takes place in water. The bride, the bridegroom and the priest wade up to their waists, while fully dressed into the water of a pond, a river or a lake.

In the Koran in Chapter XI, «Hood», 5, it is mentioned: ... and His Throne was upon the w a t e r s... and in Chapter XIII, 1, it says: ... and palms in pairs, and palms single, watered with o n e w a t e r... Again in Chapter XXV «Salvation», 55, it mentions: And it is He who created of w a t e r a mortal, and made him kindred of blood and marriage.

There are many situations referring to water in the Koran as well as in all Holy Books of all religions.

Thus one can realize that water has an exceptional significance for people all over the world.

SOME FACTS

As a medium, freshwater

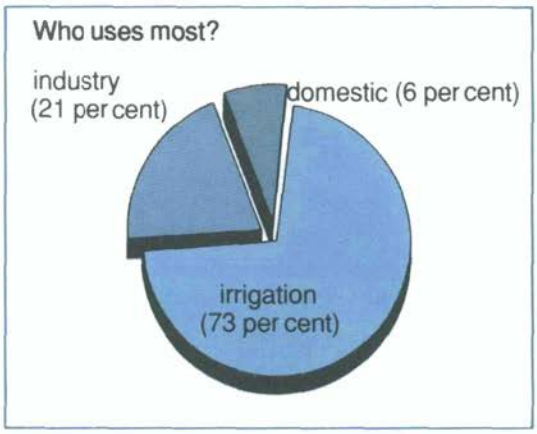
- facilitates the transportation of wastes as well as of goods,
- may be a pathway for pollutants,
- can be harnessed to serve as a continuous source of energy.

Freshwater is used for

- drinking
- domestic purposes
- irrigation
- livestock
- industrial production
- mining
- cooling
- navigation
- fishery
- forestry
- recreation

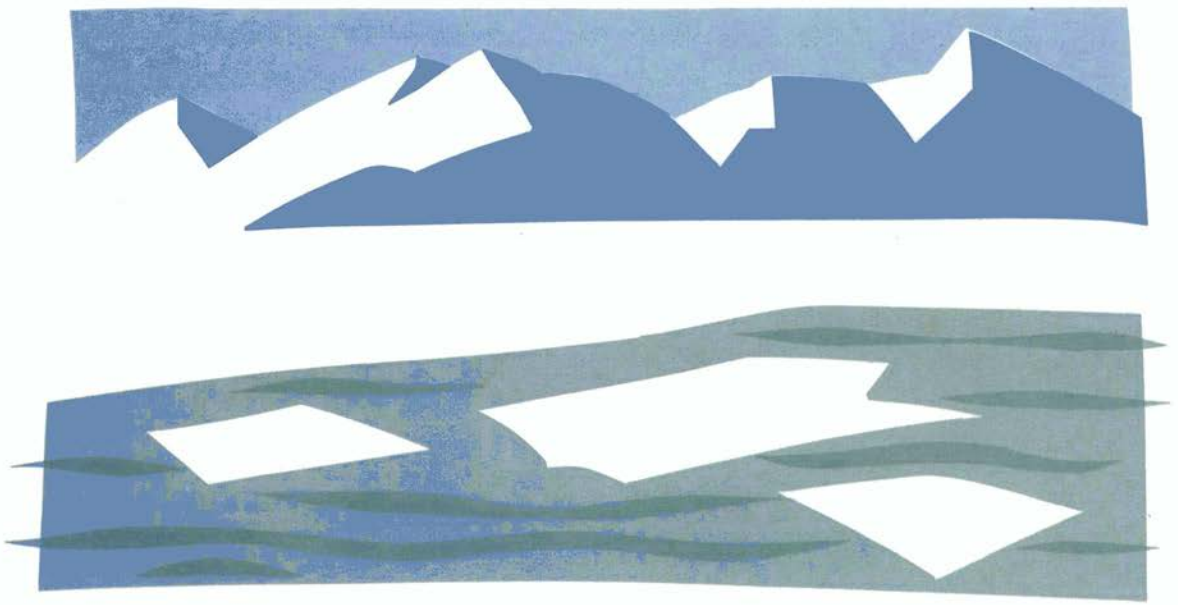
Global water use breaks down into three categories:

- irrigation (73 per cent)
- industrial (21 per cent)
- public use (6 per cent)



Unbelievably the amount needed for these functions is less than o n e per cent of the supply of freshwater on the earth, the rest being locked away in glaciers and the polar ice caps.

Yet this tiny quantity of freshwater can meet the man's demand. Unfortunately it tends to be available in the wrong place, at the wrong time or with wrong quality or quantity. Its uneven distribution is shown by the fact that 15 of the largest rivers carry one-third of the global run-off, and the Amazon alone carries 15 per cent.



- In most of Africa, much of western and southern Asia, the western United States, Mexico, Australia and large areas of western South America, rainfall cannot supply sufficient water.
- By contrast, large areas of western and south-east Asia and central Africa suffer from torrential rains and seasonal flooding.

The Congo-Zaire basin has less than 10 per cent of Africa's population but more than 50 per cent of its water.

Water shortages are causing more and more nations to utilize their supplies of ground water, which is some 3000 times more abundant than surface water and often much cleaner. However.

ground water is neither renewable nor self-cleansing

and

already the groundwater used for irrigation in many semi-arid areas is being drawn upon many times faster than it is being replenished

Average daily consumption of water in the cities of the developed world can be almost a hundred times as high as in some of the world's poorer countries.

World demand for safe water will more than double by the year 2000,

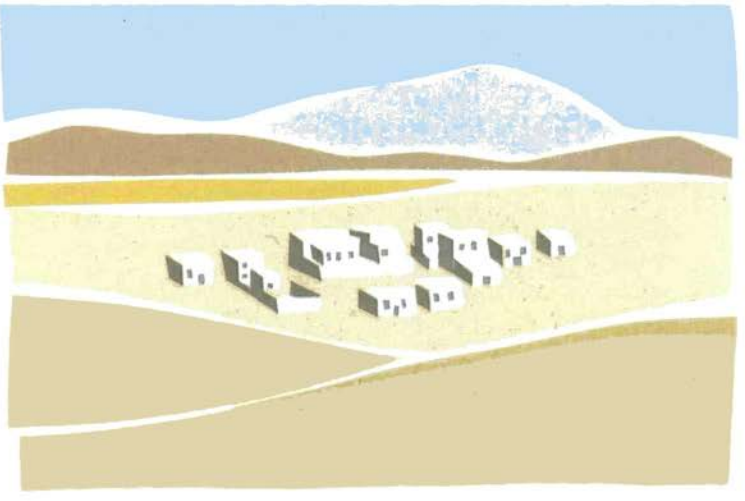
- partly to meet the needs of urbanization, and
- partly to support the new advances in irrigated agriculture.

Actually every year 4,600,000 children under five die of diarrhoea in developing countries and suffer from dehydration as a result

Dirty water causes the death of 25,000 people a day in developing countries.

In a world of water, two thirds of the rural population have no access to safe drinking water.

At least 1,700 million people do not have an adequate supply of drinking water and some 3,000 million are without proper sanitation.



THERE IS A SOLUTION TO EVERY PROBLEM

Because of seasonal alterations of surpluses and deficits of freshwater in developing countries, three main problems are encountered in freshwater resources schemes:

- relation of the freshwater resources to the environment,
- the search for the most rational way of using freshwater resources,
- the search for the most rational manner of their development.

In the developed countries problems exist as well. Some of them are the same whereas some are different.

What we all need to help solve the various water problems are

- Adequately motivated and trained people
- Community involvement
- Information as to the full dimensions of the water resources
- More sensitivity to the environmental problems of water resources

LET US NOT FORGET!

In these days of growing environmental awareness, young people are often among the first to understand the implications of the destruction of our natural resources, and to try to take a preventive action.

Mostafa K. Tolba
Executive Director, UNEP

and

...today's young people will become the decision-makers of tomorrow.

Mostafa K. Tolba
Executive Director, UNEP

REMEMBER!

Water is our life and the life of our children's children. If we all care for this, we will become the promoters of a chain of actions, which will have a general impact on all environmental aspects. Then we will be able to talk about a sustainable development.

The young adults of WAGGGS are given the privilege to motivate for action their units, their community. Motivation depends on widespread understanding of the problems and this in turn depends upon educaiton.

I. WATER AND HOME

'Mid pleasures and palaces
Though I may roam
Be it ever so humble
There's no place like home
. . . . . .
From a song....

WATER MAKES LIFE BEAUTIFUL

Water for life,
Water for a healthy life,
Water for a well balanced life,
Water, the centre of social life.

WATER AT HOME!

What more precious element could one wish to have at home?

- In the hot nights, half sleeping, we search for this precious liquid: a glass of water next to our bed.
- The day starts with some water on the face: we need it as plants need the morning dew.
- A life-giving shower.
- In a hurry, a cup of coffee, and off we go...

There are countless domestic uses of water besides drinking. We need water for

- cooking
- washing dishes
- laundering
- home cleaning
- toilet flushing
- personal sanitation

and eventually for just enjoying ourselves.

Water is essential for life

One or two litres of drinking water is adequate per person per day

Water is indispensable for a healthy life

Flushing of an average sized toilet tank requires 10 litres of water

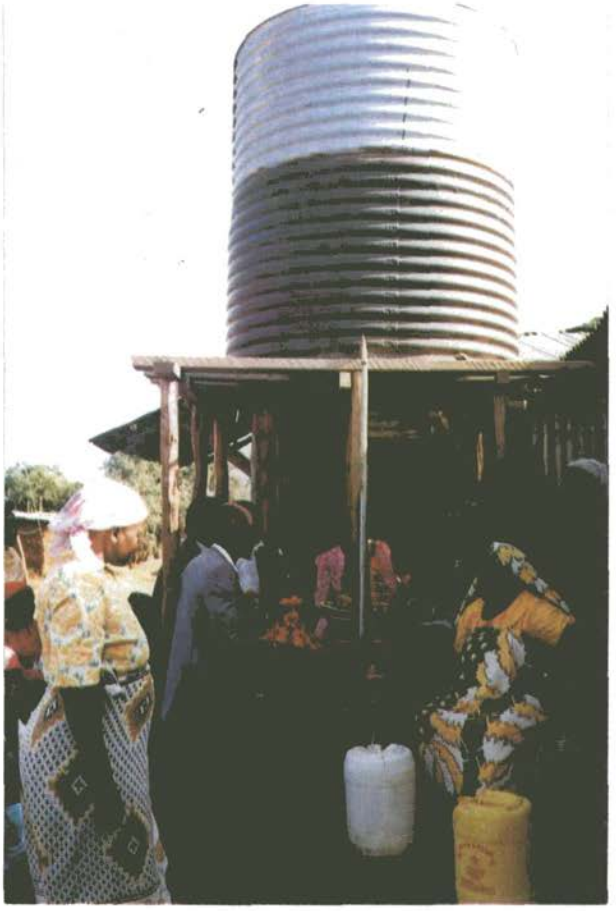
Water is the key to a happy mind in a healthy body

A single shower uses nearly 100 litres of water

1 = 400

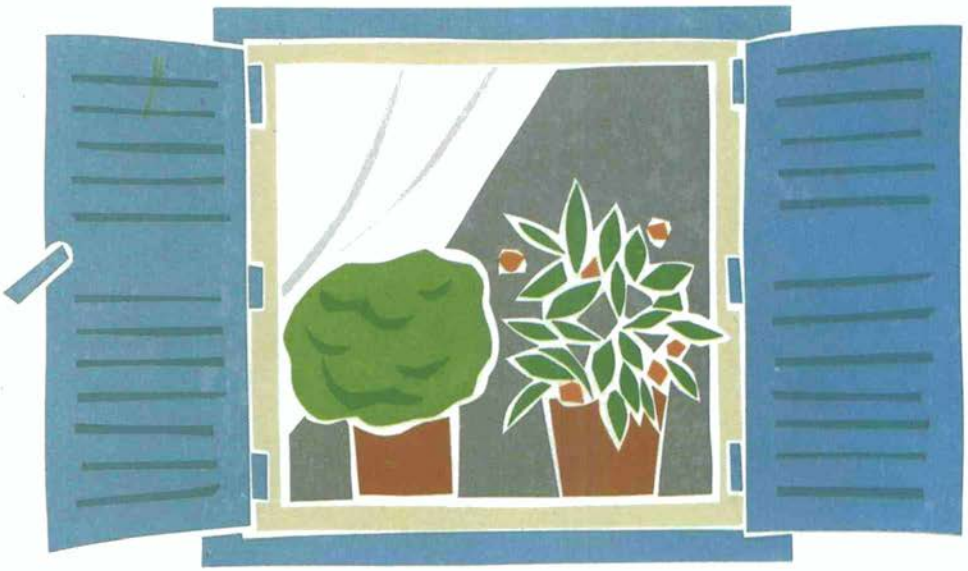
Water was and still is the centre of social life

- Roman baths had a social aspect
- Islamic baths, hamam, were a social gathering
- At the village fountain women meet, news is spread, events are announced
- Commercial life is developed around a water source



WATER HELPS DEVELOPMENT OF BODY AND SPIRIT

Water is necessary not only for building a healthy body but also for developing mental health through a clean and neat house.



Water is a contributor to our aesthetic world.

History reveals to us that in all ancient religions water has been considered as the purification means for both body and spirit.

The Moses' Law suggests frequent bathing and the love for water has taken a spiritual aspect.

In the History of ancient Greece one can trace innumerable sacred springs protected by various Gods. Many of those springs have survived up to-date.

In the exscavated palace of Philippos, the father of Alexander the Great, in Macedonia and in other Greek towns, the drainage system is a witness to the use of water in the ancient Greek houses.

The Romans later improved the water distribution net of the towns through the aqueduct, the canal water transportation system, thus permitting the development of the famous Roman municipal baths as well as the fountains in the towns and the houses.

THE STRIVE FOR WATER

It has been said that the degree of civilization, which humanity has achieved, can be measured by the water consumption for domestic purposes. And yet, actually humanity faces tremendous water shortages in almost half of the planet. In desert and in semi-arid zones women sacrifice time and energy on the search for water.

This energy consumption deprives women and adolescent girls from other activities, which would have improved their personal development and the state of their home.

What is the average time a woman needs in the developing countries to provide her family with water?

In Wayen, Burkina Faso, mothers walk daily for two or three hours to stagnant water holes by a river 12 km away and return with 25 litres of water on their head. According to WHO the trip consumes up to 600 calories a day, one third of their food intake.

Nearly 30 per cent of the women in Egypt have to walk more than 60 minutes a day to meet their water needs.

House water provision has always been the women's task. Therefore, any mobilization to participation of girls and young women in the protection of freshwater resources, as well as in projects on availability and safe quality of water, is of great value for a sustainable development of the water suffering societies.

In some rural areas, for example in Dodota, Ethiopia, women participate actively in the Water Supply Project.

In Kenya, the concern for safe and easily available drinking water led to the foundation in 1975 of the KWAHO, the Kenya Water And Health Organization, while in 1977 women initiated a UNICEF/NGO water-for-health programme.

WATER AVAILABILITY

Water for domestic use can be obtained from

- springs
- wells
- rivers
- ponds
- lakes
- stagnant water
- the rain
- dams
- house reservoirs
- a village fountain
- a tap in the house

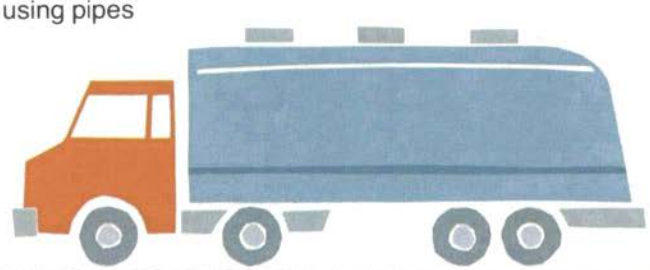
Before water is available at home, three main operations are needed:

- transportation
- storage, and
- treatment

WATER TRANSPORTATION

Water can be transported in several ways:

- using human power to carry it home
- using animal power to carry it home
- using energy other than human or animal, for example tank-lorries or tank-boats.
- by gravity
- through canals, open or closed
- through the distribution net, using pipes



Water transportation by means other than carrying it, implies a minimum of infrastructure, mainly a distribution net which can secure a safe quality.

- Water in open canals is subject to contamination
- The town distribution net is safe on the condition that water is treated and that there is no leakage in the pipes.

Whatever the transportation means is, water can always be subject to pollution or contamination if special protective measures are not taken.

Carrying water by using man or animal power or by tank-boats and lorries is a combination of both transportation and storage.

All vessels transporting water must be free of everything which can contaminate the transported water.

All vessels have to be scrupulously cleaned before they are used for transporting water, especially if they have been used initially for other purposes.

No vessels used for agrochemicals (pesticides or fertilizers) or for petrochemicals (petroleum, benzene etc.) should be used for water transportation.

WATER STORAGE

Water storage is a serious operation since stored water is subject to pollution either from external sources or through indigenous causes.

Water is never completely sterilized even when treated, unless it is boiled. This means that it always contains a certain minimum bacterial population above which any increase means it becomes unsafe to drink. When it is stored for long time in tanks, the bacterial population increases. Therefore, all reservoirs even buckets have to be cleaned regularly.

- In arid zones the development is slower than in hot and humid areas.
- In semi-arid zones with very little or no groundwater, the main water source is the eventual rain. The method of capturing this water is characteristic in each country and belongs to its tradition.

Houses of Greek islands of the Aegean Sea: a terrace for capturing the rainwater substitutes for the usual roof. Water is then transported through pipes and stored in the basement, thus kept cool.

The water reservoirs in this case are usually sterilized by using lime.

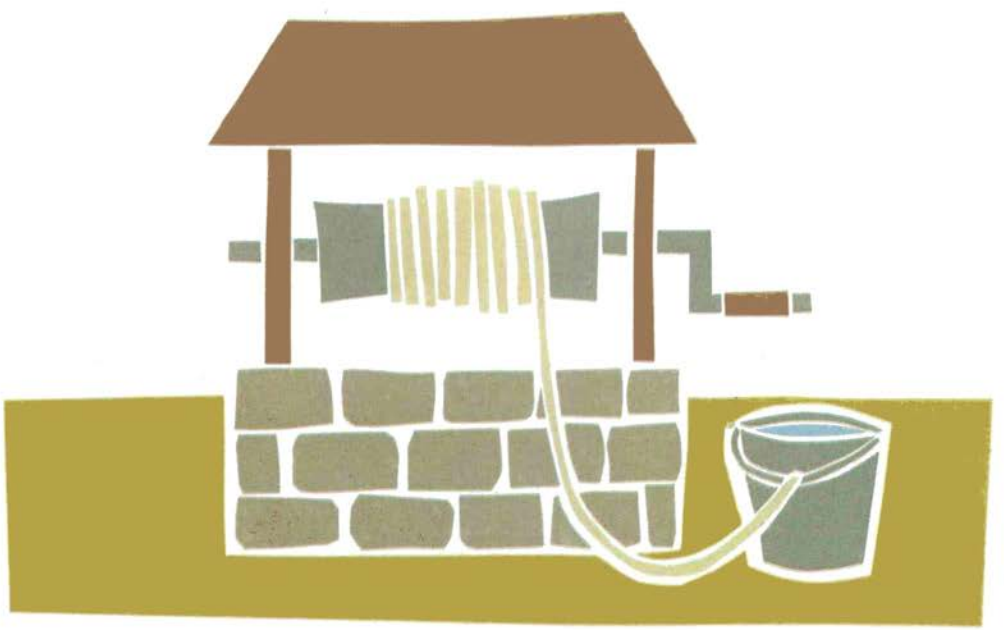
Many people also store water near the house so that they don't have to fetch it many times during the day. It can be stored in a large cement pot or in a regular bucket. Whatever the vessel is, a cover must always be on it, to protect water from animals to drink it or fall in it, from dust or other items to fall and pollute it.

WATER TREATMENT

In the history of humanity many are the cases of loss of a great part of population due to some epidemic. One of the main causes of an epidemic spread is water.

Unless water comes from an artesian (underground water under pressure) well pumped under a closed system through a safe distribution net, it has to be treated before use.

- One can never be sure of what is going on upstream.
- One can never know whether no polluting or contaminating objects, such as small animals, birds, snakes etc., have fallen into an open well.
- Very often well water is polluted by human or animal excretions which are quite close to it.
- Springs are safe on the condition that water is collected on the spot.
- Lake or pond water is often dangerous to drink since very often at some point on their banks animals or people may have contaminated it.



One always has to be aware of the origin of the water one is going to drink.

Lime or treatment with chlorine or iodine kill germs but make water disagreable because of the particular smell it gets. Care must be taken as to the quantity of the sterilizing reagents added.

Very often in countries with water shortages stagnant water is the only solution to survival. This water could be used after

- filtration
- evaporation and condensation
- treatment with chlorine water
- boiling

Water can be filtered by using certain ground material such as gravel, sand, light soil, and, where available, ceramic material pumice stone, or moss. Sphagnum i.e. bog moss is often used in rural areas and others are nearly as efficient.

Cloth can be quite efficient. Cotton or charcoal can also be used as filters to eliminate harmful living organisms.

Evaporation and condensation can provide clean and safe water free of germs but unfortunately also free of salts.

When condensing water use a clean receptacle to collect the condensed water.

Boiling is efficient and also coagulates suspended particles. After cooling in a closed recipient, all these particles precipitate and the water becomes clear.

WATER IN CAMP

Camp is our provisional home. We look for a pleasant campsite, and when there we try to make all sorts of facilities so that our stay be agreeable if not unforgettable.

Our first concern is to find a place with adequate and safe water. If water is not at the campsite and has to be transported and then stored, care must be taken to apply the above mentioned rules for transportation and storage.

In the camps, even if we have the privilege of a spring in the middle of it, just having water is not enough. Girl Guides and Girl Scouts have to invent their own facilities so that water can properly serve them. This is one of the many benefits we have from the camp life.

One of the many features Girl Guiding and Girl Scouting tries to develop in its members, is this creative mind which helps overcome difficulties in life.

Activities related with water in the camp are

- cooking
- washing dishes
- personal sanitation

In cases of abundance of water, one could add a fourth one:

- water recreation activities

Water in the camp has many aspects. Leaders and those in charge of the units are called to draw the maximum benefit from the combination.

In the camp, however, Girl Guides and Girl Scouts could be given the chance of experiencing water shortage, as people in water suffering areas of the world do. Water then can be more appreciated.

II. WATER AND HEALTH

All things are connected like the blood that unites one family. Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does it to himself.

Chief Seatle

WATER, THE MAGIC ELEMENT

Water is an obligatory element for all living bodies, life whose is impossible without it.

- The human body contains 60-80 per cent of water.
- The bodies of other land animals are composed of 60-65 per cent of water.
- The bodies of fishes are formed of about 80 per cent of water.
- In algae and other plant life water accounts for 90-99 per cent of the plant body.
- In a temperate climate the normal bodily water requirement for an adult is about 2.2 l a day.
- In a hot and dry climate this requirement can increase to more than 9.0 l a day.

Some of this water is provided by daily food.

- Both of the above figures must be considered as requirements for survival only.

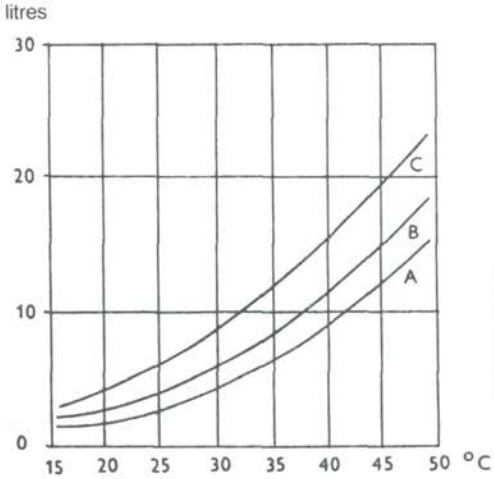


Figure 2. Daily water intake recommended by the U.S. Army in relation to air temperature and level of day's activity. A, rest in shade; B, moderate work in sun; C, hard work in sun.

It has always been believed that physical contact of the human body is reflected in a healthy mind and optimistic outlook.

In ancient Greece rivers were considered as «adolescent feeders», helping the youngsters to develop into adulthood.

In India water baths have been used for curing certain illnesses since prehistoric times. This has been revealed after the excavations of Mohenjo-daro, a town in the valley of river Indus.

The first steam-bath S v e d a , the actual «sauna», is described in the A y u r - V e d a (the Science of Long Living) namely in the C h a r a k a and S u c r u t a .

Hot water therapy was known in ancient populations: in India it was connected with medicine having a mystic aspect as well. In Egypt and Israel the water of certain springs was considered to have a curative power.

In ancient Greece water therapy was particularly developed. It started detaching from legends and losing its mythological aspect. Baths were used along with certain medical herbs against certain diseases.

Today the same hot springs and rivers still exist. Mud baths are considered as highly curative in quite a lot of cases. Yet, we cannot freely enjoy what our ancestors did:

Actual humanity is facing water pollution problems related to health, the basic element of man for both his well-being and sustainable development.

SOME FACTS

In developing countries nearly 70 per cent of the population live in rural areas. It has been estimated that in 1981

- about 1,200 million people were without clean water, and
- about 1,500 million people were without adequate sanitation

Every year 4,600,000 children under five years of age die of diarrhoea in developing countries.

In all the 340 million children under five who live in developing countries (excluding China) are estimated to suffer almost a b i l l i o n diarrhoeal episodes a year.

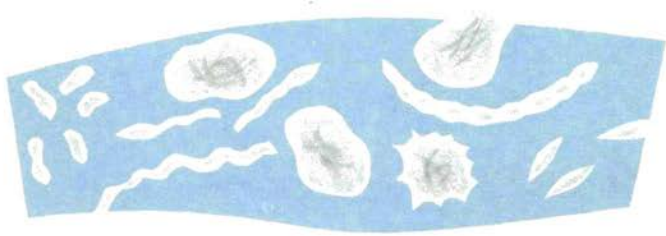
WHEN WATER GETS POLLUTED

Diarrhoeal diseases are mostly the result of water-borne viral and bacterial infections.

Infants are especially prone to acute diarrhoea particularly if they are not breast-fed.

If not treated, acute diarrhoea may kill rapidly, mainly through dehydration.

The Oral Rehydration Therapy (ORT) introduced by WHO and UNICEF in 1970s is very effective against diarrhoea.



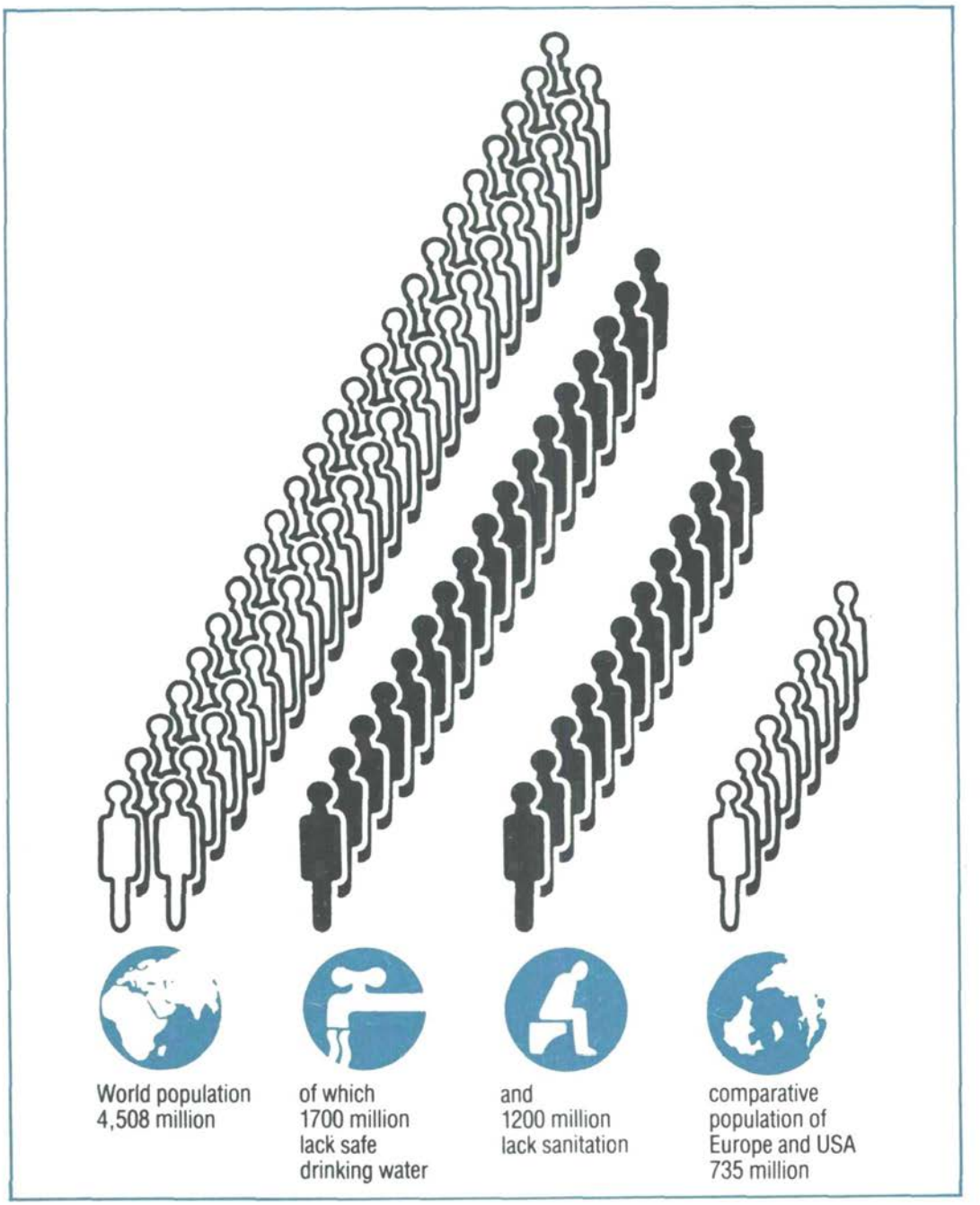


Fig. 3. Water and sanitation (source: The State of the Environment 1984, UNEP 1984).

In 1980, in the developing countries, the proportion of the population supplied with adequate water varied, on a region to region basis,

- in urban areas from 66 to 83 per cent, and
- in rural areas from 22 to 41 per cent

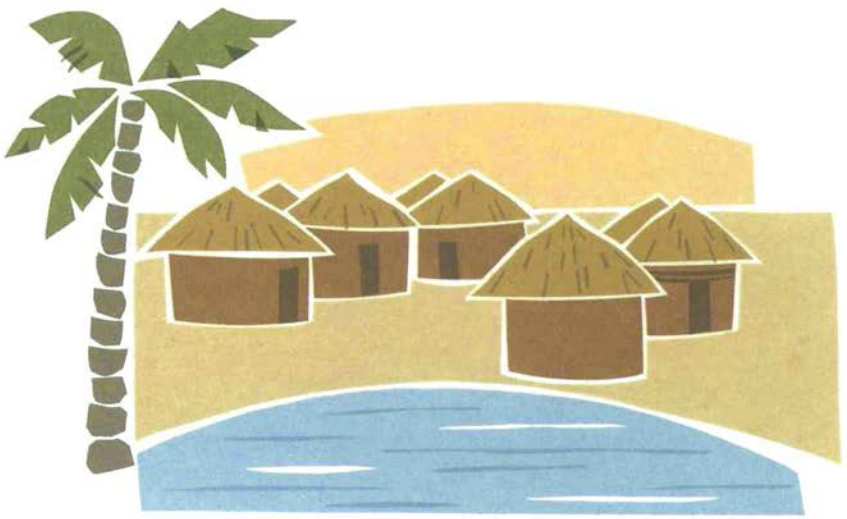
By contrast the coverage in most European countries of the WHO region was close to 100 per cent.

The picture in developing countries concerning sanitation, is very worrying where sewage facilities are lacking and where faecal contamination is widespread.

Latrines are being introduced in the rural and urban areas of the developing countries, but

care must be taken so that they are far from any freshwater resources.

Neglect in the protection of freshwater resources in these areas, including the distribution net, can be fatal especially among the young population.



In many developing countries especially in the rural areas, the freshwater resource is either a well or a spring, a river, a lake or a pond.

The least dangerous is the moving water: a spring or a river. Yet, they are also subject to contamination and microbial pollution if precautions are not taken.

Wells, ponds or lakes can easily be polluted.

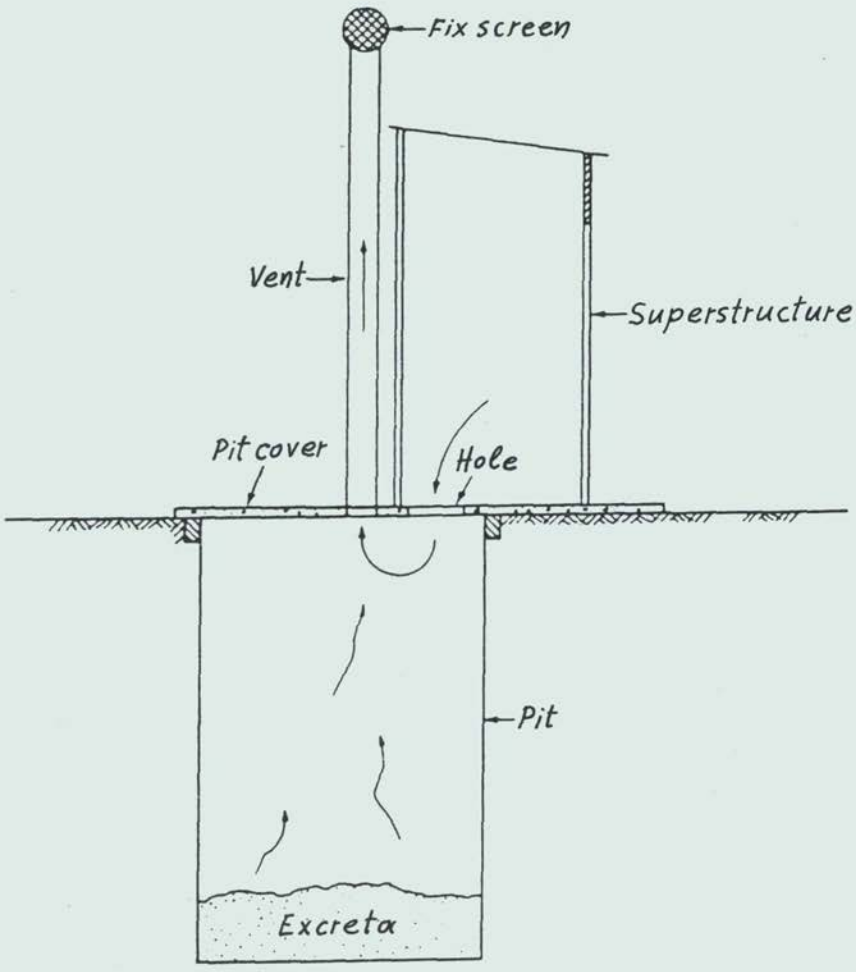


Figure 4. VIP-latrine. Basic components. (World Bank)

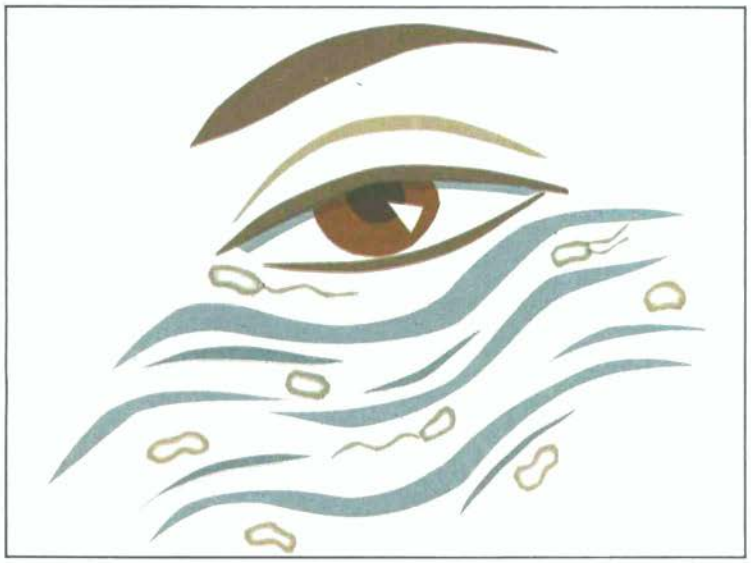
Try to identify pollution sources and the means to prevent their interference.

Diarrhoea is not the only health problem caused by polluted water. Bilharzia (schistosomiasis), due to a parasite which at a certain stage of its life cycle develops in freshwater, is a serious water-based disease.

Six hundred million people in Africa, America and Asia are exposed to the parasite.

Two hundred million are estimated to be infected, and there is evidence that the parasite still gains ground in some 74 countries where it is endemic.

The consequences of this disease is a chronic debilitating condition with loss of productivity that may significantly impair development in high-prevalence countries.



Chemotherapy, use of molluscicides and environmental management of ponds, lakes, streams and waterways can control the problem and the results are promising.

River Blindness (onchocerciasis) is another water-borne disease. The population at risk is smaller, about 50 million, but the consequences of the infection are much more serious:

It can blind its victims

To eradicate the illness, up to 18,000 kilometres of rivers in the Volta River basin were treated with larvicides. Some 10 million people lived in the area and 100,000 were blind when the campaign started in 1974.

Ten years of efforts have now reduced the risk of blindness to virtually nil, and people are able to practice their agriculture in the valley.

PESTS ARE HAPPY IN WATER

The connection between pollution, water, poor sanitation and health is well documented:

a. Water-borne diseases: The pathogen is in the freshwater and a person drinking it becomes infected: cholera, typhoid, hepatitis, poliomyelitis, diarrhoeas, dysenteries.

Preventive strategy: Improve quality of drinking water. Prevent casual use of other unimproved sources.

b. Water-washed diseases: The transmission of these diseases is reduced following an increase in the freshwater volume used for hygienic purposes irrespective of the quality of water: diarrhoeal diseases, cholera, dysentery, already mentioned in (a), as well as skin and eye infections like scabies and trachoma, louse-born typhus and relapsing fever.

Preventive strategy: Increase water quantity used. Improve accessibility and reliability of domestic water supply. Improve hygiene.

c. Water-based diseases: The pathogene spends a part of its life cycle in a water snail or other aquatic animal. Upon contact with freshwater, infection takes place by skin penetration. The snail lives in stagnant or slow-moving water. Its diffusion may be increased by the construction of water supply reservoirs or irrigation canals: schistosomiasis (bilharzia) and guinea worm.

Preventive strategy: Decrease need for contact with infected water. Control snail population. Reduce contamination of surface water by excreta.

d. Water-related insect vector: These diseases are spread by insects which either breed in freshwater or bite near water: onchocerciasis (river blindness), yellow fever, malaria. The West Africa trypanosomiasis (sleeping sickness) is transmitted by the Tsetse fly which bites near the water.

Preventive strategy: Improve surface water management. Destroy breeding sites of insects. use mosquito preventive measures. Vaccinate against yellow fever.

Think of activities and/or projects related to the preventive strategies.

THE URBAN EXPANSION

No fewer health problems are created in urban areas due to remarkable increases in urbanization in the developing countries, which are not followed by the necessary substructure to provide a safe and healthy life.

In developed countries people living in urban areas were.

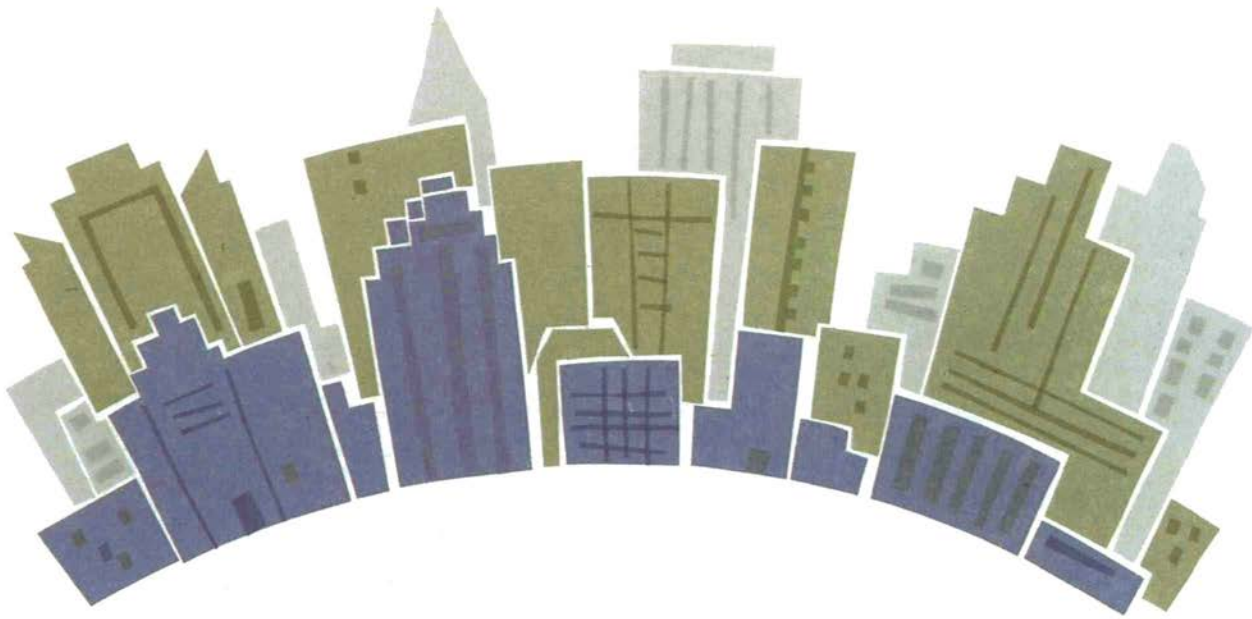
- in 1970: 66 per cent
- in 1985: 73 per cent

In developing regions the population living in urban areas was

- in 1970: 25 per cent
- in 1985: 32 per cent

On a global basis people living in urban areas were.

- in 1970: 37 per cent
- in 1985: 42 per cent
- in 2000: will be more than 50 per cent



Such a remarkable increase in urbanization in the developing countries resulted in an expansion of the number of large cities:

Developed regions
1975: 95 cities of one million 2000: 155 cities of one million

Developing regions
1975: 90 cities of one million 2000: 284 cities of one million

In 1950 only one city in developing regions had a population of more than 4 million.

In 1960 there were 8 cities that exceeded this size compared to 10 cities in developed countries.

In 1980 there were 22 such cities in the developing regions and only 16 in the developed regions.

In 2000 it is estimated that in developing areas there will be 61 cities with more than 4 million and 25 such cities in the developed regions.

In 2000 18 cities in the developing countries will exceed 10 million inhabitants.

It is questionable as to whether proper freshwater distribution nets and sewage systems are being developed at a comparable rate to meet these needs. People must be aware of the health dangers involved.

LET US ALL HELP

Whether in big cities or in villages, lack of awareness and means of sanitation lead to infections and diseases.

People must be willing to appreciate and protect the rural life.

Rural people must be aware of the dangers of the rapidly increasing urbanization.

People in the cities must be aware of the dangers and the means of protection of their health.

Governments, local authorities and the public must take care of the freshwater resources as the most important factor for their good health and welfare.

THE NEWS IS GOOD

«It's a small world after all...»

On an international scale the United Nations Organizations as well as Universities and other Institutional bodies, are intensively working towards the solution of the water problem concerning health and the improvement of the quality of life.

- The United Nations Environment Programme (UNEP) is leading the efforts.
- The World Health Organization (WHO) through its training personnel has largely contributed to the improvement of people's understanding about the proper quality and use of water in relation to health.
- World Food Programme (WFP) campaigns for safe unpolluted water in the developing countries and how to protect it.
- Non-Governmental Organizations (NGOs) acting in developing countries, work on educational programmes including the importance of clean water for health.
- Youth Organizations in Europe, Asia, America, Africa and the Pacific have launched projects on the safety of drinkable water.

The number is unlimited: We are not alone.

The eight million people's strength of the World Association of Girl Guides and Girl Scouts is ready to participate in the effort for the achievement of a better world.

DRINKING WATER QUALITY PARAMETRES

Potable water must meet certain values of quality parametres so that it be safe for health. Some of them are acceptable ranges of the following:

Potassium (K^+)	Chlore (Cl^-)
Sodium (Na^+)	Carbonate (CO_3^{--})
Calcium (Ca^{++})	Bicarbonate (HCO_3^-)
Magnesium (Mg^{++})	Sulfate (SO_4^{--})
Iron (Fe^{++}, Fe^{+++})	Nitrate (NO_3^-)
Ammonia (NH_4^+)	Silicone (SiO_2)

pH, conductivity, total hardness, total dissolved solids.

Here is an example of a good quality freshwater.

Cations	K^+	Na^+	Ca^{++}	Mg^{++}	Fe^{+++}	NH_4^+
mg l^{-1}	0.91	16.10	6.00	79.04	0.01	0.00

Anions	Cl^-	CO_3^{--}	HCO_3^-	SO_4^{--}	NO_3^-	SiO_2
mg l^{-1}	35.50	0.00	390.40	5.00	2.48	25.50

pH 7.5, conductivity 675 uScm^{-1} (25^0 C), total hardness 340 mg l^{-1}, TDS 535.5 mg l^{-1}

Water classification in general is based on certain anions and cations concentration.

Anions (-)	Cations (+)
bicarbonate	sodium
carbonate	potassium
chloride	calcium
sulfate	magnesium

On this basis the natural waters are distinguished into three major categories:

- Bicarbonate waters
- Chloride waters
- Sulfate waters

III. WATER AND AGRICULTURE

All the rivers run into the sea,
Yet the sea is not full;
Unto the place from which the rivers come,
Thence they return again.

Ecclesiastes 1:7

LAND NEEDS FRESHWATER TO PRODUCE FOOD

Agriculture is by far the greatest user of freshwater, mostly in the form of irrigation

- Irrigation was practised even in ancient times.
- The great civilizations which existed around the Euphrates, the Indus, the Nile and the Tigris thrived on it.

The first sophisticated use of a river water for irrigation known in history, was in ancient Egypt where they used the water of the Nile. The ancient Egyptians had managed to control the Nile's flood by conveying the water with the contained silt, through conduits to the neighbouring fields. The benefit was double: the silt enriched the soil and improved its fertility; the water irrigated the soil. When it was absorbed, the farmers could proceed to the planting or sowing of their crops.

The height of the flood was a measure to anticipate a good or a bad yield. For this purpose the nilometers were invented, which were nothing else but wells communicating with the river. They were graded and had a ladder inside. Thus it was possible to measure the flood height and anticipate the expected yield.

In the agricultural machinery sector one can mention the Archimedes screw which was used in ancient Egypt as a tool to clear the Nile's estuary.

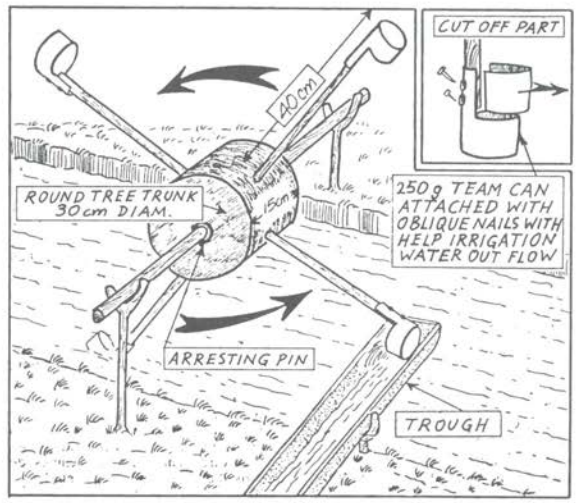
History however has shown that all too often problems did arise, including ill health associated with irrigation waters.

The availability of water resources poses an obvious limit to the expansion of irrigation schemes.

All too often, however, 70-80 per cent of the water used never reaches the crops

It takes approximately 1000 tons of water to grow
one ton of grain and 2000 tons to grow one ton of rice

The total irrigated area in the world is approximately 250 million hectares of which about 100 million are in the developing countries. People in the Sahelian region try to draw the maximum benefit even from the least quantity of water there might be in the area. The water mill below shows one of the subtle inventions of these people.



An important aspect of water management in agriculture is prevention of soil erosion which is often caused by overgrazing or deforestation. Existing efficiencies of irrigation systems are prodigiously low, and there is much room for water conservation in industrial and domestic sectors as well.

It is well recognized that soil, water and vegetation resources cannot be managed for quality and sustained availability in isolation from each other.

MAN HAS TO PAY FOR HAVING THE BENEFIT OF WATER

Irrigation increases wet land or land under water providing breeding sites to various bacteria. Insects also, like mosquitoes, breed in water. Depending on the speed of the flow of the water, various species develop.

Malaria is transmitted by mosquitoes in areas
like the tropics, where the disease is endemic.

Agricultural workers, farmers and their families working in areas of wet lands are exposed to mosquito bites. Certain precautions against them have to be taken such as:

- Keep off the river near and after sunset
- Cover the body preferably with white clothes
- Use mosquito nets when sleeping
- Use mosquito repellent lotion either manufactured or prepared from certain plants, like citronelle, according to the traditional way
- Take antimalaria medicines
- If the houses are close to the river, clear the area around from bush
- Exterminate mosquito breeding small sites around the house by using kerosine
- Plant citronelle if the climate permits it

Mosquitoes also breed in northern or temperate climates where lakes and rivers exist, i.e., in Canada, Holland, Finland, Sweden etc. There they cannot transmit malaria because these are malaria-free areas. However, other infections can be caused through mosquito bites.

Schistosomiasis (bilharzia) is a disease associated with irrigation schemes

Irrigation schemes benefit not only agriculture. Farmers tend to take advantage of the presence of water to cover their daily needs like washing clothes and dishes, recreation, even drinking.

Irrigation waters become polluted with human excreta and people get infected with the disease. The water flow transmits the pollution to a vast area.

Gather information about the disease and think of prevention measures

Onchocerciasis, known as river blindness, has ground villages to a halt leaving only blind people who can hardly support themselves

The worm causing the disease is transmitted by black flies.

Irrigation dams, if not well designed in relation with the ecology and the relief of the landscape, can provide breeding sites to the worm.

How can such dangers be prevented?

CHEMISTRY IN THE SERVICE OF AGRICULTURE

The ever increasing demand for food leads to the use of fertilizers to improve the nutrient status of the soils, and pesticides to control pests.

They are both chemicals, and

there are no safe chemicals; there are only safe ways of manufacturing, handling and using them.

Jan W. Huismans, Director, International Register of Potentially Toxic Chemicals

The Food and Agriculture Organization of the United Nations (FAO) estimates that world agriculture will have to increase output by about 40 per cent by the end of the century to meet the needs of the population.

Increasing the yield per unit of land by using modern agricultural technologies implies continuing intensive use of chemical fertilizers and pesticides. Their irrational use, however, is at the origin of a number of environmental and health problems.

The rates of increase in the consumption of fertilizers are

very low in South and Central America and Africa,

steady in North America,

high in Asia, and

very high in Europe.

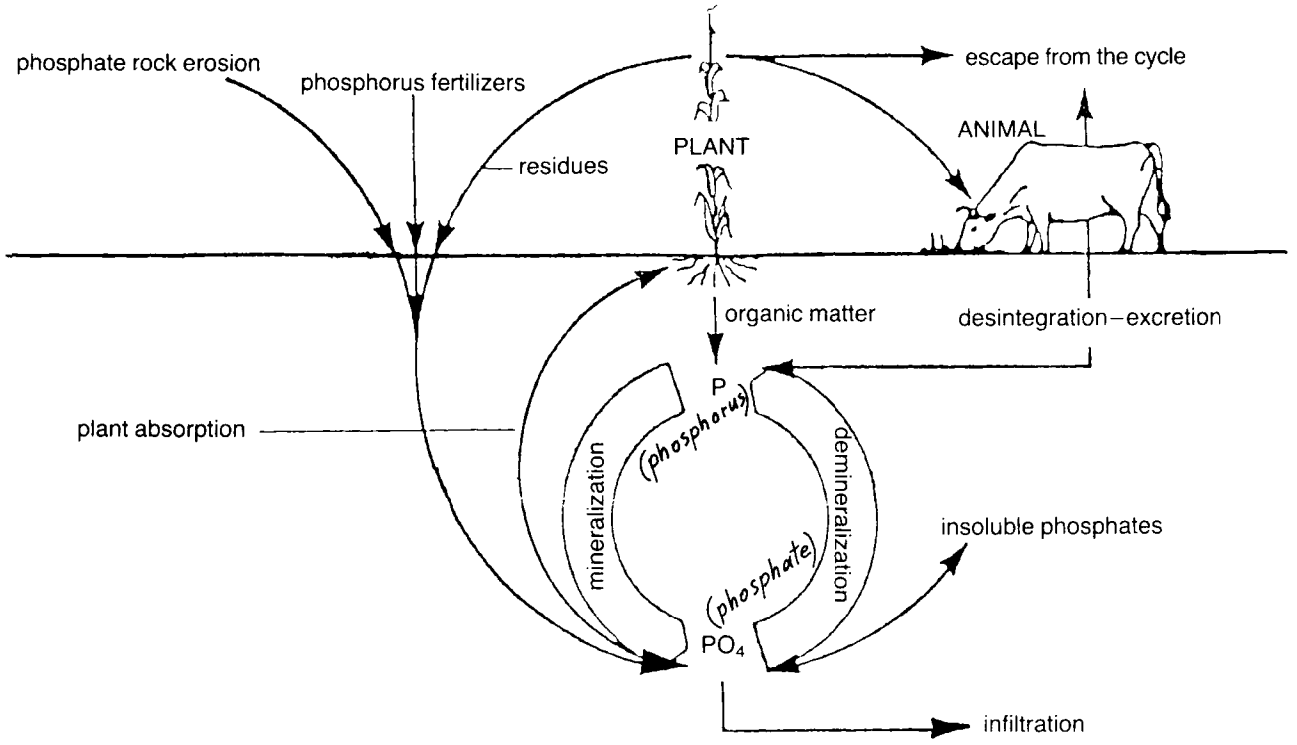


Figure 5. The phosphorus cycle in the agrocosystem (source: Donigian et al., 1977).

Run-off from land treated with chemical fertilizers leaches them into the fresh and ocean waters causing eutrophication (see glossary). Irrigation or rain water infiltration in the soil removes fertilizers to the underground water table causing contamination mainly with nitrates.

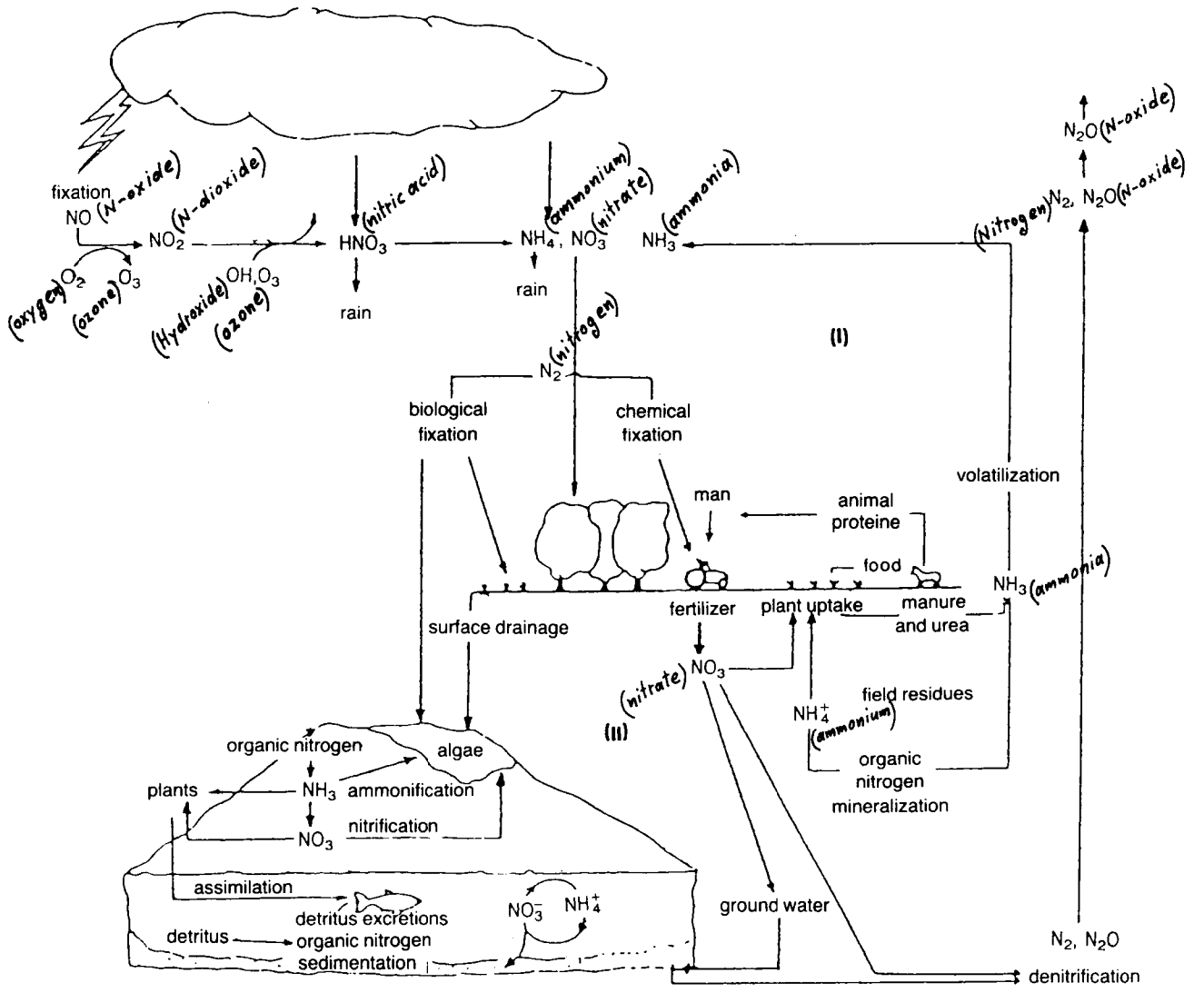


Figure 6. The nitrogen cycle in an agroecosystem (I) and in a water ecosystem (source: The Nitrogen Cycle of the United Kingdom, 1983).

Application of high rates of pesticides and particularly of herbicides, may result in fish kills and contamination of our freshwater resources, both surface and underground, through run-off and infiltration.

The Pesticide Action Network (PAN) has undertaken a worldwide effort, launching in 1985 the «Dirty Dozen» (DD) Campaign. It was a global educational attempt aiming at the banning of twelve hazardous and widely used pesticides. There was a positive response in many countries.

In conjunction with WHO and FAO, UNEP is working to reduce the dangers of using pesticides in developing countries. The programme concentrates on integrated pest management, which combines the use of crop resistant varieties, pest predators, pesticides and traditional techniques of control.

The problem exists in developed countries as well:

- The Rhine was polluted by pesticides
- The Mississippi is so polluted that it is doubtful whether it is suitable for drinking water
- In 1972, in Perham, Minnesota, 11 people were poisoned by arsenic after drinking from a well drilled near a pit where 20 kg of grasshopper bait had been buried 40 years earlier.
- Wastes from pesticides and defoliants at the Rocky mountain Arsenal in Denver, Colorado poisoned more than 70 square kilometres of land around in the 1950s causing death to crops and sheep.
- In St. Louis, Missouri, a horse-breeding farm was sprayed with waste sludge that was found later to contain dioxin, a contaminant of a herbicide. Two people were seriously affected, half of the horses were killed as well as many pets and chickens.
- In Yunnan Province, China, a lake was polluted by the pesticide PCP (pectachlorophenol).

To control the use of pesticides, the FAO implemented the International Code of Conduct on Distribution and Use of Pesticides which came in force in 1985.

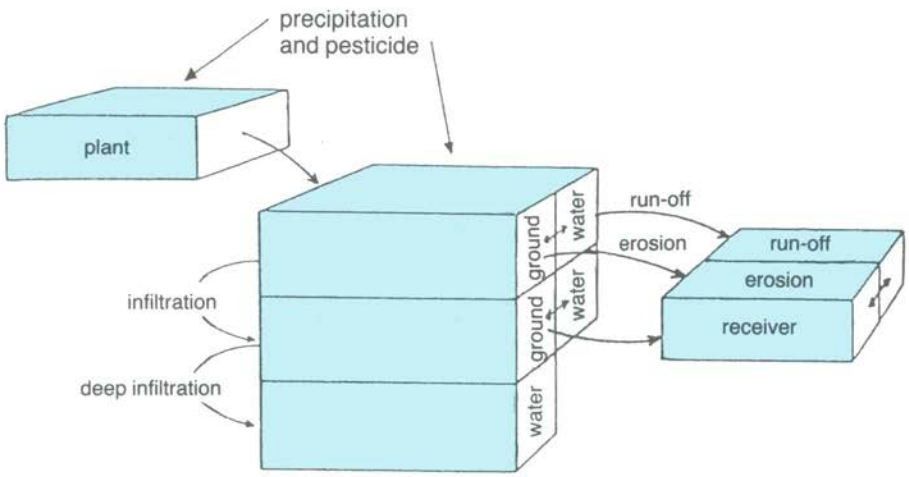


Figure 7. Movement of a pesticide in the field (source: Frere, 1982)

The disposal of

- animal manure,
- slurry, and
- unused pesticides

creates a problem of increasing importance related to freshwater pollution.

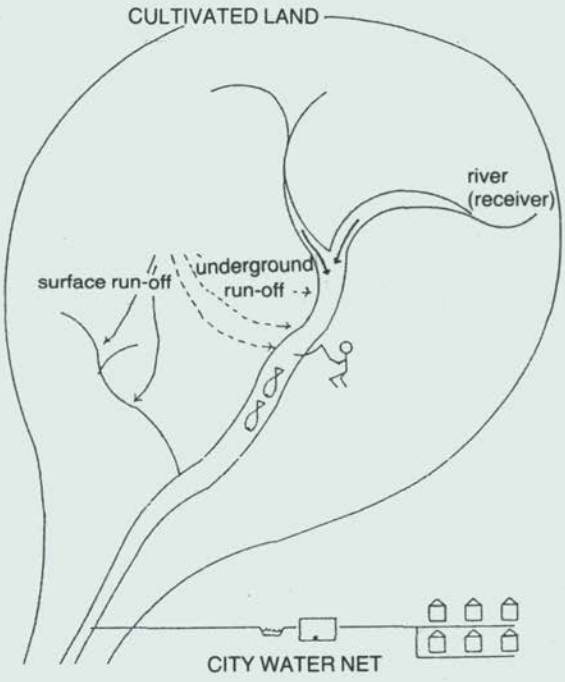


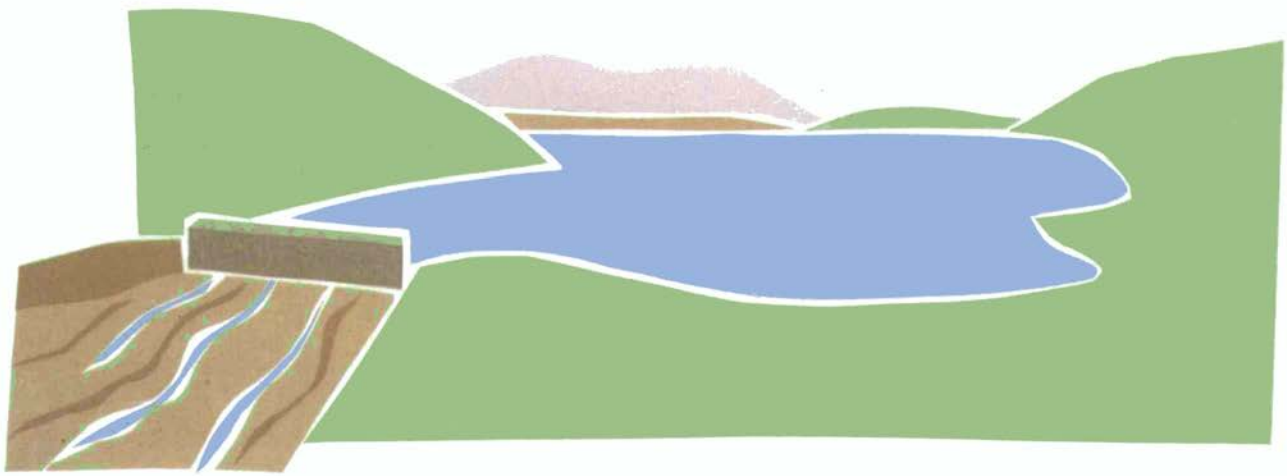
Figure 8. Ways of exposure of the organisms to pesticides through surface waters (source: ERA, 1988)

LANDSCAPE RELIEF AND WATER ADEQUACY

Irrigation schemes are related to the landscape feasibility concerning the relief of the site or the region. The construction of dams and canals, the intervention on the river bed, the water dynamics of the lakes, largely depend on the hydrological possibility of the region. Every intervention on the relief of the land has special impacts of economic, social or agricultural kind.

> Irrigation schemes in one area should not create pro blems on the general water balance of the region.

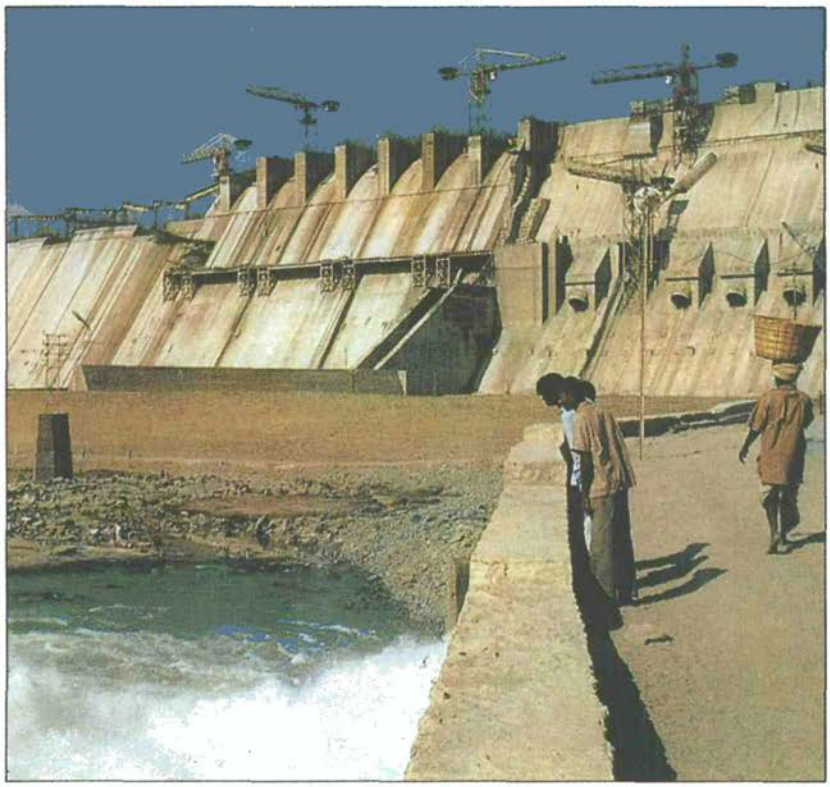
Water demands are increasing in urban areas due to the increasing urbanization trends. Irrigation should not interfere with the water demands of the urban centres.



With rational management, water resources can be maintained on such a balance that freshwater adequacy be obtained for both urban and rural use, and meanwhile protect the landscape.

The past 25-30 years has been a period of unprecedented development of water resources in many countries of the developed and developing world. The Zambesi River Action Plan in which eight countries are involved, Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe, is a positive example of good will of these eight countries to sound water resources development. The plan will cover food control and flood plain management, water pollution control, the reuse of waste water, the supply of safe drinking water and sanitation schemes.

The Three Gorge Project on the Chiang Jiang (Yangtze River) in China will provide flood control in the region, improve agricultural irrigation schemes and produce 100 trillion kilowatt-hours (kwh).



Hydrological attainments when soundly planned and executed are beneficial for both agriculture and urban areas.

Water, the life for man and plants, when mitigated and mastered can serve humanity and support a sustainable development. For example, this is the basic challenge in the arid and semi-arid zones of Sub-Saharan Africa, where the problem of water management and the integrity of the environment are at stake.

Forests are related to both water and agriculture. They protect the watershed through prevention of soil erosion and they act as water reservoirs improving the climate by controlling both rain and wind.

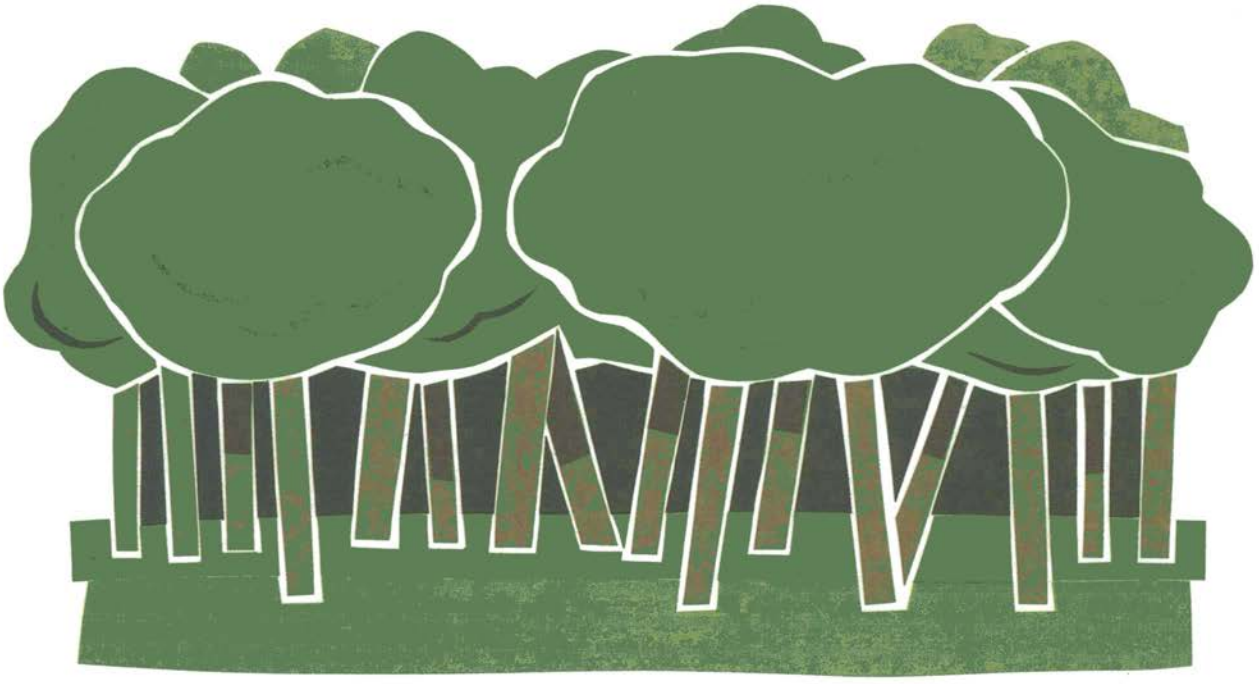
Certain countries in the industrialized as well as in the developing regions face deforestation and desertification problems due to various reasons of economic or political origin. Among these, there are India, Kenya, Indonesia, Brasil, Greece as well as Ethiopia. In Denmark, Italy and Greece emphasis is placed on the prevention of natural resources, mainly forests. A study in Rwanda reveals that after five years of campaign, farmers' appreciation of the utility of protected forests increased. In the European Community and in Canada there is a considerable public concern about the depletion of the world's forests and the acid rain.

Messages from all over the world come expressing interest and determination to protect the forests on our planet.

Make a survey in your area concerning the freshwater status from the viewpoint of man's intervention on its resources and its impact.

How many of the following sources of water can be recognized in the freshwater resources of your region?

- □ surface streams which maintain water all year round
- □ surface streams found at locations with gentle slopes, where the water moves slowly into the stream
- □ phreatic water which is of a rather poor quality but which is easily obtained from shallow wells
- □ groundwater that can be pumped or which springs up to the surface
- □ springs of a limited water supply
- □ artificial tanks collecting rain water
- □ rivers
- □ lakes



Make a correlation between the water supply and the existing forests in your region and in other regions of your country.

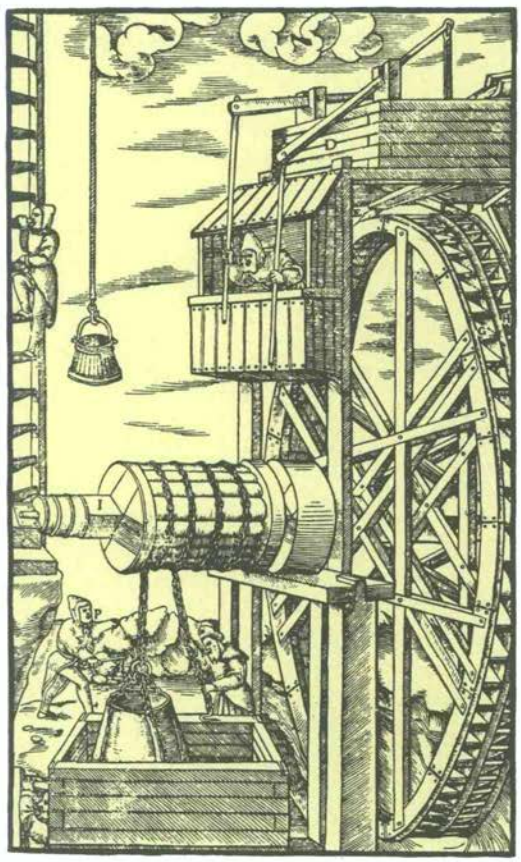
IV. WATER AND INDUSTRY

Knowledge alone or ignorance alone
leads man into darkness.
The union of fitting knowledge with
fitting ignorance is the nectar of eternity

Vinoba Bhave

INDUSTRY: EASY AND DIFFICULT LIFE

Water's first industrial application goes back to the 16th century. It was used to move a giant wheel on which two series of buckets were attached. With the aid of one of the levers, water could run from a reservoir on one of the two series of buckets, turning the wheel in such a way that a huge leather bucket was going down into the pit of the mine. Then, with the second lever, the water could run into the second series of the wheel buckets turning the wheel into the opposite direction, and bringing up the leather bucket with water from the pit, thus permitting safer work for the miners.



- Industry provides society with goods resulting in a better quality of technological life.
- Industry now produces seven times more goods than it did in 1950.
- It caters for a population that totalled

3,000 million in 1960

5,000 million in 1987

and will probably reach

8,000 million in 2025

The production of industrial goods implies

- the extraction of natural resources
- their utilization in the manufacture of industrial products
- the disposal of unwanted materials not utilized in the final product.

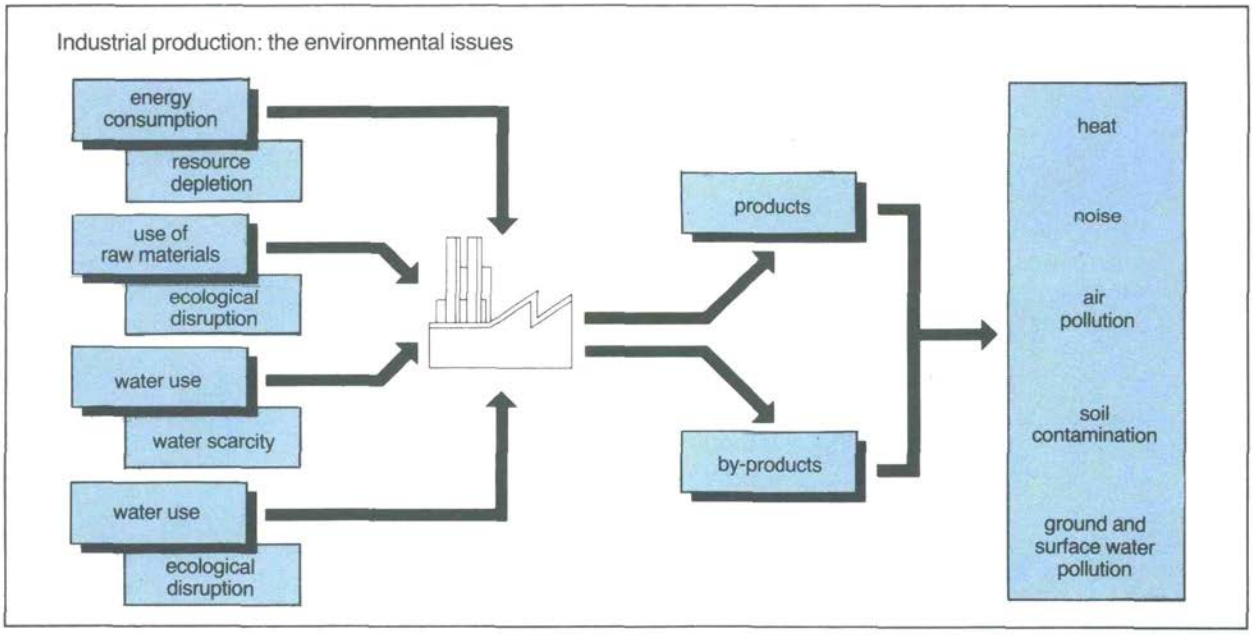
However, the industrial sector constitutes a major component in most countries. Many innovations and scientific advances in some industries in the developed countries emerged during the period 1979-1985. New technologies appeared in certain areas such as:

- robotics
- automation
- microelectronics
- informative technology
- biotechnology

This «refined» industry has its share in water pollution:

- The microelectronics industry emits toxic chemicals such as chlorinated solvents which contaminate freshwater resources.
- The biotechnology may release micro-organisms which can pollute, amongst others, the surface water.

Besides the ecological disturbance, industry may cause water scarcity.



THE EXPERIENCE OF TODAY: OUR FUTURE GUIDE

For thousands of years humanity has discharged untreated or inadequately treated wastewater into rivers, lakes and seas. More recently, industrial wastes have created new pollution problems:

- Mercury and cadmium concentrated in edible fish in estuaries used by industry, killed thousands of people around Minamata Bay in Japan.
- The Rhine, one of the world's largest rivers, was polluted by chemicals and radioactive substances.
- Industrial accidents in the last 3-5 years deprived 70,000 people of drinking water in the developed countries.
- Fish had disappeared in the Thames due to its heavy pollution.
- By 1970 the mercury concentration in freshwater fish in the St. Lawrence, Oswago and Niagara Rivers, as well as in the Lakes Erie, Ontario and Champlain, was such that their consumption was banned.
- In England and Wales in 1987/88 there were 23,253 cases of reported river pollution.
- The relocation of populations from hydroelectric impoundment areas may provide new habitats for disease vectors and may also result in health problems through water use, as a result of lack of sanitary facilities.
- Nuclear industry generates radioactive wastes. The Marcoule plant in France released to the Rhine a substantial quantity of radionuclides.

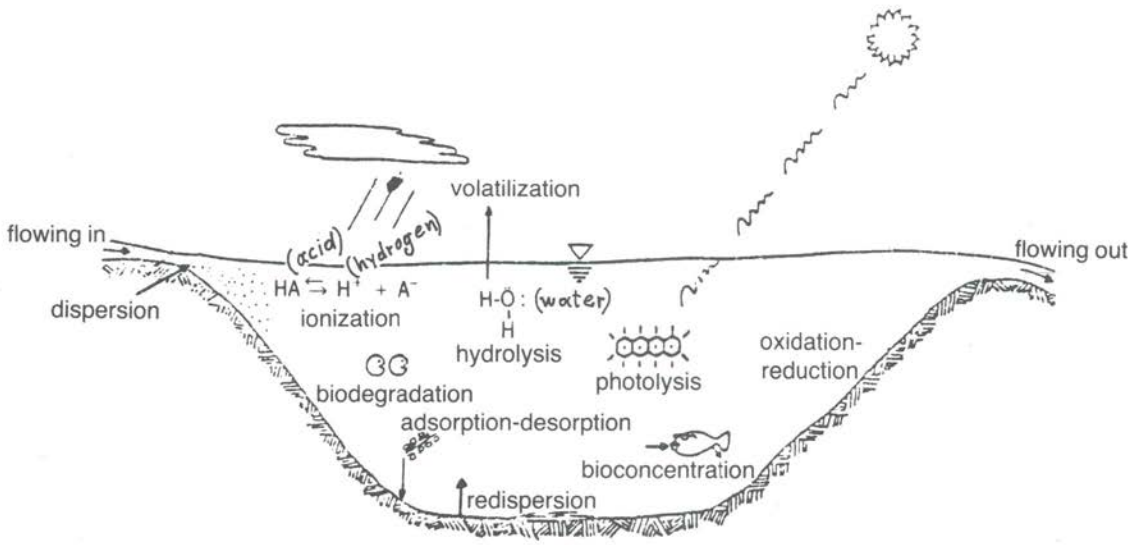
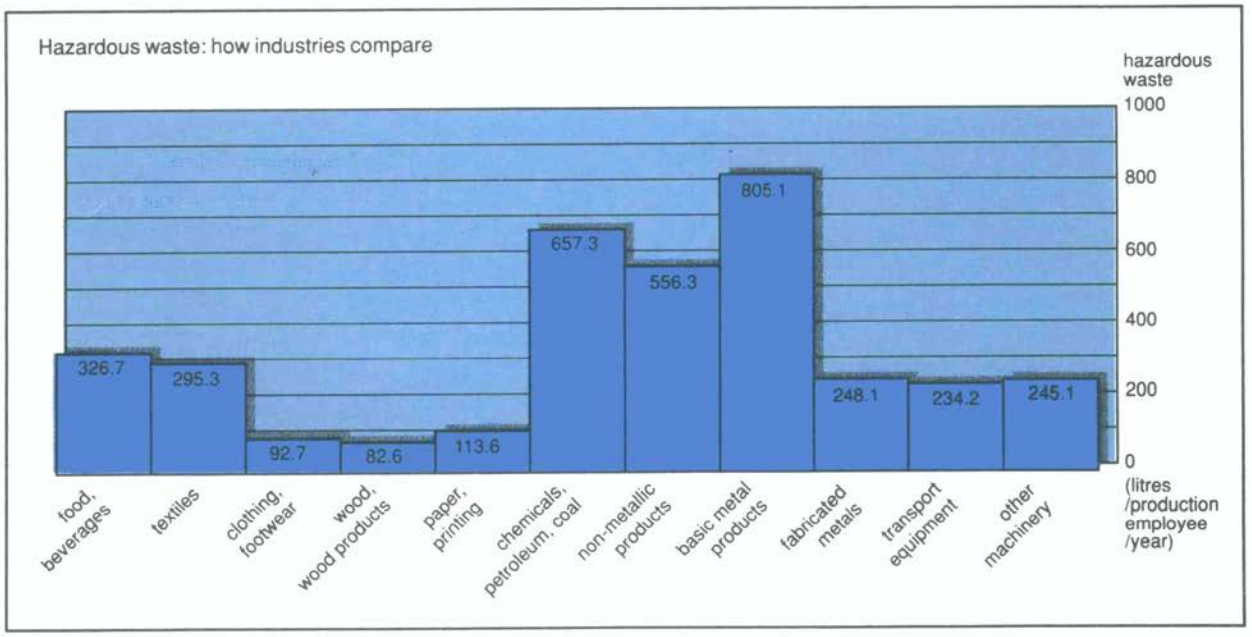


Figure 9. The process of transportation and transformation of a toxic substance in a lake (source: ERA, 1988).

- The leather industry discharges suspended solids, sulfates and toxic metals into the water.
- The same is true for the textile industry.
- The aluminium industry releases fluorine, solids and hydrocarbons into the water.
- The iron and steel industry pollutes the water with suspended solids, oil, metals, acids, phenol, sulfates, ammonia and cyanides.
- The explosion of a depot in Sandoz Company in Switzerland spilled over 10 tons of toxic chemicals in the Rhine river in November 1986.

Industrial wastes reach groundwater from impoundments or lagoons, spills, pipeline breaks and land disposal sites.



- It is estimated that in the United States there are 76,000 active industrial landfills, mostly unlined, from which contaminants may leach to groundwater.
- In Denmark 3,200 sites were found, 500 of which contained chemical wastes.
- In the Netherlands there are 4,000 abandoned sites, 350 of which require immediate remedial action.

In the developing countries the industrial pollution of freshwater has begun to be a growing problem:

- In India 70 per cent of the surface water is polluted
- China's rivers are increasingly contaminated with untreated sewage and industrial wastes.
- In Malaysia waters are so polluted that they are nearly devoid of fish and aquatic mammals, the main pollutant being palm oil and rubber processing residues, sewage and wastes from other industries.

The modernization, however, of existing production processes in traditional industries such as textiles, pulp and paper, has provided the basis for and the driving force behind the development of new high technology industries. Some of these technologies can reduce industrial discharges by using raw materials and energy more efficiently and through recycling.

Special terms have been formulated regarding the wastes: «special wastes» or «hazardous wastes» are defined substances having «physical, chemical or biological characteristics which require special handling and disposal procedures to avoid risk to health and/or other adverse environmental effects», according to WHO.

Special attention must be given to the expansion of the chemical industry for several reasons:

- It has grown rapidly:

  in 1950 the world production of organic chemicals was 7 million tons

  by 1970 it had reached 63 million tons

  in 1986 it was 250 million tons

- it is extremely diverse: it is estimated that in 1986 there were about 80,000 organic and inorganic chemicals in commercial production and each year 1,000-2,000 new ones appear in the market
- it is difficult to obtain systematic information about hazardous effects due to its confidential character.

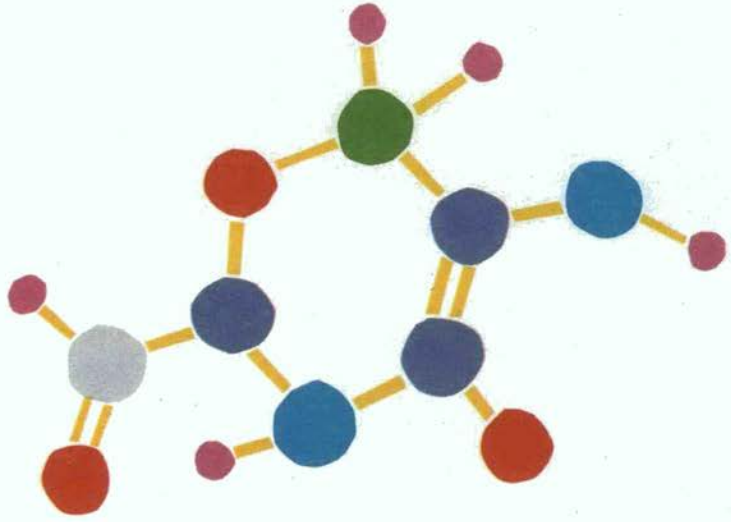
In terms of release of pollutants, inorganic chemistry is far from being the main pollutant of the environment.

For example

The release of amounts of sulfur and nitrogen oxides is only a small percentage of the total anthropogenic human emissions

The arsenic, cadmium, and lead pollution attributed to the chemical industry is negligible.

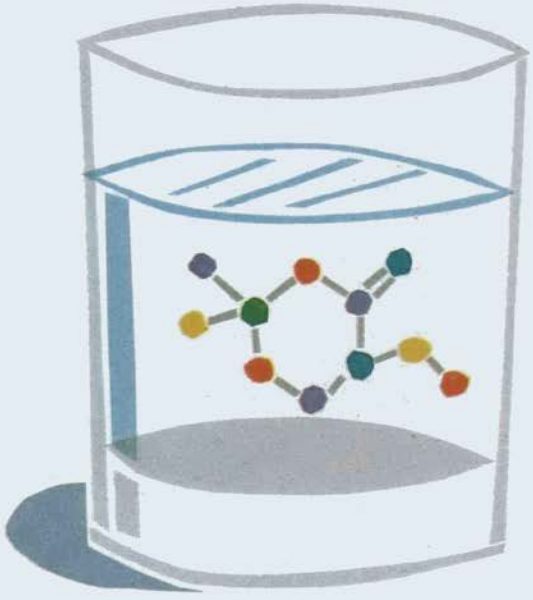
Only in production of caustic soda and chlorine the chemical industry is the major source of mercury pollution of water.



Industrial by-products are often toxic

Organic chemistry plants pollute the water with a mixture of complex substances including toxic by-products. However, these effluents are in relatively small amounts as compared with the emissions from alcohol distilleries, pulp and paper mills.

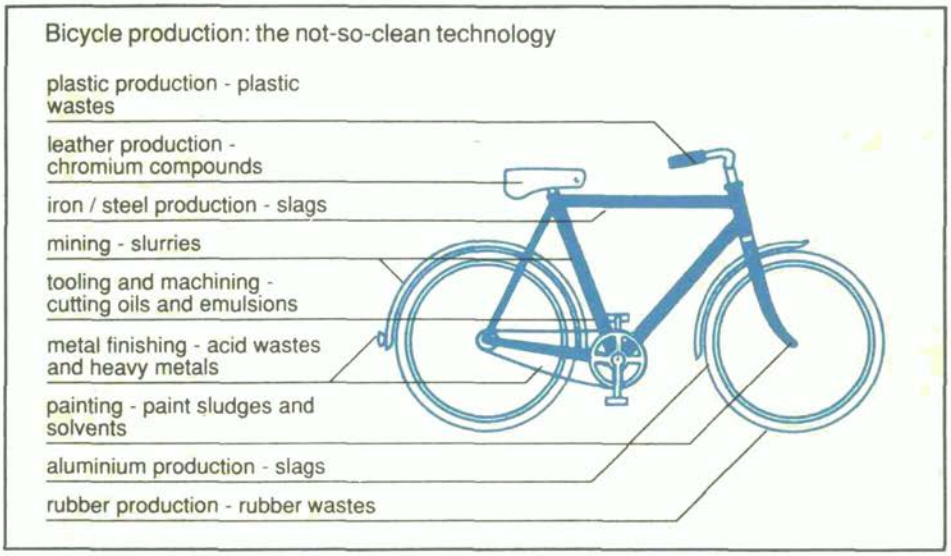
Effluents from inorganic, organic and petrochemical plants as well as from industries that make use of chemicals, contain persistent toxic chemicals that may seep with surface waters into the ground, contaminating the water table, and impair the long-term supply of drinking water.



Water table and supply of drinking water can be polluted by chemicals.

All kinds of industries may pollute freshwater resources on the earth

The use of bicycle suggested as a means of eliminating the air pollution by the conventional means of transport but is itself a «not-so-clean» technology.



THE RAIN OF TERROR

What goes up, comes down as acid rain

- Heavy industries
- Electricity generating plants
- Industrial boilers, and
- Large smelters

release into the atmosphere oxides of sulfur and nitrogen. Tiny solutions of acid carried by the wind or dropped from the sky are known as acid rain which causes the familiar signs:

- dead forests in North America and Europe
- lakes and rivers no longer able to sustain higher life forms.

In West Germany up to one third of the Black Forest is being destroyed

- The damage caused to the timber industry is estimated to be some USD 800 million a year.
- The loss of soil productivity is costing a further USD 600 million annually.

Yet lots of knowledge and understanding is needed concerning the effects of the acid precipitation on the ecosystem.

- Does the acid affect the growing tips of the trees directly or is it the roots that suffer most from the mobilization of toxic aluminium in the soil?
- or both?
- is acid deposition more or less important than the effects of ozone?
- What is the seasonal effect in northern climates of the Spring «snow melt pulse», which flushes a wave of accumulated acidity through the stream systems?
- Is it possible that a similar phenomenon takes place in the arid tropics when wet season moisture releases the dry season's accumulated chemical dust?

Let's all try to find an answer to these questions urging specialists, the public, the governments to become interested in the problem of the r a i n o f t e r r o r

LET US COPE WITH OUR INDISPENSABLE ENEMY: THE FUTURE IS PROMISING

Industry, if considered as a tool, provides us with goods, which make our life easy thus giving the opportunity of economizing time for intellectual, spiritual and physical distraction.

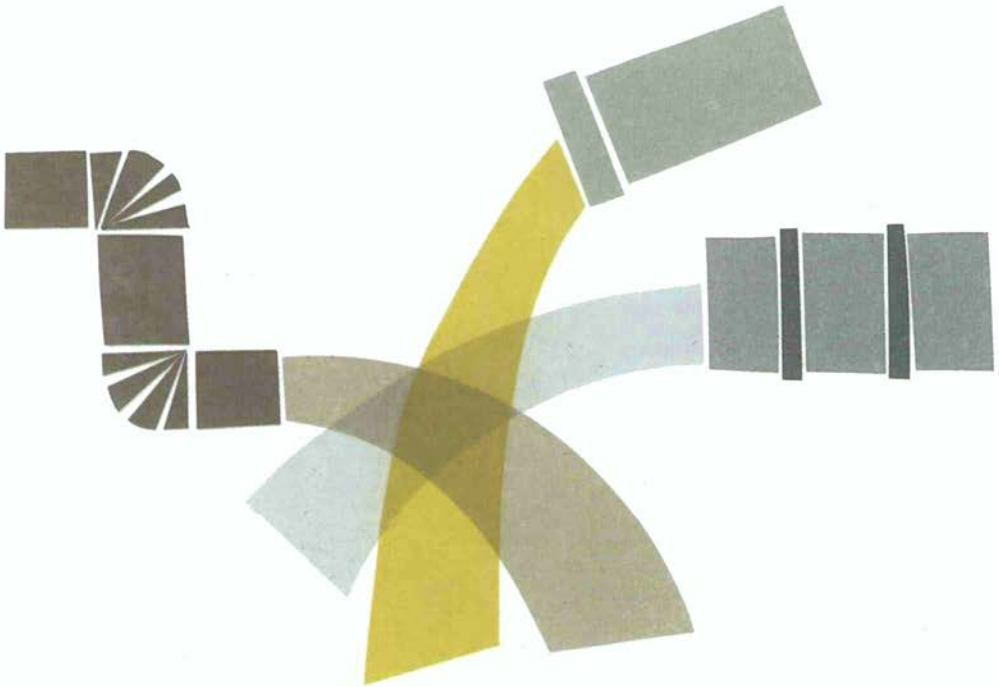
Coping with it means eliminating to a minimum all negative implications of its existence.

Optimistic messages on this come from all over the world:

- The index BOD (biochemical oxygen demand) which is a measure for freshwater pollution, has improved since the 1970s.
- The BOD level in the Mississippi dropped from 2.4 mg l^{-1} in 1970 to 1.1 mg l^{-1} in 1983.

The 42 rivers monitored in the OECD countries since 1970 have also shown improvement regarding certain other pollutants:

- The amount of l e a d in the Rhine dropped from 24 µg l^{-1} in 1970 to 8 µg l^{-1} in 1983.
- The amount of c h r o m i u m dropped from 40 mg l^{-1} to 9 mg l^{-1} in the same period.
- The amount of c o p p e r has been reduced from 24 µg l^{-1} to 19 µg l^{-1}.



Unfortunately the concentration of nitrates increased from 0.8 mg^{-1} nitrogen in 1975 to 1.58 mg l^{-1} N in 1983 in the Mississippi.

In the Rhine nitrates increased from 1.82 mg l^{-1} N in 1970 to 3.88 mg l^{-1} N in 1983.

Nitrates is a measure of the quantity of microorganisms causing waterborne diseases to man.

Another positive fact: the low-or-non-waste technology: LNWT

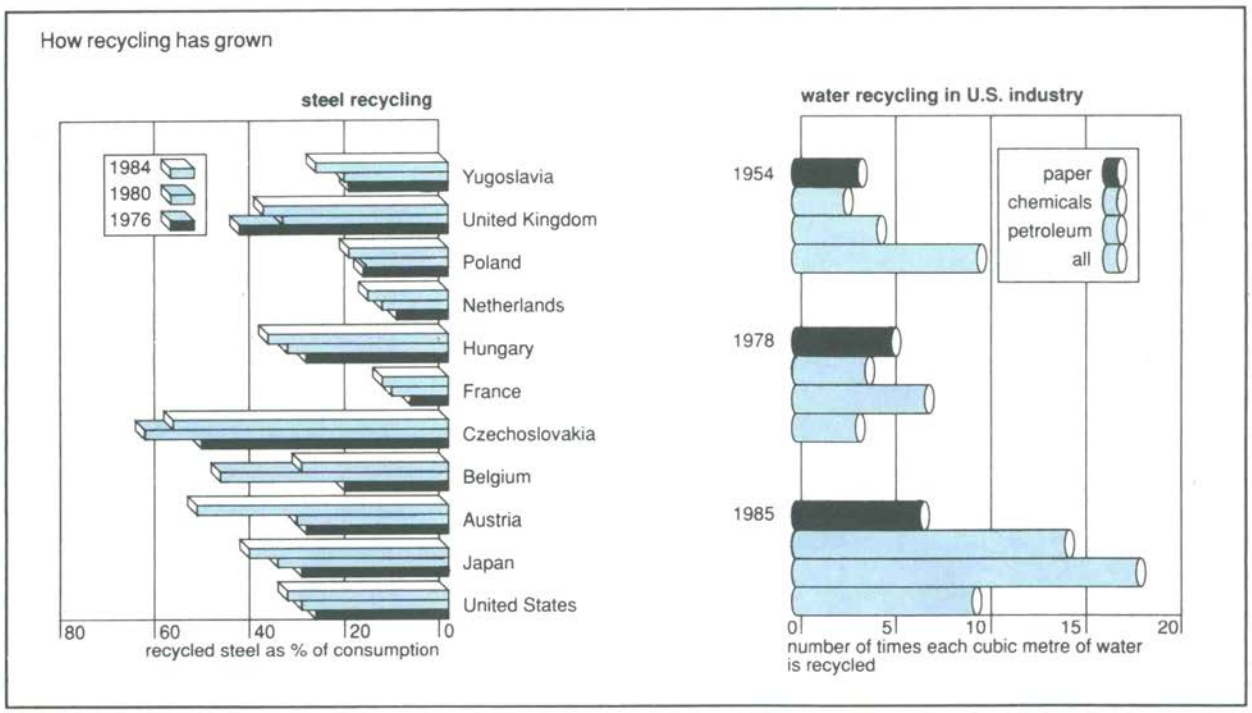
- The simplest LNWT may involve no more than closing a valve that allows two waste liquids to mix and thus produce a toxic, hard-to-degrade chemical.
- At its most complex, LNWT may involve the complete redesign of a process of metal finishing to reduce costs, waste and toxicity levels.
- Many LNWTs involve energy: techniques for using agricultural wastes as fuel, wood instead of oil etc.

In Finland, France, the Federal Republic of Germany and the United States, there are available volumes with lists of available LNWTs. The adoption of LNWT is undoubtedly responsible for much recent progress in recycling and lowering energy consumption.

- In Europe glass recycling has grown from about 1.3 million tons in 1970 to 2.7 million tons in 1984.
- Recycling of aluminium cans in the USA increased from 24,000 tons in 1972 to 510,000 tons in 1982.
- In Bulgaria the LNWT reduced industrial wastes by about 5.5 million tons annually.

Increasing use of wastes is made from the chemical, pharmaceutical and food processing industries and from mining.

- In the German Democratic Republic about 30 million tons of industrial wastes are recycled each year.
- In Hungary about 22.5 million tons of industrial wastes were generated in 1985. About 6.5 million tons of these recycled.



UNEP'S Industry and Environment Office (IEO) in Paris was established in 1975 to bring industry, governments and non-governmental organizations together to work towards environmentally sound forms of industrial development. IEO'S technical guides provide government officials, industrial managers and members of environmental protection agencies with the information they need to make environmentally sound decisions.

Look around and try to identify waste sources. How many of them can be recycled?

Protection against harmful industrial implications depends on all of us. Let's bravely recognise our share of responsibility.

and...

... let us act

V. WATER AND ENERGY

It moves. It moves not.
It is far, and it is near.
It is with all this,
And It is outside of all this.

The Upanishads

THE SEARCH OF MAN

In the dawn of his civilization Man worships the Sun, the Water, the Wind as Gods, because they are too powerful compared with his strength.

Then the Fire emerges: the miracle which changes his life. He can now be heated, he can cook his food. Dangerous wild animals keep off when a fire is maintained in the night.

Now Man starts thinking how he can compete with all these powerful «Gods». How he can increase his strength. He needs to ascend... And he does.

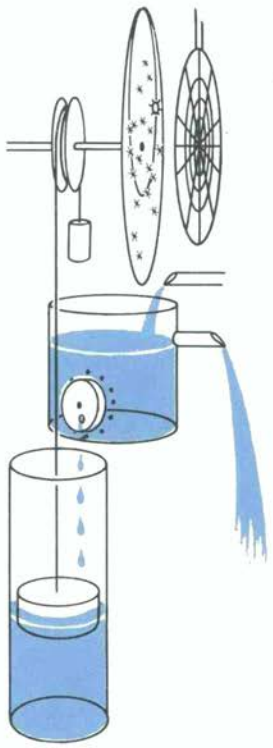
The technological civilization of man starts with the discovery of the lever and the wheel, both forms of energy.

In the Stone Age he moves the stones and rocks with the lever, the first machine.

Fire can melt metals. The Copper and Iron Ages follow.

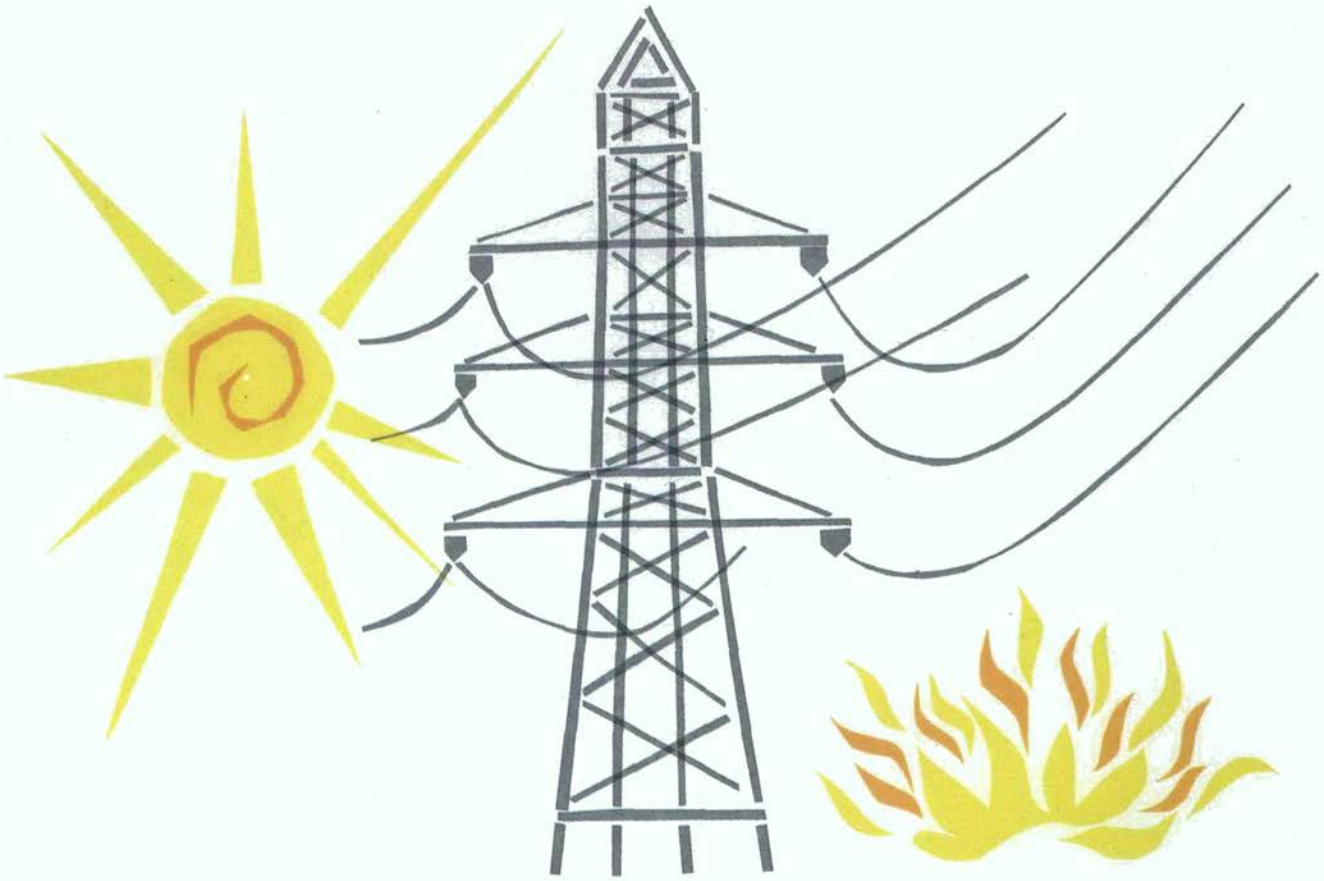
Long before 3000 BC the discovery of the wheel marks his ascent.

An ancient water clock, or clepsydra, had the problem of running at different speeds, since day, for the ancients, started at sunrise and ended at sunset – giving the hours different lengths at different seasons of the year. One ingenious device for changing the clock's speed was a small «movable» hole set on a wheel at the side of the upper tank. When the hole was turned to its lowest position, water would run out of the tank more quickly than when it was in its highest position, there then being less pressure behind it. The float in the lower tank would rise at the proper rate, and time could be told by it. The float could also be used to rotate a star map, and the positions of the constellations read through a permanent grid placed in front of them.



In an elementary way, according to our standards, he has captured and uses energy other than his own strength. The concern for capturing, converting and conserving energy in all its forms has followed him since.

- Fire becomes vapor and vapor is transformed into movement.
- Heat rules the metals. Metallurgy is born.
- Certain chemical reactions absorb or emit heat during their process.
- The energy of the sun is captured in photoelectric cells: energy is both captured and stored.
- Energy is also stored in hydroelectric dams.
- Hydropower is transformed into electricity.



MAN CURBS ENERGY

The world commercial energy consumption has increased more than three-fold over the past three decades:

- in 1955 total consumption was about 2,400 million tons of oil equiv.
- in 1970 total consumption was about 5,000 million t.o.e.
- in 1980 the figure was about 7,000 million t.o.e.
- in 1985 it reached 7,400 million t.o.e.
- while for 2000 the estimates are about 12,000 million t.o.e.
- and in 2050 the estimate reaches 39,000 million t.o.e.

Energy use is essential for health and development but often has adverse side effects. Modern civilization is based on easy availability of energy, and many of the health gains in less developed countries are derived from increased energy use, e.g., pumping water.

Try to identify in everyday life the forms of energy you use directly or indirectly.

Relate the energy used with the natural resources.
Where does it come from?
Is it a direct use or is the energy converted?

The main world energy resources are:

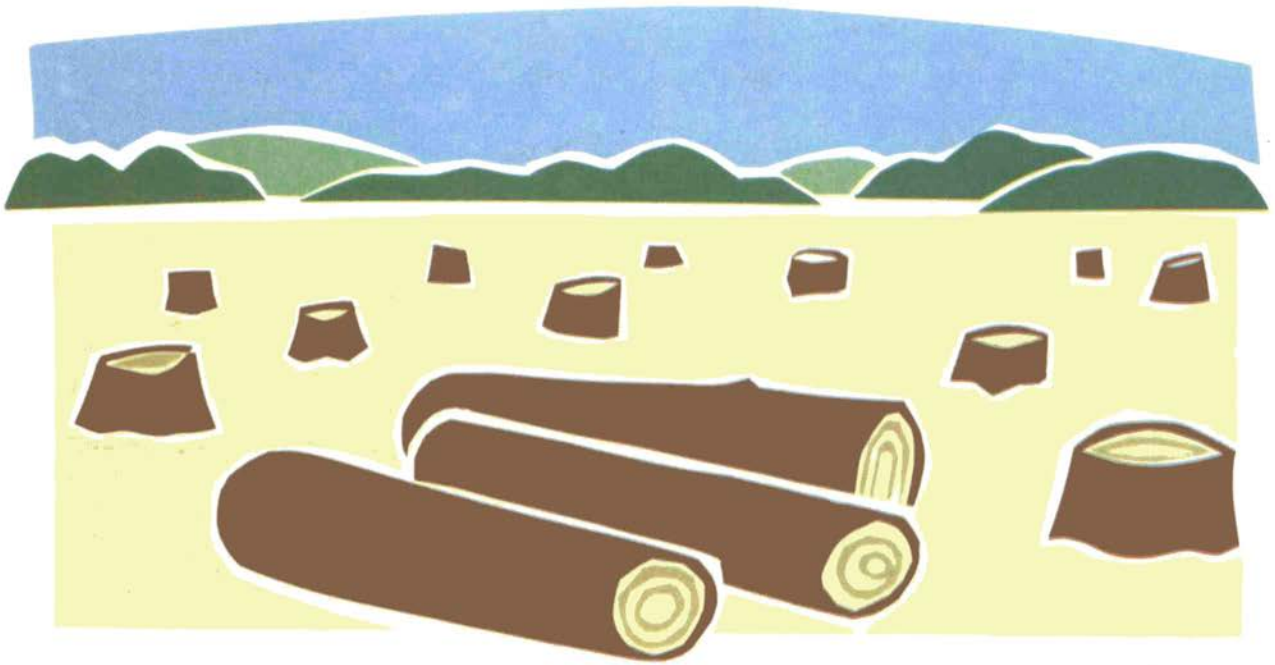
- Biomass
- Fossil fuel
- Coal
- Geothermal energy
- Hydropower
- Nuclear power

These forms of energy are transformed through industrial processes for the technological benefit of man.

The use of certain forms of energy introduces problems to man and his environment.

Certain forms of energy are directly or indirectly related to water.

The production, conversion, transportation and use of energy have already caused serious environmental problems.



The use of biomass, based mainly on fuel wood, is one of the desertification reasons.

- Desertification changes the rain pattern of a region, and consequently the climate.
- Changes in the rain pattern result in heavy or inadequate rains.
- In the case of slopes, the watersheds flood and the soil run-off changes the relief and the land use feasibility.
- Lack of trees causes reduction in the water retention capacity of the soil.
- Thus, indirectly, agriculture and food production are affected.
- More than 160 million hectares of land on upland watersheds in Africa, Asia and Latin America have already been seriously degraded.
- So have the foothills of the Himalayas and the Andes and in East Africa, the Philippines, Jamaica and Panama.
- India is losing forests at a rate of 1.5 million hectares a year. People there, are not only in need of fuelwood but also of building materials.

In Nepal, the government, the World Bank, UNDP and FAO have joined forces to mount one of the most successful watershed restoration programmes comprising mainly reforestation, better management of existing forests and the introduction of 15,000 wood stoves.

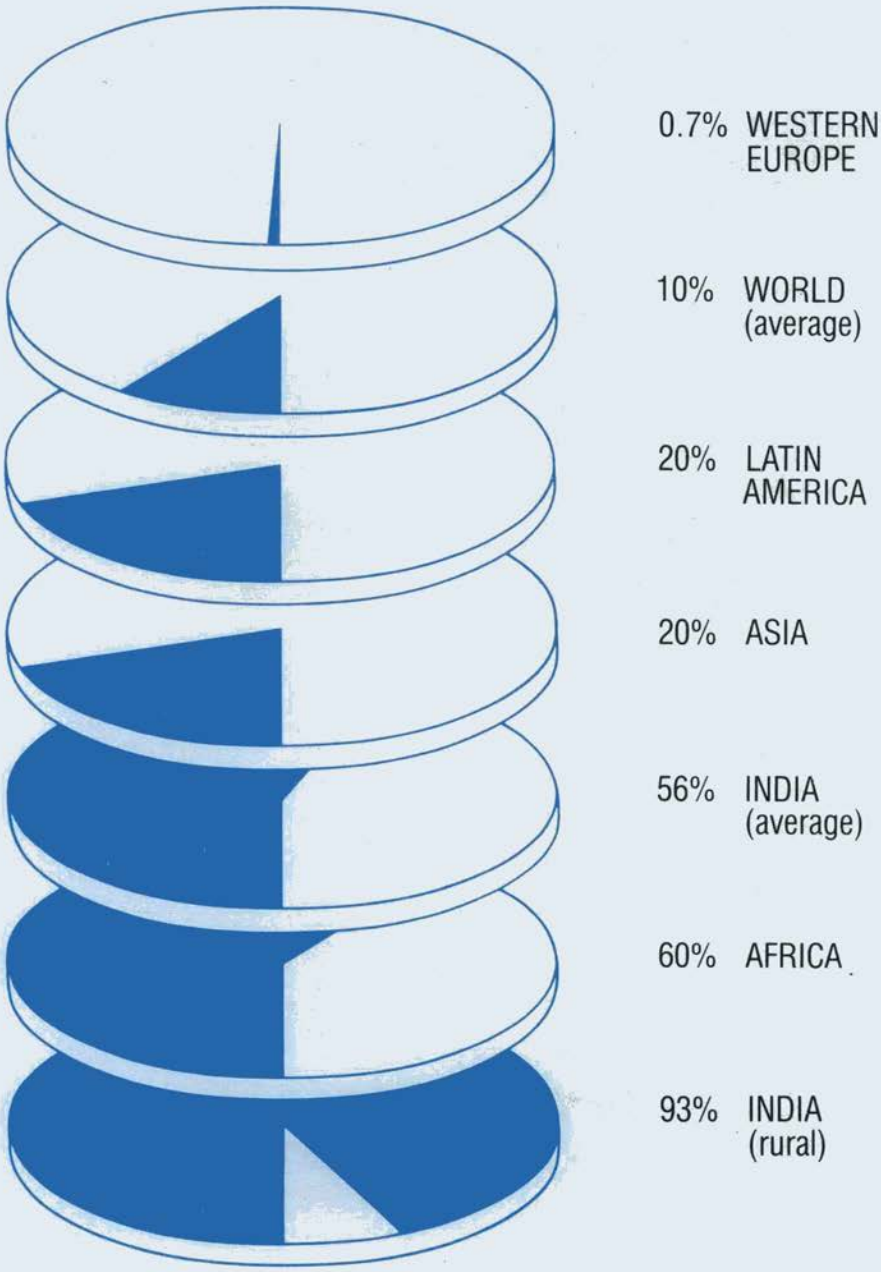


Figure 10. Share of fuelwood in total energy consumption (%) (source: Hamilton, L.D., Overview of Health Risk Analysis and Assessment for Selected Energy Systems, Brookhaven National Laboratory, New York, 1985).

The Third World women use natural resources for the provision of basic needs: food, water, shelter and energy.

When water is scarce or polluted, women must spend more time and energy walking farther and farther away to haul it home.

Women in the Third World are central to any conservation effort. They have knowledge and skills built over centuries of daily use of natural resources. Yet a woman will be forced to burn trees for charcoal as long as other sources of renewable energy are not available.

The use of f o s s i l f u e l has its share in the water pollution:

- Car exhaust gases which contain lead contaminate the soil-water system.
- Car emissions contribute to the so called «acid rain», which may pose threats to health by mobilizing toxic metals, such as cadmium, from the soil.
- Leaking of underground gasoline tanks may be losing millions of litres of gasoline each year, some of which contaminates the groundwater.

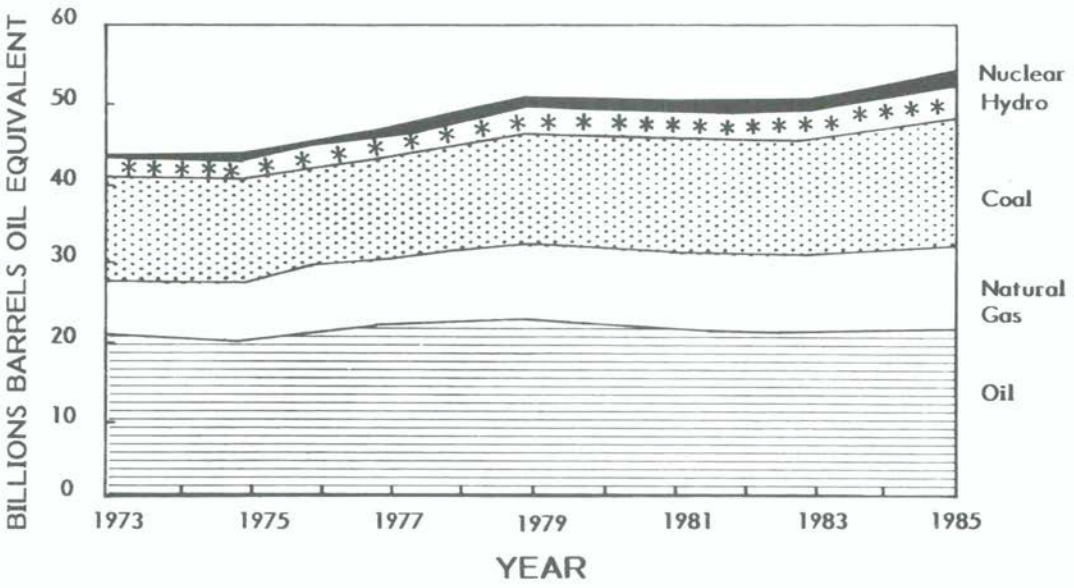


Figure 11. World consumption of commercial energy sources.

Geothermal well-fields release hydrogen sulfide, other noxious gases and hazardous brines. These present acute and chronic occupational risks to health and to the public exposed to these pollutants through air and water pathways.

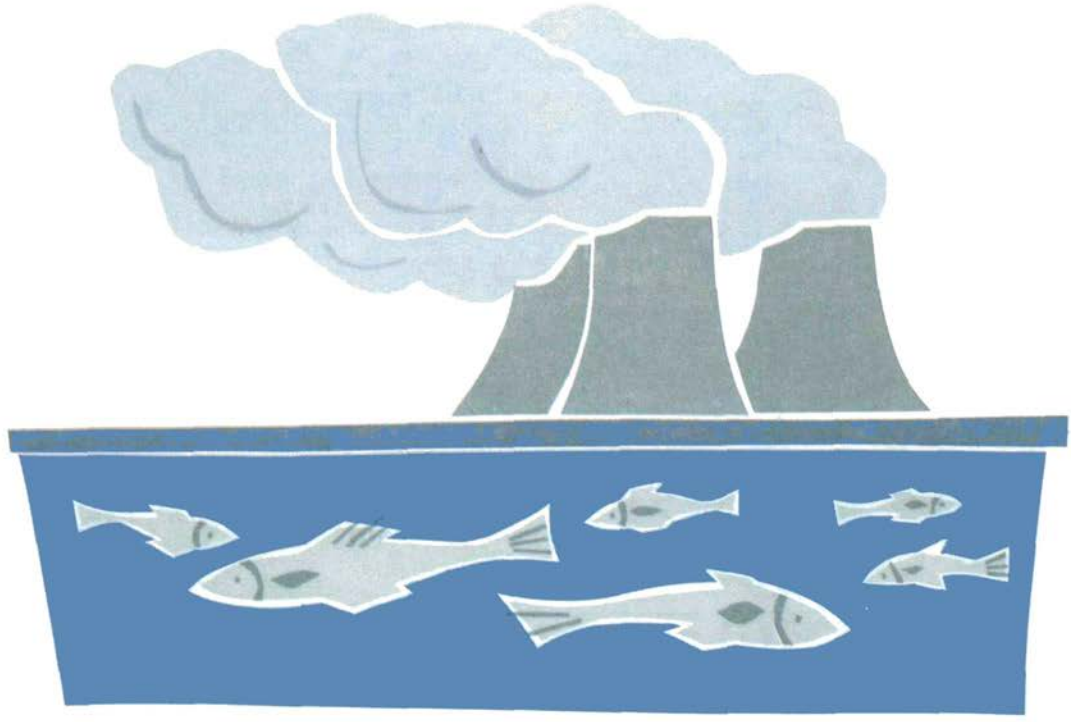
Hydropower is an important energy source with unique hazards. There might be catastrophic failures of hydroelectric dams, which are low-probability but high-consequences events.

- In Vajout, Italy, the hydroelectric dam failure caused 1,800 fatalities.

  The relocation of populations from hydroelectric impoundment areas can provide new habitats for disease vectors and may also result in health problems as a result of sanitary and medical facilities or food shortages.

  Hydropower generation requires a full reservoir and thus conflicts with the requirements for flood control.

- This nonconsumptive water can affect the migration of anadromous fish.
- Hydropower dams often become substrates for water-borne diseases such as schistosomiasis, onchocerciasis, malaria.
- Thermal pollution is another problem caused by power stations: When they draw water from a river or a lake for cooling, they return the warmed water back to its source. As the temperature of water increases, its ability to hold oxygen decreases; this can dramatically alter the ecological balance of a stream, lake or river.



Studies by UNEP and others have shown that there are many environmental impacts associated with any energy technology.

- Some are significant and may affect different communities in different ways,
- others might cross international boundaries affecting large regions, and
- others might have long-term effects on man and the environment.

The operation of nuclear reactors producing electric energy may involve releases of radioactive material to the environment. Some of these go to rivers or lakes causing long-term contamination.

- On 26 April 1986 fire broke out at one of four reactors in Chernobyl, Ukrainian SSR, and continued for a number of days. As a result, significant amounts of volatile radionuclides were released to the atmosphere. Contaminated rain polluted large regions beyond the USSR boundaries.
- After the accident at the Chernobyl reactor, measurements of radioactivity were carried out throughout Europe, in the air, precipitation, drinking water and food. All measurements showed rates beyond the acceptable ones. It was an accident with international impacts affecting large regions in different countries.
- Most of the radioactive materials are derived from reactor operations and fuel reprocessing. In the course of reprocessing three commercial plants released radionuclides into the Rhine.

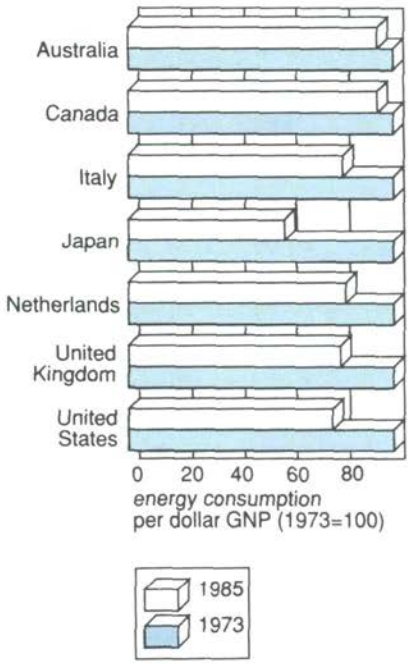
MAN MITIGATES ENERGY–RELATED DAMAGES

The industrial growth in the developed countries during the past century was linked to the increasing energy use. In the past decade it has been clear that much of this increase was due to inefficient design and operation.

Conservation of energy can be achieved through increased energy efficiency, e.g., in manufacturing, heating and cooling buildings and in automobile design.

Energy conservation can also be achieved through public awareness and education: public transportation instead of car trips, use of bicycle, walking, maintaining buildings at higher temperatures in summer and lower in winter etc.

Energy efficiency and conservation has a direct impact on the conservation of our natural resources as well as on the maintenance of pure freshwater on our planet.



Man has understood the importance of decreasing energy consumption.

Man turns back, with hope, to the renewable sources of energy, solar and wind. His technological achievements will help him to effectively and efficiently use it to the benefit of his life which is the well-being of the environment.

Energy recycling is one more hope.

VI. GO TO ACTION

A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise.

Aldo Leopold, Ecologist.

ACTION? WHAT FOR?

The overall objectives of actions to be taken could emphasize the human, economic and spiritual development of young people. Some partial prerequisite training objectives could be:

- help young people to understand and be interested in freshwater resources in relation to the conservation of the environment:
- give them the methods of assessing and evaluating water quality and quantity,
- motivate, exchange ideas and learn about new dangers of water pollution and adequacy as well as new technologies for its conservation,
- stimulate young people to spread knowledge acquired through research.

Troop activities on freshwater resources could achieve these objectives by:

- providing practical experience in natural situations,
- performing practical conservation tasks, sometimes in cases or places where authorities will not, do not or cannot afford to carry out similar activities,
- developing a working knowledge on freshwater principles,
- identifying appropriate roles promoting community action for the protection of freshwater resources,
- developing initiatives, responsibility, teamwork and commitment among the unit members.

Some essential and useful questions to answer before starting the action:

- W h y freshwater protection?
- H o w to protect freshwater resources?
- W h a t is the role of young people?

W h y ?

H o w ?

W h a t is the role of youth?

THE ROLE OF LEADERS

The role of Leaders could be summarized as follows:

- How to work on the issue of freshwater pollution
- How to raise awareness in the decline in quality and quantity of freshwaters
- How to reach and mobilize the uninterested youth as well as the enthusiasts
- How to identify practical conservation tasks which can be executed by our Organization
- How to stimulate youth to a greater knowledge and understanding of the structure of nature and its functions.

APPENDICES

APPENDIX 1

GLOSSARY

Acid	a compound which yields hydrogen ions in solution
Aerobic	denotes the presence of gaseous or dissolved oxygen in water
Algae	a group of simple chlorophyll-containing (green) lower plants, mostly aquatic; although most are microscopic, some forms reach extremely large sizes.
Algal bloom	a bloom of certain planktonic algae occurs when their growth is so rapid that they become enough to colour a body of water.
Alkali metals	the elements in group IA of the Periodic Table, like lithium, sodium, potassium etc.
Alkaline earth metals	the elements in group IIA of the periodic table like beryllium, magnesium, calcium, strontium and barium.
Anadromous	adj., refers to fishes ascending rivers from the sea at certain seasons to spawn and breed as the salmon or shad. (word of Greek origin: anadromos, running upward)
Anaerobe	an organism that can only exist in the absence or near-absence of gases or air or dissolved oxygen in water.
Anaerobic	derotes the absence of air, gases or dissolved oxygen in water.
Anion	a negatively charged ion like Cl^-, SO^{-2} and PO_4^{-3}
Anthropogenic	caused by or derived from man
Atmosphere	the envelope of air around the earth.
Atom	is the simplest structure comprising of a positively charged nucleus which is surrounded by revolving negatively charged electrons in various orbits; nucleus comprises protons and neutrons
Bacteria	tiny organisms that live in air, soil, water, plants, animals and people. Some bacteria are helpful. Others are germs that cause diseases.
Biota	living organisms including bacteria, plants and animals
Brine	concentrated saline water containing more than 36,000 mg l^{-1} of total dissolved solids.
Carrying Capasity	the maximum population that can be sustained indefinitely from a given resource base, with a given lifestyle, economic system, and set of technologies.
Cation	a positively charged ion like Na^+, K^+, Ca^{+2} and Al^{+3} etc.
Conservation	the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations, while maintaining its potential to meet the needs and aspirations of future generations.
Development	the modification of the biosphere and the application of human, financial, living, and non-living resources to satisfy human needs and improve the quality of human life.
Disinfection	the process of destroying microorganisms in water by the application of a chemical agent (disinfectant) such as chlorine etc.
Ecology	the study of the interrelationships of living organisms and their environment.
Ecosystem	an interrelated group of living species and the physical environment in which they live.
Education	the process of learning knowledge, skills, and attitudes to live successfully in the world. When it takes place as part of a course in an organization such as a school or college, it is formal education. When it takes place through media, on the job, through community action, through voluntary youth organisations through word-of-mouth it is informal education.
Entropy	unavailable energy, a measure of the disorder of a system.
Environment	the total surroundings in which all living things exist and from which they draw their sustenance.
Environmental education	programmes and activities that increase the level of awareness, understanding, and appreciation of the environment as a totality and its interactions with human activities.
Eutrophication	the process of increasing the nutrient content of natural waters, which is usually demonstrated by an increase in productivity (increased biomass)

Germs	harmful microorganisms, the main ones being bacteria and viruses.
Halide	a compound of the elements of group VIIA of the periodic table such as fluoride (F^-), chloride (Cl^-), bromide (Br^-) and iodide (I^-).
Heavy metal	metal with an atomic weight of 50 or higher.
Holism	philosophical idea according to which the whole is greater than the sum of its parts
Hydrosphere	the earth's waters, whether in liquid form in the oceans, seas, lakes and groundwater, in gaseous form in the atmosphere, or in solid form in the ice caps and glaciers.
Infection	the entry of germs into the body where they may multiply and cause disease.
Ion	an atom which has acquired an electrical charge; cations possess positive charge, and anions a negative charge.
Lithosphere	the soil and rock that comprise the earth's crust and outer mantle.
Metal	element which readily loses an electron to form a cation.
Milligram per litre	a concentration unit of chemical constituents in solution; the weight of solute (substances) per unit volume of solvent ($mg\ l^{-1}$)
Non-metal	element which loses an electron to form an anion.
Nutrient	an environmental substance (element or compound) necessary for the growth and development of plants and animals.
Oxides	compounds of oxygen with another element are called oxides.
Oxidation	may be defined as any change in which the proportion of oxygen or other electronegative element in a substance is increased or in which there is a loss of electrons e.g. $2\ FeCl_2 = 2\ FeCl_3\ Fe^{2+}\ Fe^{+3}$
Pathogenic	giving origin to or resulting in, disease or death (pathogenic organisms are pathogens).
Phreatic	underground water
Potable water	water suitable for drinking and culinary purposes.
Radioactivity	the spontaneous disintegration of atomic nuclei with the emission of corpuscular or electromagnetic radiation.
Radionuclide	an isotope (nuclide) that exhibits radioactivity.
Raw water	natural water, either surface water or ground water, that has not been treated or sterilized.
Reduction	may be defined as any process which involves the gain of electrons by a substance.
Salts	by the combination of an acid and a base the hydrogen of the acid is replaced by the metal of the base and the result is the formation of a salt. Thus the action of hydrochloric acid (HCl) on the base caustic soda (NaOH) gives the salt sodium chloride (NaCl) together with water (H_2O) as shown in the equation below: $HCl + NaOH = NaCl + H_2O$ (acid + base = salt + water)
Saline waters	waters having salt concentrations approaching that of sea water.
Sanitary	free from germs, clean.
Sociosphere	the man-made system of institutions, rules, ideas, information, culture, economics, and politics.
System	any interrelated set of elements organized around a purpose.
Technosphere	the manmade system of structures, machines, factories, roads, and other physical objects that reflect the prevailing technological ideas.
Toxic	pertaining to, due to, or of the nature of, a poison, thus toxicity: the quality of being poisonous.
Trace element	an element found naturally, or required by living organisms, in extremely small quantities.
Trace	a concentration that is below the detection limit of the standard chemical method used.
Training	higher-lever educational programmes designed to develop knowledge and skills for the solution of practical, and usually specialized, problems.
Virus	the tiniest type of micro-organism. Some can cause diseases.
Water-borne	water is the only or the principal means of transmission.

APPENDIX 2

SOME ADDRESSES OF YOUTH ENVIRONMENTAL ORGANIZATIONS

ALGEMEEN CHRISTELIJKE JEUGDBOND VOOR NATUURSTUDIE EN NATUURBESCHERMING (ACJN)
Driebergseweg 16 c, 3708 JB Zeist, The Netherlands

ARAB OFFICE OF YOUTH AND ENVIRONMENT (AOYE)
P.O. Box 49, Manial El Roda, Cairo, Egypt

AFRICAN YOUTH FOR ENVIRONMENT (AYE)
(This federation is being reorganised at present)

APROREMAR
Apartado Postal 2, Colón, Panama

ASIA-PACIFIC YOUTH ENVIRONMENTAL FEDERATION (APYEF)
M-101, Saket, New Delhi - 110017, India

ASOCIACION CONSERVACIONISTA DE LA UNIVERSIDAD DE PANAMA (ACUPAN)
Apartado Postal 6-7534, El Dorado, Panama

ASOCIACION ESTUDIANTIL PARA LA CONSERVACION AMBIENTAL EN PANAMA (AECAP)
Apartado Postal 2797, Balboa, Panama

ASSOCIATION DES CLUBS DES AMIS DE LA NATURE DU CAMEROUN (ACAN)
B.P. 271, Garoua, Cameroun

BRONTOSAURUS MOVEMENT
SSM - International Department, Nam Maxima Gorkeho 2, 11000 Prague 1, Czechoslovakia

COLECTIVO HABITAT
Universidad Centro-Americano, Escuela de Ecologéa y Recursos Naturales, Apartado 69, Managua, Nicaragua

CONSERVATION AND CHONGOLOLO CLUBS OF ZAMBIA
P.O. Box 255, Lusaka, Zambia

DEUTSCHER JUGENDBUND FUR NATURBEOBACHTUNG (DJN)
Forstmannstr. 10 a, 2 Hamburg 60, Federal Republic of Germany

ECOTIPO
Centro de Ecologéa y Recursos Naturales Renovables, Universidad Nacional de Córboda, C.C. 395, 5000 Córdoba, Argentina

ELTE TERMESZETVEDELMI KLUB
Egyetem tér 1-3, 1053 Budapest, Hungary

FIJI NATIONAL YOUTH COUNCIL (FNYC)
Box 961, 208 Waimanu Road, Suva, Fiji

FALTBIOLOGERNIA
Box 6022, 19106 Sollentuna, Sweden

FEDERACION LATINO-AMERICANA DE JOVENES AMBIENTALISTAS (FLAJA)
c/o ACUPAN, Apartado 6-7534, El Dorado, Panama

GRUPO ECOLOGICO DE ACCION AMBIENTAL (GEAG)
Apartado Aereo 413, Medellén, Colombia

GORAKHPUR ENVIRONMENTAL ACTION GROUP (GEAG)
1, Roongta Bldg, Cinema Road, Gorakhpur - 273001, India

INDONESIAN ENVIRONMENTAL FORUM (WALHI)
P.O. Box 456, Jakarta Pussat, Indonesia

INTERNATIONAL YOUTH FEDERATION FOR ENVIRONMENTAL STUDIES AND CONSERVATION (IYF)
Headquarters and Office for the Asian-Pacific Region:
M-101, Saket, New Delhi -110017, India

Office for the European Region:
Klostermollevej 48 A, 8660 Skanderborg, Denmark

KALPAVRIKSHA
1, Court Road, New Delhi - 110054, India

LUONTO LIITTO
Peramiehenkatu 11 A B, 00150 Helsinki, Finland

MALIHAI CLUBS OF TANZANIA (MCT)
P.O. Box 3134, Arusha, Tanzania

MALTA ORNITHOLOGICAL SOCIETY YOUNG MEMBERS SECTION (MOS-Y)
P.O. Box 498, Valetta, Malta

NATUR OG UNGDOM (NU-DK)
Kompagnistraede 34, 3. Sal, 1208 Kobenhavn K, Denmark

NATURE CLUBS OF INDIA
c/o WWF-India, Godrej & Boyce Mfg. Co., Private Ltd., Lalbaug, Parel, Bombay 400012, India

NEDERLANDSE JEUGDBOND VOOR NATUURSTUDIE
Schaep en Burgh, Noordereinde 60, 's-Graveland, The Netherlands

POLSKI KLUB EKOLOGICZNY
Palac «Pod Baranami», Rynek Glowny 27, 31-010 Krakow, Poland

SAHABAT ALAM MALAYSIA (SAM)
37 Lorong Birch, Penang, Malaysia

SIERRA LEONE ENVIRONMENT AND NATURE CONSERVATION ASSOCIATION (SLENCA)
P.M.B. 376, Freetown, Sierra Leone

SRI LANKA ENVIRONMENTAL FEDERATION – YOUTH FRONT (SLEF)
G-2/5 Andersons Flats, 215 Park Road, Colombo – 5, Sri Lanka

WILDLIFE CLUBS OF KENYA (WCK)
P.O. Box 40658, Nairobi, Kenya

WILDLIFE CLUBS OF MALAWI (WCM)
P.O. Box 619, Blantyre, Malawi

WILDLIFE RANGERS CLUB OF SURINAME (WRCS)
c/o STINASU, P.O. Box 436, Paramaribo, Suriname

YOUNG CONSERVATIONISTS CLUB (YCC)
Kasetsart University, Bangkhen Campus, Bangkok 9, Thailand

YOUTH AND ENVIRONMENT EUROPE (YEE)
Klostermollevej 48 A, 8660 Skanderborg, Denmark

YOUTH COUNCIL FOR PROTECTION OF NATURE (MSOP - MGU)
Moscow State University, Economics Department, Moscow, USSR

APPENDIX 3

ABBREVIATIONS

ACCIS	Advisory Committee for the Co-ordination of Information Systems
ATRCW	African Training and Research Centre for Women
BAPMoN	Background Air Pollution Monitoring Network
CIDIE	Committee of International Development Institutions on the Environment
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CGIAR	Consultative Group on International Agricultural Research
CLADES	Latin American Centre for Economic and Social Documentation
DESCON	Consultative Group for Desertification Control
DIESA	Department of International Economic and Social Affairs, United Nations
DOEM	Designated Officials for Environmental Matters
DPSCA	Department of Political and Security Council Affairs, United Nations
DTCD	Department of Technical Co-operation for Development, United Nations
ECA	Economic Commission for Africa
ECE	Economic Commission for Europe
ECLAC	Economic Commission for Latin America and the Caribbean
EEC	European Economic Community
EMER	Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
EMINWA	Environmental Management of Inland Water
ESCAP	Economic and Social Commission for Asia and the Pacific
ESCWA	Economic and Social Commission for Western Asia
FAO	Food and Agriculture Organization of the United Nations
GATT	General Agreement on Tariffs and Trade
GEMS	Global Environmental Monitoring System
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Pollution
GIS	Geographical Information System
GRID	Global Resource Information Database
HEALs	Human Exposure Assessment Locations
IAEA	International Atomic Energy Agency
IARC	International Agency for Research on Cancer
IAWGD	Inter-Agency Working Group on Desertification
IBPGR	International Board for Plant Genetic Resources
ICAO	International Civil Aviation Organization
ICEL	International Council on Environmental Law
ICSU	International Council of Scientific Unions
IDWSSD	International Drinking Water Supply and Sanitation Decade
IEEP	International Environmental Education Programme
IFAD	International Fund for Agricultural Development
IGADD	Intergovernmental Authority on Drought and Development
IGBP	International Geosphere-Biosphere Programme
IGCP	International Geological Correlation Programme
IGOSS	Integrated Global Ocean Services System

IGU	International Geographical Union
IHP	International Hydrological Programme
IIASA	International Institute for Applied System Analysis
IIED	International Institute for Environment and Development
ILO	International Labour Organisation
IMO	International Maritime Organization
INSTRAW	United Nations International Research and Training Institute for the Advancement of Women
IOC	Intergovernmental Oceanographic Commission
IPCS	International Programme on Chemical Safety
IRPTC	International Register of Potentially Toxic Chemicals
ISRIC	International Soil Reference and Information Centre
ISSS	International Society of Soil Science
IUBS	International Union of Biological Sciences
IUCN	International Union for Conservation of Nature and Natural Resources
IUFRO	International Union of Forestry Research Organizations
IUGS	International Union of Geological Sciences
IWC	International Whaling Commission
KWAHO	Keya Water and Health Organization
MAB	Man and the Biosphere Programme
MARC	Monitoring and Assessment Research Centre
MIRCENs	Microbiological Resources Centres
OAU	Organization of African Unity
OECD	Organization for Economic Co-operation and Development
OHP	Operational Hydrology Programme
PCBs	Poly-chlorinated biphenyls
PEEN	Panel of Experts on Environmental Management for Vector Control
PRIO	International Peace Research Institute – Oslo
SADCC	Southern African Development Co-ordination Conference
SCOPE	Scientific Committee on Problems of the Environment
SIPRI	Stockholm International Peace Research Institute
UNCTAD	United Nations Conference on Trade and Development
UNCTC	United Nations Centre on Transnational Corporations
UNDP	United Nations Development Programme
UNDRO	Office of the United Nations Disaster Relief Co-ordinator
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Fund for Population Activities
UNHCR	Office of the United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNISIST	Intergovernmental Programme for Co-operation in the Field of Scientific and Technological Information
UNITAR	United Nations Institure for Training and Research
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
UNSO	United Nations Sudano-Sahelian Office

UNU	United Nations University
WATER AID	United Kingdom Organization
WCIP	World Climate Impact Studies Programme
WCP	World Climate Programme
WDC	World Data Centre on Micro-organisms
WFC	World Food Council
WFP	World Food Programme
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WMO	World Meteorological Organization
WTO	World Tourism Organization
WWF	World-wide Fund for Nature
WWW	World Weather Watch

International bodies concerned with chemical hazards

UNEP	International Register of Potentially Toxic Chemicals (IRPTC)
UNEP	Global Environmental Monitoring System (GEMS)
UNEP/ILO/WHO	International Programme on Chemical Safety (IPCS)
UNEP/WHO/SCOPE	Scientific Group on Methodologies for the Safety Evaluation of Chemicals (SGOMSEC)
WHO	International Agency of Research on Cancer (IARC)
WHO	Regional Programme on Chemical Safety (WHO/EURO)
FAO/WHO	Joint Expert Committee on Food Additives (JECFA)
FAO/WHO	Joint Meetings on Pesticide Residues (JMPR)
ILO	The International Occupational Safety and Health Hazard Alert System (Hazard Alert)
ILO/WHO	Joint Committee on Occupational Health
UNESCO	Man and the Biosphere (MAB)
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Pollution

APPENDIX 4

COUNTRIES AND INSTITUTIONS WORKING ON WATER

AUSTRALIA	Sharma, Munnal. CSIRO, Division of Water Resources Private Bag, P.O. Wembley, WA 6014
AUSTRIA	Nobilis, Franz Hydrographisches Zentralburo Marxergasse 2 A – 1030 Wien
BELGIUM	Bultot, Franz Royal Inst. of Meteorology 3, ave Circulaire B – 1180 Bruxelles
CANADA	Sanderson, Marie The Water Network Dept of Geography Univ. of Waterloo Waterloo Ontario, N2L 361
DENMARK	Knudsen, Jesper Danish Hydraulic Inst. Agern alle 5 2970 Horsholm
ETHIOPIA	Yeshanew, Abebe Nat. Meteor. Services Agency P.O. Box 1090 Addis Ababa
F.R.G.	Liebscher, H-J. Bundesanstalt für Gewässerkunde Postfach 309 D – 5400 Koblenz
FINLAND	Ekholm, Matti Water and Envir. Res. Inst. P.O.B. 436 SF – 00101 Helsinki
FRANCE	Bessemoulin, Pierre Centre Nat. de Rech. Meteorologiques F – 31057 Toulouse Cedex
HOLLAND	Warmerdam, Piet Agric. Univ. 6709 P.A. Wageningen NL – 450515
FRANCE	Verhoog, Frederik Division of Water Sciences UNESCO 7 Place de Fontenoy 75700 Paris
HUNGARY	Nagy, László S. Min. for Env. and Water Manag. Budapest 1011 FÖ u 48 P.O.B. 351 1394 Budapest

ICELAND	Einarsson, Kristinn Orkustofnun Grensasvegur 9 IS – 108 Reykjavik
INDIA	Ramasastri, K.S. Nat. Inst. of Hydrology Jal Vigyan Bhawan Roorkee 247667 India
ITALY	Klohn, Wulf FAO Via delle Terme di Castella 00100 Roma
KENYA	Balek Jaroslav UNEP P.O.B. 30552 Nairobi
NORWAY	Laumann, Tron Norwegian Water Resources and Energy Adm. P.O.B. 5091 Majorstua 0301 Oslo 3
POLAND	Jurak, Danuta Inst. of Meteorology and Water Manag. ul. Podlesna 61 01-673 Warszawa
SPAIN	Pou, Antonio Direccion General de Medio Ambiete, Ministerio de Obras Publicas y Urbanismo P.O. de la Castellana 67 28071 Madrid
SWEDEN	Berndtsoon, Ronny Dept. of Water Resources Engineering Univ. of Lund P.O.B. 118 22100 Lund
SWITZERLAND	Rodda, John World Meteorological Organ. Case Postale No 2300 1211 Geneva 2
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