



**ISLAM:  
LIFE CYCLES  
& POLLUTION MAIN TABLE**

**OZONE layer:** gases in the atmosphere absorb some of the sun's heat reflected by earth's surface and radiate them back. They act as sunscreen against ultra violet rays.

When sunlight hits the atmosphere, about 30% is reflected back into space; 1/2 heats the earth; 1/4 sets in motion water cycle, the winds and water currents; 0.02% is used by plants

**Pollutants:**

Septic systems cause disease-carrying bacteria To leak into ground and surface water.

Most 90,000 landfills leak into soil.

Nuclear power plants produce thousand cubi meters of radioactive wastes every year.

Hazardous wastes from homes (oven cleaners, paint, aerosols, etc.) are another source of pollution.

Carbon dioxide builds up in the atmosphere, creating a blanket that traps heat that would radiate in outer space

This **greenhouse effect** could raise the temperature of the Earth and could cause damage to the biosphere.

In the clouds, sulfur dioxide and nitrogen dioxide combine to form sulfuric acid and nitric acid.

This **acid rain** falls when it is raining, snowing, etc., damaging the global ecosystem.

**Pollutants:**

Pesticides, fertilizers hormones and other agricultural chemicals leak into rivers, and upset the balance of the soil.

Mine runoff are great source of pollution (principally coal mines).

## PREFACE:

This Unit on Pollution is the first part of an overall Unit on Ecology & Islam. The purpose of this Unit is to inform the reader about major problems related to pollution, nowadays, in the World. The Unit tries to touch every possible subject related to Pollution; not to study them through, but to give the maximum chances for the reader to seize a big picture of the problem. Positive and negative aspects are both exposed with an emphasis on the problems since the aim is to provoke an awareness among the readers without exaggerating or causing panic or passiveness before the overwhelming difficulty of the situation. On the contrary, the unit tries to expose while reassuring. It is meant to prove that we all can do something about pollution each one of us in our own ways. However, some questions are open questions, which means nobody really has an answer for them. These were included on purpose, first, to stimulate the imagination of the reader, second, to provoke an awareness concerning the multiplicity of the challenges involved as far as a National or an International cooperation is concerned.

Allah Ta'alah has foreseen the future and warned all the Muslims about the importance of respecting our planet, and the great sins linked to the idea of wasting: wasting our time, our youth, our money, our health. For all that we waste, we will be accountable one day, a day called doom day.

And remember:

The Prophet said, "There are two blessings which many people lose:  
(They are) Health and free time for doing good"  
[Bukhari: Volume 8, Book 76, number 421. Narrated Ibn 'Abbas]

Muslims have to be active as far the Earth and its protection are concerned.

It is our duty; it is not a question of choice!

This unit addresses all Muslims, bigger and smaller, for a better world.

Insha Allah!

**Soumy Ana**

1420 HJ - 2000 AD

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## INTRODUCTION:

The Qur'an tells us many things about water cycles, food chains, ecosystems, air, soil protection as well as wildlife protection. Sometimes the Qur'an even educate us about natural cycles that only recent scientific discoveries verified.

The Qur'an also warns us about wasting and destroying the earth. What is interesting to know is that pollution problems were not crucial or even important at the time of Rasulallah (PBUH); they have really become crucial since the 19<sup>th</sup> C, proving to us that the Qur'an was revealed to all mankind and for all ages, not just for the time of its revelation.

The purpose of this unit is to keep in mind what Islam says about natural resources while studying recent statistics and problems.

We want to keep in mind how natural cycles function in order to have a comprehensible apprehension of what is hurting them and to understand how we can help prevent their abuse.

But first of all, lets consider what the word "pollution" really means.

Can you site different types of pollution?

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- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_
- 5) \_\_\_\_\_

As Islam constantly warns us about, the term "pollution" does not describe only something we can see, it also describes developing "diseases" of the heart that are not really perceptible for the eyes. These diseases are caused by wasting our time, our youth, our intelligence and our wisdom. This waste is caused by watching too much TV, playing electronic games instead of studying for school, using bad language in order to abuse people, never reading any of the Qur'an, or misusing other modern devices or behaving the wrong way.

What do you think is the most dangerous of all types of pollution? Explain:

\_\_\_\_\_

But where does come the pollution we know nowadays?

What important discoveries were made between the 19<sup>th</sup> century and the 21<sup>th</sup> century?

Or, what is new since the last three centuries that did not exist for thousand of years since the Earth was created by Allah Ta'alah?

Give examples:

- 1 - \_\_\_\_\_
- 2 - \_\_\_\_\_
- 3 - \_\_\_\_\_
- 4 - \_\_\_\_\_
- 5 - \_\_\_\_\_

Imagine yourself in the time of Rasulullah (PBUH), when there were no fridge, no TV, no modern appliances. How would your life look like?

How would you preserve the food, cook, look for a piece of news, etc?

Imagine and write a short essay about it:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

How would you spend most of your time without computer, television, video games, or recreation centers?

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Would you feel more happy or balanced? Would you feel less happy than you are now?

\_\_\_\_\_

Look at the way most Muslims in the world live?

Some Muslims live in the what we call "the third world". What does this word mean? How is their lives characterized? Think about black Africa, Pakistan, Malaysia.

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Do you think Prophet Muhammad (PBUH) and his companions lived the same way?

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Do you think they were concerned by problems related to the environment? Why?

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Now, imagine you live in the desert where water is scarce and you need to eat everyday and make sure your herd of camels is doing ok.

What primary concerns would be yours?

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Now, imagine you are living in Saudi Arabia, in the middle of the desert. This time, you are living in an oasis, and you want your grove of palm trees to prosper.

What are your basic problems? What are the solutions you propose to solve them?

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Would you use pesticides or chemicals in order to grow more trees, protect them against insects and to make them look healthier?

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Do you think it is possible to make the desert become green? Why? How?

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Now, do you think Allah Ta'alah gave some rules for the protection of the environment to protect the plants from the man's abuses?

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## Answers:

There are different kinds of pollution:

Garbage, waste

Chemical

Noise

Intellectual

Moral

The environment has been a great concern for many centuries, even if people did not call the attitude of taking care of their surroundings as being "environmental" problems.

In arid regions of the world, people are still very concerned about the preservation of water. They care not only about keeping suitable amounts of water for irrigation and mainly for drinking and ablution purposes, but also they try to keep it safe from illnesses and impurities.

In the desert, water is a constant problem since the wells are not many and they are soon covered with blowing sand, making it hard to find them and obliging locals to constantly dig for water. In the desert, Bedouins say: "water is the greatest treasure, well before gold or gems." For them, water is life. People of the desert hate to spill water and would go to the extent of killing a person whom they see waste water intentionally. It is therefore still considered there a great crime to waste water because to waste water is putting in danger many people.

For us Muslims, clean water is an essential problem since we need water to do our ritual ablutions for the prayer, even if a smooth rock or sand can do the purpose for the minor ablutions.

Clean water is also necessary in hot countries where many dangerous diseases can spread rapidly through water to contaminate entire populations. Usually, people boil the water before drinking.

Preserving the soil is also a great concern for many peasants. For instance, in Japan, there are so many people and the country is so small that it is hard to find ground to cultivate crops. The portion of earth they can get is dear for many Japanese since it means independence and comfort. As far as the protection of wildlife is concerned, the forest is very essential. Most animals and insects live in the forest; they need trees and green leaves in order to eat, mate and be well protected against natural enemies.

Groves have been well kept by Muslims of all times since trees and especially fruit trees mean life and a good source of income. Besides, there are many blessings coming from the fact that

people and animals can profit from those trees. Allah warns us against killing or torturing animals for pleasure. Furthermore Muslims are discouraged from eating too much meat, this to be more healthy and to make sure more animals will live and provide for a balanced food chain and ecosystem.

### **SELF POLLUTION:**

As far as food is concerned, did you ever think about other forms of pollution that you impose to your own body?

Can Muslims be fat, eat junk food? Why?

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Medical studies report that a person who loses a few pounds feels more active, less prone to laziness and drowsiness. A lighter person means a healthier and happier person.

What do you conclude about a person who gains a lot of extra pounds? Would it be easier or harder for him to wake up for Fajr prayer, to go to sport in order to make his body healthier, and to perform all activities that please Allah Ta'alah?

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Imagine a fat person going to war or being trapped in a war where he would have to defend other Muslims? This person would certainly experience shortness of breath more easily; he could not run or move as swiftly as others; he might have problems carrying loads, defending himself or his family and so on and so forth.

As far as private life is concerned, fat people are more subject to illnesses and we can conclude that it might be come very difficult for them to bow and kneel on the ground for prayers, and to restrain from worldly pleasures or goods.

However, fat people should not be criticized by other Muslims. On the contrary, they should be advised that they are polluting their bodies with food and the wrong drinks. They should be warned against the risks of diabetes or heart failure; they should be aware that they are displeasing Allah.

If Muslims have so much they are becoming fat, this also means they are more tempted to waste!

Can Muslims waste or throw away dishes after a meeting because people did not finish their plates? Was Rasulullah (PBUH) fat? Did he eat everyday, him and his family?

No!

At the time of Rasulallah (PBUH), a man came to ask for hospitality. Our prophet (PBUH) did not have anything to give him in the manner of food, so he asked around his companions who could take care of the man. A man stepped forward and drove the guest to his home. But while entering his home, his wife told him there was no food for the guest. Knowing this, the man asked his wife to give their dinner to the guest. Since there was not enough for everybody, the couple sent the children to bed without eating and dimmed the light. When dinner was served, only the guest ate; in the dim light he could not see that the couple was pretending eating with him. The day after this event, Rasulallah (PBUH) met the host and gave him good tidings from Allah Ta'alah for his act. He knew about the sacrifice of the family.

What can we learn from this true story? Is food more important than what we do for Allah Ta'alah?

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Can Muslims drink alcohol or use drugs? Why?

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Is it ok to sell wine if we do not drink of it or profit from it? Explain:

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Can Muslims watch or enjoy movies showing forbidden things, for example, discriminating films or scenarios showing Western holidays as good things? Why?

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All these examples are related to the pollution of the body and mind.

What is pollution of the body and mind?

It is the fact to fill one's head with wrong ideas or things Allah Ta'alah has forbidden for us. These things are not forbidden just to make sure there are some rules and because they are difficult to follow. No. We all have desires and we might want to try one day to answerback to our parents or we might get sick of always obeying the rules. Sometimes we might be willing to try some pork in our diet or to eat too much. However we have to resist the temptation, not because we have to, but because Allah Ta'alah knows us perfectly and he knows what will make us unhappy. Allah has created us in the most perfect manner and he knows that when we drink

alcohol, for instance, we are not completely conscious of what we are doing and we may fall into greater sins.

It is related that there was a man who was a pious man. He swore he would never drink, kill or be dishonest. People told him never to swear such a thing because nobody knows the future and he might be tempted one day. One day arrived for him when he was tested. He fell in love with a bad woman. The bad woman made him drink alcohol. At first he refused but, pressed by his beloved, he accepted just to put his lips on the rim of the glass. Having the flavor of the wine in his nostrils, he felt it smelled good contrary to what he had thought before. He then took a sip of alcohol in his mouth, and soon another sip, and another one. There was no moment he did not think he was perfectly conscious. He thought he had just drink a little bit when his glass was filled in again and again, till he did not know what was going on around him. He could see only his desire. So, he became dishonest to the wife's husband by touching his wife. At this moment, the husband came back unexpectedly. Our man killed the husband for fear of the husband, and escaped, leaving everything behind him. When he woke up the day after, he realized how wrong he had been to say he would never commit any major sin. He became more humble and paid his debt to the community by giving himself away.

As Muslims, there are several items in our diet that we must avoid; these items are called *haram*, which means "forbidden" by Allah Ta'alah. Which are they? Do you remember the verses of the Qur'an that talk about them?

- 1 – \_\_\_\_\_
- 2 – \_\_\_\_\_
- 3 – \_\_\_\_\_
- 4 – \_\_\_\_\_

These items are not only forbidden because we are Muslims; everybody should avoid their consumption.

Do you know what these foods and drinks do to your body?

If you do not know, read the articles below:

**Pork:** see article **PORK IS SIN AND SICKNESS**, at:  
<http://www.angelfire.com/ak/BaltoMuslims/pork.html>

" Forbidden to you for (food) are: dead meat, blood and the flesh of the swine and that which hath been invoked the name other than Allah. "  
[Qur'an 5:4]

" Let him find out which is the best food ( to be had ) Eat of the best foods We have provided for you . "  
[Qur'an 18:19;7:160]

**Alcohol:** read its side effects, at:  
<http://www.islamicvoice.com/march.99/zakir.htm>

:O ye who believe! Intoxicants and Gambling, (Dedication of) stones, And (divination by) arrows, Are an Abomination Of Satan's handiwork; Eschew such (abomination), That ye may prosper.  
[Qur'an 5:90]

Allah Ta'alah knows that when we give way to a first temptation, other temptations soon follow, and we become polluted by our actions or thoughts. Actually, a person who disobeys Allah Ta'alah feels right away sad and uneasy; this person feels polluted. The same way when we trash things instead of recycling them. The first time we may feel guilty, but when we see nobody really cares, we are tempted to trash as much as anybody. But Muslims should feel different and act differently because we are mindful and responsible. When we do not care, it falls back on ourselves, and if we make the earth dirty, we become dirty too. When what we eat, drink, do or think is clean, we feel clean and healthy and happy, this is why we have to keep our environment clean as well. It is a question of happiness and safety. Pollution of the mind is closely related to the pollution of the physical environment; it would be wrong to forget that!

## POLLUTANTS AND WASTE:

Air pollution already existed hundred of years ago.

Many historians speculate that the overuse of lead plumbing for drinking water in Rome caused chronic lead poisoning among rich people.

The mining and smelting of ores that accompanied the transition from the Stone Age to the Metal Age resulted in piles of mining wastes that spread potentially toxic elements such as mercury, copper, lead, and nickel into the environment.

By the 19<sup>th</sup> century, chimney sweeps contracted cancer from hydrocarbons in chimney soot; hatters became disoriented, or "mad," from nerve-destroying mercury salts used to treat felt fabric; and bootblacks suffered liver damage from boot polish solvents.

During the 20th century, pollution became so widespread that pollutants not only persisted in the environment, but changed atmospheric and climatic conditions.

**In the United States**, the Clean Air Act (1970) reduced certain types of air pollution.

The Clean Water Act (1977) and Safe Drinking Water Act (1974) set water quality standards.

Followed laws to control toxic wastes, such as the Toxic Substances Control Act (1976) and the Resource Conservation and Recovery Act (1976).

The Liability Act (CERCLA) provides funds to clean up the most severely contaminated hazardous waste sites.

**International agreements** have also played a role in reducing global pollution, such as the Montreal Protocol on Substances that Deplete the Ozone Layer (1987) or the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989).

But to avoid ecological disaster and increased poverty, developing countries will require aid and technology from outside nations and corporations, community participation in development initiatives, and strong environmental regulations.

**Non-governmental organizations** are also very active; they form at the local, national, and international level to combat pollution problems worldwide.

Greenpeace International is one of them!

But what is pollution?

*Pollution can be defined as a contamination of the earth's environment with materials that interfere with human health, the quality of life, or the natural functioning of ecosystems.*

However, pollution can also have natural causes like volcanic eruptions, cyclones, and so on.

There are two main categories of polluting materials made and used by humans; they are **biodegradable** and **non-degradable materials**; these materials are called **pollutants**. The first category, biodegradable pollutants (sewage, feces, vegetables, fruits, etc), rapidly **decompose** by natural processes. However, these pollutants become a problem when they cannot decompose rapidly enough and people continue adding more and more everyday, so they accumulate. The second category are non-degradable pollutants that cannot decompose or decompose slowly in the natural environment. Once they are launched into the **environment**, it is almost impossible to remove them.

DDT, dioxins, pesticides, polychlorinated biphenyls (PCBs), and radioactive materials can be utterly dangerous when they pass through our bodies when we consume plants or animals.

Because, us humans are at the top of the **food chain**, we accumulate a lot of toxins coming from what we eat. In the 60's, at Minamata Bay, Japan, people developed nervous disorders, tremors, and paralysis in a mysterious epidemic. Over 400 people died. Why? Because a local industry was releasing mercury into the Bay, and people were eating the fish infected by it! All of a sudden, people began to notice that pollution was fatal, and someone had to do something about it! The fight against environmental pollution was born.

Expenditures to reduce pollution in the United States in 1993 totaled \$109 billion, including \$105.4 billion on reduction, \$1.9 billion on regulation, and \$1.7 billion on research and development. Twenty-nine percent of the total cost went toward air pollution, 36 percent to water pollution, and 36 percent to solid waste management. Nonetheless, the reforms do not profit everybody: low-income populations and minorities are lodged near toxic waste incinerators, chemical plants, and solid waste dumps, therefore they do not receive the same protection against hazardous wastes.

**Solid waste** are solid materials we do not want anymore, such as garbage, paper, plastics, metals, etc. It constitutes the major source of waste in industrialized countries.

Billions of tons of solid waste are thrown out annually.

A typical American generates an average of **4 pounds** of solid waste **each day**.

How much does that make in one year?

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**Developed countries** produce much more solid wastes than in **developing countries**, and they waste more of synthetic materials, which take longer to decompose than biodegradable waste materials of developing countries.

Do you know what the words “developed countries” and “developing countries” mean?

Give examples of **developed** countries:

\_\_\_\_\_

Give examples of **developing** countries:

\_\_\_\_\_

What are the major Muslim countries in general? Mark your answer:

? Developing countries

? Developed countries

Why synthetic materials are not as wildly used in developing countries? What are these **synthetic** materials?

\_\_\_\_\_

Solid waste are usually buried in **landfills**, but landfills quickly become overfilled and usually contaminate air, soil, and water because of **leakage**.

**Incineration**, or burning, of waste reduces the volume of solid waste, but produces dense ash wastes full of dangerous, hazardous materials such as heavy metals and toxic compounds.

Another way of getting rid of waste is composting. **Composting** is the act of using natural processes such as making a pile of organic materials in your garden and airing it now and then. When decomposed, the product can be used as natural fertilizer.

**Recycling, reducing and reusing materials** that take longer to decompose has become an important task of community life in many developed countries where people are sensitive to landfill and incineration problems and become more conscious of pollution around them.

Over one-fifth of the municipal solid waste produced in the United States would be now recycled. But developing countries are becoming more and more sensitive to the problems because of epidemics and sanity concerns. Moreover, people in these countries are very poor and try to make a living by recycling materials. For instance, many Asian countries have organized waste-pickers that comb streets and dumps for items such as plastics they can use or resell.

Nowadays the challenge is not to stop the waste since it has become almost impossible to educate people and industries in that sense, but to make products easier to reuse in order to reduce the high costs of environmental pollution.

**Hazardous Waste** are products non-degradable; they are toxic chemicals and flammable or radioactive substances, including industrial wastes from chemical plants or nuclear reactors, agricultural wastes such as pesticides and fertilizers, medical wastes, and household hazardous wastes such as toxic paints and solvents. The United States generates 240 million metric tons of hazardous wastes each year.

During many years, most hazardous wastes were legally dumped in solid waste landfills, buried, or dumped into lakes, rivers, and oceans. Legal regulations now restrict them.

Cleaning the 10,000 abandoned hazardous waste dumps in the US could take 50 years and cost \$100 billion.

As the towns grow more numerous and bigger, and more people use more machines, **noise pollution** has become a major problem in urban areas.

Noise, such as that produced by airplanes, traffic, or industrial machinery, is considered a form of pollution. Noise pollution is at its worst in densely populated areas. It can cause hearing loss, stress, high blood pressure, sleep loss, distraction, and lost productivity.

Most humans can hear sounds between 20 and 20,000 hertz, while dogs can hear high-pitched sounds up to 50,000 hertz.

High-frequency sounds are really annoying to humans, even dangerous.

Measured in decibels, noise intensity can range from zero, the quietest sound the human ear can detect, to over 160 decibels. A conversation reaches 40 decibels; a rock concert, 100 decibels; a jet, 110 decibels. The threshold for pain, tissue damage, and potential hearing loss in humans is 120 decibels. A person who is affected by hearing problems can lose his/her balance and spoil his/her life greatly. Modern music, especially heavy metal music, and modern appliances such as car audio or walkman make the problem very hard to solve. As Muslims, we should restrain from music as music is not recommended in Islam and walk away from the setting where music takes place since these settings are often linked with sinful acts. Not only the ear is in danger, but the promiscuity in concerts between men and women is not desirable; half-naked bodies dancing immodestly on videos, seducing are even more dangerous for the imagination of young adolescents, and so on and so forth.

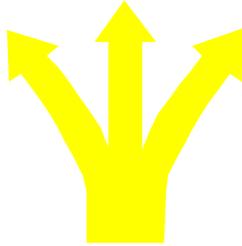
All in all, the effects of pollutants over the environment may be immediate or delayed. Primary effects of pollution occur immediately after contamination occurs, such as the death of marine plants and wildlife after an oil spill at sea. Secondary effects may be delayed or may persist in the environment into the future. For instance, birds eat grains that have been contaminated by pesticides. The more they eat of that grain, the more they accumulate poison in their body. Birds with high concentration of pesticide lay thin-shelled eggs that fail to hatch or produce deformed offspring, such as the bald eagle and peregrine falcon, species now in danger.

The same cycle is to be found in us. The more we are indifferent to our natural environment, the more the environment get polluted, the greatest our sins for not doing anything! We have all a part to play in the protection of the Earth. We are all involved because Allah Ta'alah has chosen human beings to be watchers over the Earth! Muslims should feel obligated to mind these warnings and do things at their own levels, with their own means. And protecting the environment begins by protection oneself, doesn't it?

**ECOLOGICAL CYCLES:**

**WATER Cycle**

Water rises high into the sky. Water is almost invisible (vapor). Only 10% of sea water goes inland.

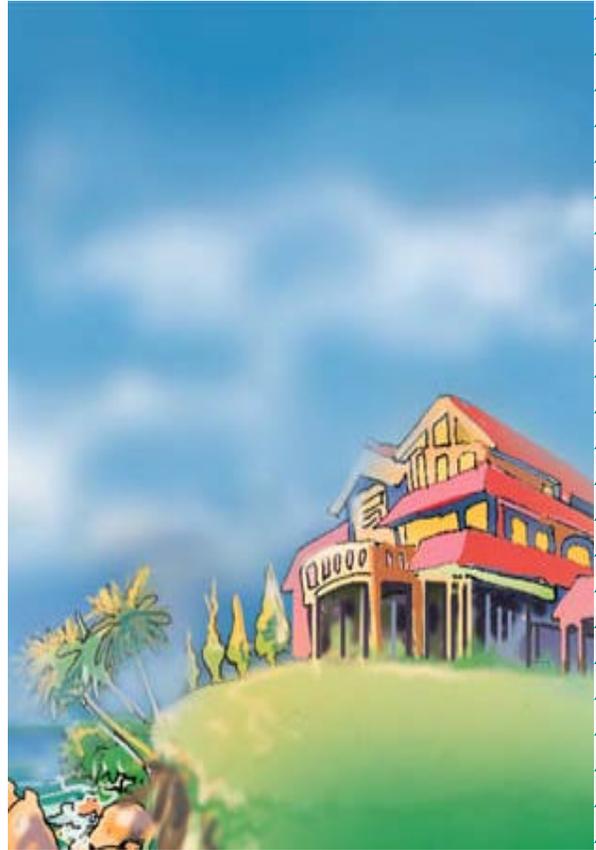


Water Evaporates :  
90% from sea; returns directly to sea.

Water is released from plant leaves: 20%  
from evapo-respiration



Water vapor forms clouds: inland, clouds are formed from 20% evapo-respiration and 10% from non-salty sea water. Total: 30%.



Plant roots absorb water. Part of this water infiltrate underground.



Water falls as rain from clouds (precipitation), returns from sea to sea: 90%; 10% from runoff (land).



## WATER

Image: <http://www.freestockphotos.com>

### Water in Islam:

Water is the natural resource maybe the most present in the sacred texts of Islam. Not only it is constantly evoked, but it also evokes several meanings.

But maybe the most interesting feature is the fact that the water's natural cycles are described in detail in the Qur'an itself.

*(The unbelievers state) is like the depths of darkness in a vast deep ocean, overwhelmed with billow topped by billow, topped by (dark) clouds: Depths of darkness, one above another: If a man stretches out his hand, he can hardly see it! For any to whom Allah does not give light, there is no light.*

[Qur'an 24:40].

This verse about the state of people who are not Muslims is a miracle in itself. One should read it over and over again to feel how deep it is.

The verse is a miracle in two ways: because of its scientific accuracy and because of the accuracy of the parable (the image that comes up into one's mind while reading it).

Allah Ta'alah could have chosen the darkness of the night in order to explain how lost unbelievers are, but the comparison with the depth of the sea is even stronger than it is unexpected, especially at the time of the Prophet (PBUH) when nobody was able to dive deep enough into the sea to tell if the sea depths had layers of darkness or not.

Scientists now have explored the sea's darkness by means of submarines. Human beings can only dive unaided for twenty to thirty meters deep. This darkness is caused by water waves, and also by the absorption of colors at the different levels that are layered one over the other.

The fact to compare the unbelievers moving about the darkness of the sea is a very effective description. There are many different layers or depths in everybody as far as sins are concerned and also the awareness: some people are completely in the dark about the revelations

of life, some other have almost understood what life really is and that only Islam is the way. For those who are completely lost, it seems that there is almost no hope for them like a person stretching his hand in the dark in a middle of the ocean, reaching for nothing and only concerned about his present desires and safety.

The Qur'an goes on to say:

*And He sends down hail from mountains (clouds) in the sky, and He strikes with it whomever He wills, and turns it from whoever He wills. The vivid flash of its lightning nearly blinds the sight.*

[Qur'aan 24:43]

Scientists have studied clouds and noticed that they can predict the weather by looking at them. The shapes of clouds depend on winds.

One kind of rain cloud is the cumulonimbus cloud associated with thunderstorms.

Scientists have found that cumulonimbus clouds go through the following steps to produce rain: clouds are pushed by the wind; then they join together forming a larger cloud. When the small clouds join together, updrafts within the larger cloud increase. The updrafts near the center of the cloud are stronger than those near the edges. These updrafts cause the cloud's body to grow vertically, so the cloud is stacked up. This vertical growth causes the cloud body to stretch into cooler regions of the atmosphere where drops of water and hail formulate and begin to grow larger and larger. When these drops of water and hail become too heavy for the updrafts to support them, they begin to fall from the clouds as rain, hail, etc.

Meteorologists have found that these cumulonimbus clouds, showering hail, reach a height of 25,000 to 30,000 feet (4.7 to 5.7 miles), like mountains, as the Qur'an says.

So the Qur'an really describes the water cycles in the sky as well as the nature of the waters in the oceans. These examples are but a few in the Qur'an. Most of the time the Qur'an speaks about how the rain falls on the earth and revives it; it tells that there is much wisdom by looking at all forms the water takes, and those who are wise enough to think about it receive a great Benediction.

*Behold! In the creation of the heavens and the earth; in the alternation of the night and the day; in the sailing of the ships through the ocean for the profit of mankind; in the rain which Allah Sends down from the skies, and the life which He gives therewith to an earth that is dead; in the beasts of all kinds that He scatters through the earth; in the change of*

*the winds, and the clouds which they Trail like their slaves between the sky and the earth;- (Here) indeed are Signs for a people that are wise.*

[Qur'an 2:164]

A great Benediction that was given to Musa (Moses) (PBUH), Ajar (RA) and Muhammad (PBUH) and us by our **duas**, is respectively the splitting of the sea, the creation of springs like the **Zamzam** spring, and the coming of the rain:

*And remember Moses prayed for water for his people; We said: "Strike the rock with thy staff." Then gushed forth therefrom twelve springs. Each group knew its own place for water. So eat and drink of the sustenance provided by Allah, and do no evil nor mischief on the (face of the) earth.*

[Qur'an 2:60]

The water in Islam is often linked to miracles, physical miracles or the miracle of the Faith.

*The Prophet said, "The example of guidance and knowledge with which Allah has sent me is like abundant rain falling on the earth, some of which was fertile soil that absorbed rain water and brought forth vegetation and grass in abundance. (And) another portion of it was hard and held the rain water and Allah benefited the people with it and they utilized it for drinking, making their animals drink from it and for irrigation of the land for cultivation. (And) a portion of it was barren which could neither hold the water nor bring forth vegetation (then that land gave no benefits). The first is the example of the person who comprehends Allah's religion and gets benefit (from the knowledge) which Allah has revealed through me (the Prophets and learns and then teaches others. The last example is that of a person who does not care for it and does not take Allah's guidance revealed through me (He is like that barren land.)"*

[Haadith, Imam Malik: 001.003.079 - Knowledge - Narrated Abu Musa]

From the water (actually the male semen) comes everything that lives. This have been verified by modern scientists.

Water has really something of a miracle because it is the heart of life. Consider how many gallons of water our body is made of?

About 65% of our body contains water and we constantly drink and use water to clean our body from inside out.

We drink an average of 2 ½ quarts (2.4L) of water per day. Our body is 2/3<sup>d</sup> water by weight; our blood is 92% water; our brain is 75% water; our bones are 20% water.

*We made from water every living thing. Will they not then believe?*

[Qur'an 21:30]

*And Allah has created every animal from water: of them there are some that creep on their bellies; some that walk on two legs; and some that walk on four. Allah creates what He wills for verily Allah has power over all things.*

[Qur'an 24:45]

*It is He Who has created man from a drop of water (semen); then has He established relationships of lineage and marriage: for thy Lord has power (over all things).*

[Qur'an 25:54]

Water revives us when we are sick. Our Beloved Prophet (PBUH) asked to be basked into water when he was on his deathbed, so he could meet with his people fresh and revived.

Water is so essential to sustain life that one needs a strong faith in order to resist the urge of drinking when he is very thirsty. Allah Ta'alah has put to the test several of his armies like the one of Muhammad (PBUH) and the one of Talut's battle:

*When Talut set forth with the armies, he said: "(Allah) will test you at the stream: if any drinks of its water, He goes not with my army: Only those who taste not of it go with me: A mere sip out of the hand is excused." but they all drank of it, except a few. When they crossed the river,- He and the faithful ones with him,- they said: "This day We cannot cope with Goliath and his forces." but those who were convinced that they must meet Allah, said: "How oft, by Allah's will, Hath a small force vanquished a big one? Allah is with those who steadfastly persevere."*

[Qur'an 2:249]

In Islam, a person who refuses water to a thirsty person or an animal can become the dweller of Hell in the Hereafter. On the contrary, a person who gives water can be granted Paradise just on account of that, even if the person has committed many sins before. So, refusing water to a living creature, in Islam, is considered really cruel and unworthy of a believer; it is one of the greatest sins.

The Prophet said, "A man saw a dog eating mud from (the severity of) thirst. So, that man took a shoe (and filled it) with water and kept on pouring the water for the dog till it quenched its thirst.

*So Allah approved of his deed and made him to enter Paradise."*

[Haadith Bukhari: 001.004.174 - Ablutions (Wudu') - Narrated Abu Huraira]

Water is closely related to Paradise.

One of the bounties of Paradise are gushing waters and springs that taste like honey.

*The righteous (will be) amid gardens and fountains (of clear-flowing water).*

[Qur'an 15:45]

Another bounty of the Paradise is that the people who were thrown into Hell because of their sins but who were Muslims are revived with the water of Paradise, then they are reborn.

*The Prophet said, "When the people of Paradise will enter Paradise and the people of Hell will go to Hell, Allah will order those who have had faith equal to the weight of a grain of mustard seed to be taken out from Hell. So they will be taken out but (by then) they will be blackened (charred). Then they will be put in the river of Haya' (rain) or Hayat (life) (the Narrator is in doubt as to which is the right term), and they will revive like a grain that grows near the bank of a flood channel.*

*Don't you see that it comes out yellow and twisted"*

[Haadith Bukhari: 001.002.021 - Belief - Narrated Abu Said Al-Khudri]

Finally, what is the practical lessons we, Muslims, can learn from the following story:

Explain:

---

I heard Anas bin Malik saying, "On a Friday a person entered the main Mosque through the gate facing the pulpit while Allah's Apostle was delivering the Khutba. The man stood in front of Allah's Apostle and said, 'O Allah's Apostle! The livestock are dying and the roads are cut off; so please pray to Allah for rain.' " Anas added, "Allah's Apostle (p.b.u.h) raised both his hands and said, 'O Allah! Bless us with rain! O Allah! Bless us with rain! O Allah! Bless us with rain!' " Anas added, "By Allah, we could not see any trace of cloud in the sky and there was no building or a house between us and (the mountains of) Sila." Anas added, "A heavy cloud like a shield appeared from behind it

*(i.e. Sila' Mountain). When it came in the middle of the sky, it spread and then rained."*  
*Anas further said, "By Allah! We could not see the sun for a week. Next Friday a person entered through the same gate and at that time Allah's Apostle was delivering the Friday's Khutba. The man stood in front of him and said, 'O Allah's Apostle! The livestock are dying and the roads are cut off, please pray to Allah to with-hold rain.' "*  
*Anas added, "Allah's Apostle I raised both his hands and said, 'O Allah! Round about us and not on us. O Allah! On the plateaus, on the mountains, on the hills, in the valleys and on the places where trees grow.' So the rain stopped and we came out walking in the sun."* Sharik asked Anas whether it was the same person who had asked for the rain (the last Friday). Anas replied that he did not know.

*[Haadith Bukhari: 002.017.126 - Invoking Allah for Rain (Istisqaa)- Narrated Sharik bin 'Abdullah bin Abi Namir]*

**WATER CYCLES: facts and pollution:**

**Introduction:**

The Earth's surface contains 70% water and 97% of this water is not available for drinking. Americans consume about 100 gallons (378 L) of water per day.

How many gallons that makes in one week?

\_\_\_\_\_ gallons

How many gallons in one month?

\_\_\_\_\_ gallons

Water is not free; it is purified and brought to your home, and you must pay each month for the service. Water meter for home usage is measured in cubic feet.

1 cubic foot = 7 ½ gallons (284 L).

So, how many cubic feet does an average American family use each month?

\_\_\_\_\_

How much do you pay for each cubic of water?

\_\_\_\_\_

Thus, how much do an average American family pays each month for its water needs?

\_\_\_\_\_

Nowadays, we need more freshwater because we are more numerous on earth and our seas are polluted. We are more numerous because less people die and we are fed better and we are well protected against many natural hazards. So, we need water for our family, not only for drinking, but also for eating, agriculture, bakeries, restaurants, schools that need more water as they have to satisfy more customers.

Of the water consumed each year, 73% is used for agriculture, 21 % for industry, and only 6% for domestic uses.

What is the % of water used to grow crops and in industry?

\_\_\_\_\_ %

What do you use water for in your house?

\_\_\_\_\_

Can you sometimes reduce the amount of water you are using daily? How?

\_\_\_\_\_

If a lot of water is used to grow plants, and if we know that many pesticides (a dangerous pollutant when it accumulates) are used in the fields, what can we conclude as far as pollution is concerned?

---

Why do industries need water?

---

Where does the industries' soiled waters go when released?

---

When you wash the dishes or go to the bathroom, where is the water you used released?

---

What does the word "sewage" mean?

---

Sewage, industrial wastes, and agricultural chemicals such as fertilizers and pesticides are the main cause of water pollution.

In 1995, about 37% of the US's lakes and estuaries, and 36% of its rivers, were too polluted for people to fish or swim in them!

How many (in %) natural water locations are polluted each year?

---

That makes how many (in %) water locations not polluted, in 1995?

---

How long ago was that?

---

Do you think it is better or worse in year 2,000? Explain:

Better:

---

Worse:

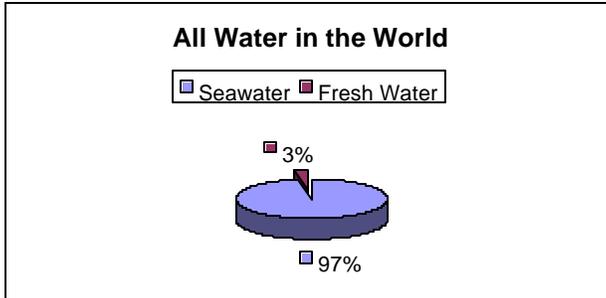
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If you know that over 95 % of urban sewage is discharged untreated into rivers and bays, what can you conclude?

Imagine you were bathed in sewage, what would probably happen to you?

---

Two things show how important water is on earth. First, water is essential to life survival. Second, the total amount of water in the world is constant and can neither be increased or diminished, as it is true for wood or for coal, oil, etc.



The total volume of water on earth is about 1,400 million cubic kilometers (1018 tones).

How many zeros that makes after the number 10?

10 \_\_\_\_\_ tons

That is a lot of water!

However, more than 97% of this water is seawater.

How many cubic kilometers water is then seawater?

\_\_\_\_\_

How many tones?

\_\_\_\_\_

How many % of water is not seawater?

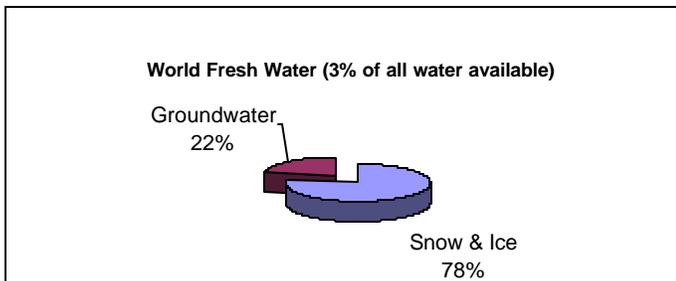
\_\_\_\_\_

How many cubic kilometers are not seawater?

\_\_\_\_\_

How many tons?

\_\_\_\_\_

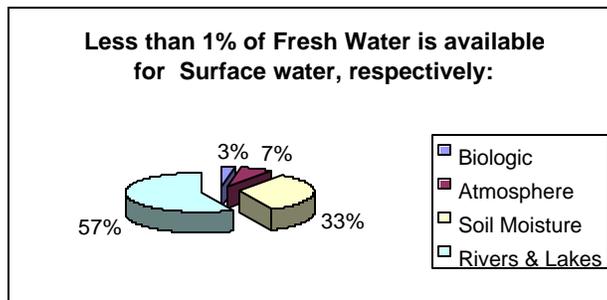


Of the percentage of water that is not seawater on Earth, 22% is groundwater, and 77% is ice, locked in glaciers and ice caps.

How many cubic kilometers of water are available then for land usage?

How many tons?

So, less than 1% of fresh water is available for groundwater or surface water (actually 0.6%)



Actually, of these 0.6% of surface water, 3% are found inside living creatures, 7% in the atmosphere, 33% in soil moisture, 57% in rivers and lakes.

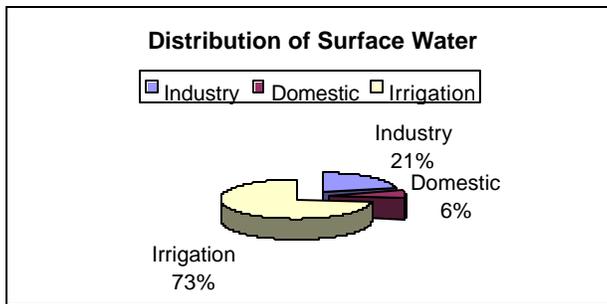
Even though, there is plenty of water for all our needs.

But surface water is unevenly distributed: some areas of the world are desertic or semi-arid while others suffer from torrential rains and seasonal flooding. In fact, 15% of world's largest rivers carry one-third of the global runoff (roughly rivers of the Americas and Russia).

#### Problems:

Most of the surface water is used for agriculture, but 70 to 80% never reach the crops, so there is much waste. Furthermore, the soil can become waterlogged and salinized in the process because of men's ignorance of the nature of their soil.

Even if industry does not use much water, it pollutes much more since water is needed for cooling and cleaning. Actually 80% of the water is being returned to its source, if not polluted, at least hot (in the case of nuclear power plants) which can disturb significantly the natural environment of rivers and lakes.



Domestic usage can however spare more water since 10 L. of water is required to flush a toilet and 100 L. for a shower and a lot more is used by washing machines.

Prophet Muhammad (PBUH) used to do the ritual ablutions with a bucket of water (a sa'), while he used to bath with 5 buckets (Sa') only! And at this time a small bucket of water was still enough to wash private parts.

Consider putting a bottle full of water inside the tank of your toilet in order to reduce the amount of water you use daily, and use the shower only to rinse the soap from your body!

#### Other problems:

Developing countries do not have sanitary facilities the western world possesses. In fact, human waste is simply deversed into rivers without treatment, and 4 out of 5 common diseases in these countries (thyphoid, cholera, etc) are caused by dirty water or lack of sanitation.

The problem is major since 20,000 people die everyday of these diseases!

To complicate the matter, only one-fifth of city dwellers in these countries have access to safe water, but one half is wasted already though leaks in pipes and taps!

#### Oceans & Rivers:

Since most streams of water end up naturally in the oceans, the pollution started in the rivers finally pollutes the seawater as well. But 90% of the pollution stays around the shore, never reaching deep sea and making local fishery and swimming unsafe. The Mediterranean sea is a good example; it is the most polluted of all seas in the world. WHY?

Think about the Mediterranean Sea. What are its characteristics? Do you think the pollution can reach the Atlantic easily, so the sea can be cleaned more easily?

This situation is important to know if we keep in mind that two-thirds of the world's population lives within 80Km of a coast, and 90% of the fish worldwide is caught around the coasts!

What kind of problems do you think this generates?

---

Now, what about that?

Water runoff carries fertilizers from the fields into lakes, streams and rivers. These fertilizers are called phosphates and nitrates. When combined with the phosphates and nitrates from sewage, they speed the growth of algae and water plants. It is probably interesting to look, but this causes an ecological unbalance, and much more than that... Try to find the main danger of this phenomenon through the following series of questions:

What is the role of plants living in the water?

1. \_\_\_\_\_
2. \_\_\_\_\_

If you do not know, remember, what do you need in order to provide livable conditions in an aquarium?

You need:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

What do you think happens when there are too many plants in the water?

---

What happens when you do not clean an aquarium after a few weeks?

---

If you do not know, remember the case of the Kudzu vine. This vine can live on the ground, but it can also live in rivers and cover an entire stream of water in a few years!

What is happening here, in picture B?

---



Picture A: Beautiful Kudzu



Picture B: trees disappear under Kudzu vines

Kudzu images courtesy: <http://www.alltel.net/~janthony/kudzu/>

**Experiment:**

If you still did not guess the answer, make this little experiment:

Sewage = dried fruits

Decay bacteria = yeast

Oxygen detectors: methylene blue test solution.

Oxygen present = methylene turns blue; without oxygen = turns light blue or clear

Mix dried fruits that we place for sewage (organic elements) with yeast (what you use to make bread rise) in a recipient. Let it stand a little.

Then look for a chemical product called methylene blue test solution, and add it to the solution.

If your solution turns blue, that means there is oxygen in your solution; on the contrary, if the solution turns light blue or becomes clear, that means there is very little oxygen to none at all in your solution.

What happened?

---

How does this relate to the proliferation of plants in water?

---

Water is to be found on the ground, and in the sky. Water coming from the sky can also be the cause of pollution if combined with other factors.

Erosion and water can play the role of a pollutant.

How?

We will try to help you to find this out:

What is the role of tree roots except from the fact that roots bring nutrients from the ground to the tree?

---

Therefore, what happens when deforestation occurs and rain falls ?

\_\_\_\_\_

Have you ever seen a flooded area? What happens to the vegetation, especially when the water is drawn away?

\_\_\_\_\_

What causes the erosion of the ground?  
You can play hangman to find the solution below:  
D \_\_\_\_\_ N

Capturing water animals we find in lakes, seas and rivers is a means of survival for many people in the world. As the world population grows, we need more fish, especially in countries where it is the main dish.

Can you site some of these countries? Are they some Muslim countries included?

\_\_\_\_\_

Not only people overfish in some areas of the world (about thousand of people eat fish, not meat, as their primary source of protein), but oil tankers destroy or contaminate their food! Thousands of spills are reported every year! However, we do need oil!  
Why do we need oil?

\_\_\_\_\_

Can we find a solution to this problem? Propose yours:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Water quality:**

In 1969, the Cuyahoga river in Ohio, USA, caught fire and burned for several hours because of the river's heavy chemical contamination. Now, it is fishable. Modern water and sewage treatment technologies slowly make a difference.

Create your own Water cycle, and learn to create an ecosystem:



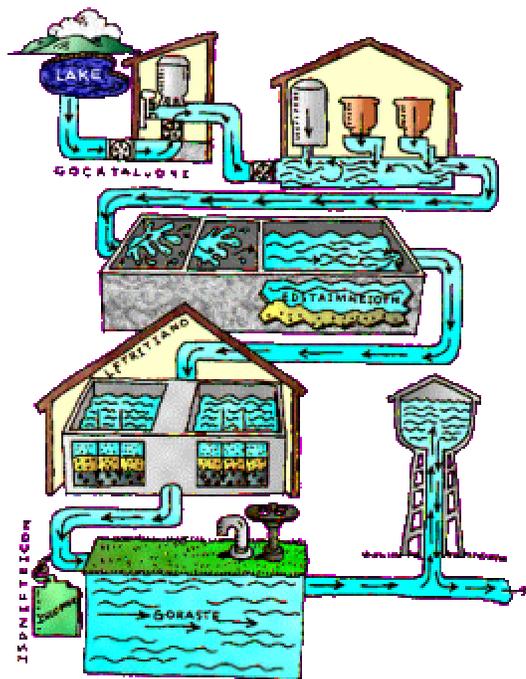
Picture courtesy of: <http://www.epa.gov/>

1) Jar, 2) plants, 3) water, 4) soil, 5) sand. 6) pebbles

### Water filtration activity:

Water in lakes, rivers, and swamps often contains impurities that make it look and smell bad. The water may also contain bacteria and other microbiological organisms that can cause diseases. That is why water must be cleaned before it can be drunk by people.

**Water treatment plants** do this job! They clean the municipal water you receive at home if you live in developed countries. Below is the explanation of what does a treatment plant.



Picture courtesy of: <http://www.epa.gov/>

In the treatment plant, water goes through a series of cleansing processes known as:

- (1) aeration;
- (2) coagulation;
- (3) sedimentation;
- (4) filtration;
- (5) disinfection.

**Coagulation** removes dirt and other particles suspended in water. Alum and other chemicals are added to water to attract the dirt particles. The weight of the dirt + the alum sink to the bottom.

Clear water moves to **filtration**. The water passes through filters, some made of layers of sand, gravel, and charcoal that help remove even smaller particles. Chlorine can help killing any bacteria or microorganisms that may be in the water.

Water is placed in a closed tank for **disinfection**.

The water then flows through pipes to homes and businesses in the community.

**Activity: Purify some water, but do not drink it!:**

This experiment do not make water drinkable; it just makes it clear!

Collect a few Liters of soiled water.

- 1) Put the water into a large bottle, then shake it vigorously. Pour water into other recipients, then pour back into the main recipient again for a few minutes: **AERATE**.
- 2) Add 20 g of alum crystals to the water. Stir: **COAGULATION**.
- 3) Let the water stand half an hour to let the particles sink at the bottom of the recipient: **SEDIMENTATION**.
- 4) Attach a coffee filter with an elastic band at the neck of a bottle. Cut off the bottom of a bottle. The bottle upside down, place into it a layer of pebbles, then a layer of sand. Pour the water over it without disturbing the layer of sand to make sure it stays effective: **FILTRATION**.
- 5) Add disinfectants to the water to purify it and kill any organisms still present: **DISINFECT**.

Make sure you do not drink the water since disinfectants are dangerous for the health. Only qualified persons know what is proper to disinfect water. Remark the color and smell of the water now.

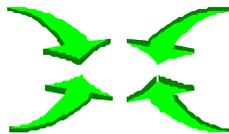
## OXYGEN-CARBON DIOXIDE

### Cycle

Photosynthesis releases OXYGEN  
into the atmosphere



Green plants,  
trees, and algae absorb the carbon dioxide  
by **PHOTOSYNTHESIS**



Burning of fuels release CARBON  
DIOXIDE



Animals and humans breathe the  
oxygen from the air



?

?



Dead organisms and feces are decomposed  
by bacteria and fungi and release carbon  
dioxide. The process is called  
**RESPIRATION.**



**THE AIR:**

### **The air cycles and Islam:**

Not many references in Islam talk about the air. In one instance, the Qur'an describes how the birds are using the air, its warm currents in order to fly.

*Do they not look at the birds, held poised in the midst of (the air and) the sky? Nothing holds them up but (the power of) Allah. Verily in this are signs for those who believe.*

[Qur'an 16:79]

Usually the air is referred as the ability to breathe into something to give it shape and life. Allah Ta'lah breathed into His hands to give life to the first man and the first woman. And it is true that the Oxygen we breathe from the air makes us live and helps purify our body. We do not make any effort to make our lungs go; it is a natural gift!

*And (remember) her (Mary) who guarded her chastity: We breathed into her of Our spirit, and We made her and her son a sign for all peoples.*

[Qur'an 21:91]

Prophets Iesa (Jesus) (PBUH) was given the miracle of life, after the permission of Allah was given.

*"And (appoint him) an apostle to the Children of Israel, (with this message): "I have come to you, with a Sign from your Lord, in that I make for you out of clay, as it were, the figure of a bird, and breathe into it, and it becomes a bird by Allah's leave: And I heal those born blind, and the lepers, and I quicken the dead, by Allah's leave; and I declare to you what you eat, and what you store in your houses. Surely therein is a Sign for you if you did believe.*

[Qur'an 3:49]

*Then will Allah say: "O Jesus the son of Mary! Recount My favour to thee and to thy mother. Behold! I strengthened thee with the holy spirit, so that thou did speak to the people in childhood and in maturity. Behold! I taught thee the Book and Wisdom, the Law and the Gospel and behold! thou makest out of clay, as it were, the figure of a bird, by My leave, and thou breathed into it and it became a bird by My leave, and you healed those born blind, and the lepers, by My leave. And behold! You brought forth the dead by My leave. And behold! I did restrain the Children of Israel from (violence to) thee when you did show them the clear Signs, and the unbelievers among them said: 'This is nothing but evident magic.'*

[Qur'an 5:110]

## The air cycles: pollution and facts:

### **THE SMOG:**

The earth's atmosphere has been polluted since long, in fact, since humans first began to use fire for agriculture, heating, and cooking. But, during the Industrial Revolution, people began to build cars and plastic products, cameras, etc. These new inventions made life more enjoyable, and it was affordable for many, but they were produced by industries which rejected toxic wastes directly into the water and the air. Therefore, since the 18th century, air pollution became a major problem in industrialized countries because nature could not handle that amount of pollutants released into its air.

**Urban air pollution** is nowadays commonly known as **smog**.

Smog is a mixture of carbon monoxide and organic compounds from incomplete combustion of fossil fuels such as coal, and sulfur dioxide from impurities in the fuels. As the smog ages and reacts with oxygen, organic and sulfuric acids condense as droplets, increasing the haze.

Another type of smog, called **photochemical smog** alters the air quality over large cities like those of California. The sky is charged with dark clouds and gives an impression of stormy weather. This latter smog is caused by combustion in cars, trucks, and airplane engines, which produce nitrogen oxides and release hydrocarbons from unburned fuels.

Sunlight causes the nitrogen oxides and hydrocarbons to combine and turn oxygen into ozone, a chemical agent that attacks rubber, injures plants, and irritates lungs. The hydrocarbons are oxidized into materials that condense and form a visible, pungent haze. This haze is also called **acid rain!**

In 1952, 2000 Londoners died of its effects.

Another important fact: Most pollutants are washed out of the air by rain, snow, fog, or mist, but only after traveling large distances, sometimes across continents.

### **SMOG is made of different substances:**

POLLUTING SUBSTANCES	SOURCES OF POLLUTANT FOR SMOG	HARMFUL EFFECTS

Sulfur Compounds	Burning coal and gasoline	Can kill plants and fish. Eats away at metal, stone, plastic, rubber
Carbon Monoxide	More than 80% from car exhausts	Nausea, dizziness, drowsiness, even death
Carbon Dioxide	Burning coal : gasoline, gas, wood	Too much can harm and cause Earth's atmosphere and ground to warm up
Nitrogen Compounds	Power plants, autos, diesel engines, home furnaces	Forms nitric acid and results in acid rain
Hydrocarbons	Auto and plane engines	Lung cancer

Industrial pollution comes from the burning of coal, oil, etc.

The black smoke you see reaching into the air from the chimneys of most industries is made of two basic chemical compounds known as **sulphur dioxide (SO<sub>2</sub>)** and **nitrogen oxides (NO)**. These two compounds are transformed into other compounds when they are in contact with the sun rays and the water in the air (water in the air takes the form of clouds or the evaporation of water coming from seas and plants).

This is called a **Chemical Reaction**.

What is a Chemical Reaction?

Imagine you want to bake a bread. You will need separate and very different elements such as water, maybe eggs, flour and yeast. As you mix the elements together, you cannot recognize anymore the eggs from the flour, and the water makes the mixture become like a smooth ball to form the dough. Add some yeast and a chemical reaction happens. How do you know it is a chemical reaction? You know it because the dough rises; some kind of magic happens, something you could not obtain without the yeast!

In the pollution process, a very different chemical reaction occurs.

SO<sub>2</sub> and NO<sub>x</sub> become something else when mixed with the sun rays and the water present in the clouds or the atmosphere.

Oxidation means that some parts of the product will be detached and recomposed differently.

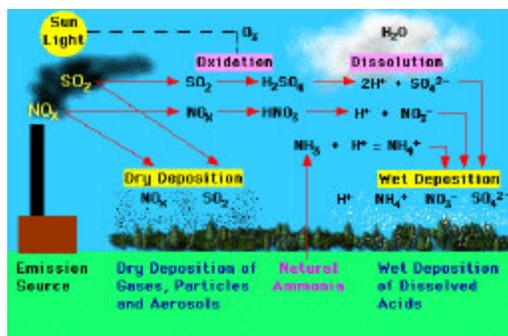
Have you ever seen a metal rusting? This is an oxidation; the oxidation is caused by a chemical reaction. The bright metal becomes red in contact for a certain time with water and the air.

See, in the figure below, SO<sub>2</sub> and NO oxide. The elements obtained by oxidation are dissolved.

Do you know what the word dissolution means?

Put a lump of sugar in a glass of water, then watch. What happens? The sugar disappears and the water tastes of sugar, right? This is called a dissolution.

It is pointless at this stage to explain all these chemical reactions. The most important thing to remember is that some dangerous chemical elements are dissolved into the atmosphere and fall into the earth. This is called the **Acid Rain** because SO and NO are transformed into acids. We will see later what the word acid means.



Picture courtesy of: <http://royal.okanagan.bc.ca/mpidwirn/atmosphereandclimate/acidprecip.html#a>

60-70 % of the acid deposition coming from emissions of **sulphur dioxide (SO<sub>2</sub>)** is from human origin.

The sulphur dioxide is obtained from coal burning, by smelting metals, volcanic eruptions adding to a local problems, and organic decay.

In Europe, emissions of **SO<sub>2</sub>** have been well reduced, about 40% in 20 years.

In Western Europe, emissions are almost 50% lower now than in 1980.

The reasons are the economic decline followed by the closure of factories, and the introduction of new technology to clean up emissions.

When in the air, sulphur dioxide can land on the Earth's surface in the form of dry dust, or it can be turned into acid by a chemical reaction in contact with the moist air (**H<sub>2</sub>O**).

What do the transcriptions So and NO mean?

They are the symbols of two basic elements in our natural world.

For example, plants release Oxygen that we breathe in order to ventilate our lungs and stay alive.

Oxygen's symbol is O. We release Carbon Dioxide from our lungs into the air; this Carbon Dioxide is inhaled by plants who need it to live. The Carbon' symbol is CO<sub>2</sub>. The symbol of

Carbon is C. CO<sub>2</sub> is only one form that can take the carbon knowing that our bones are made of Carbon, pencils are made of Carbon called Graphite, and many things around us are made of Carbon.

CO<sub>2</sub> means that an atom of Carbon bonds with 2 atoms of Oxygen. The equation could also be written that way: COO = CO<sub>2</sub>.

This meeting of two basic elements is called a **Chemical Reaction**.

What does SO<sub>2</sub> mean then?

It means that

---

In the following equation:



the basic elements add to each other.

Can you write this equation in a different way?



See how the elements add to each other. In this equation, SO<sub>2</sub> + H<sub>2</sub>O, we have:

How many atoms of Oxygen (O)? Cross out the wrong answers:

1	2	3
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How many atoms of Hydrogen (H)? Cross out the wrong answers:

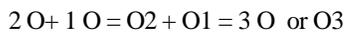
1	2	3
---	---	---

How many atoms of Sulphur? Cross out the wrong answers:

1	2	3
---	---	---

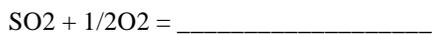
Add then one to each other as in a traditional addition:

You get:



The order the elements are written down follow an alphabetical order (H is before S which is before O).

Now, try to find out the solution to this equation or chemical reaction:



95 % of the **nitrogen oxides (Nox)** in the atmosphere are the result of human activities; 5% come from natural processes.

Here are several sources of nitrogen oxides. Determine if they are from human origin or natural origin, or both. Cross out the right answer:

Source	Human	Natural
Combustion of oil, coal, gas		
Bacterial action in soil		
Forest fires		
Volcanic action		
Lightning		

Here is the Chemical Reaction with the nitrogen dioxides (NO). Can you solve it?:



These chemical elements therefore are produced into the air and fall over the earth with the rain, the snow, etc. It is called **Acid Rain**.

**Acid Rain:**

Sulfur (from coal) & nitrogen (from high temperature flames) & oxides (from cities & industry)	? chemical reactions with ? moisture in the air	»» falls many miles away Sulfuric & nitric acids form acid rain ??? Affects Trees + rivers
--	--	--

That word acid rain is formed by two words: "acid" and "rain".

What is acid?

What happens when acid falls on something: an object, an animal or food? If you do not know, try to look at the exhaust pipe of old cars, and you will have a good hint:

---

**Acid** occurs naturally in nature.

If you want to remember what acid is in food, remember that **ACID = SOUR taste**.

Of course, other acids that do not come from food are very dangerous!

Where can you find acid?

In drinks: \_\_\_\_\_

In fruits: \_\_\_\_\_

In candies: \_\_\_\_\_

Cite a few dangerous acids; usually they are products parents try to hide in the cabinets for the safety of their children:

---

What happens after a few days when you deep a piece of meat into coca-cola?

Describe:

---

Along with acid, there is in nature what we call **basic**.

If you want to remember what basic is, remember that **BASIC = BITTER taste**.

What taste bitter in food?

---

**Activity:**

**ACID BASE SCALE.**

Use a Ph paper or strips of boiled red cabbage until they become white. Then, deep the paper into diverse products you will find around the house. Read the color on the paper.

Acid scale Color chart:

..Pink..	..Orange..	Green	Black
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Acidic lakes show a rapid decline in fish numbers. Lake life cannot reproduce or they die of cancer like illnesses. The important reduction in plant nutrients (potassium, magnesium, etc) and the difficulty to absorb these nutrients due to root damage causes the decline in plant growth rates.

Many important soil organisms die below a pH of about 6.0 which upsets the decomposition and nutrient cycles.

In humans, this process causes respiratory problems and other illnesses due to the food chain cycle.

There are several things that can be done in order to alleviate the problems of acid deposition. The pH of lakes can be increased by a technique called liming (deposition of hydrated lime or soda in the lake).

Environmental regulations can limit the amount of sulphuric pollution released in the atmosphere from industrial sources.

It would help to reduce the number of motor vehicles and to return to walking and biking or generalize the usage of community buses. New cars must be more adapted to prevent pollution, and many companies are working on this.

There have been some progress so far, but everyone has to participate in order to make the Earth more livable.

#### The GREENHOUSE effect:

The **global warming** is another effect of the smog.

What is it?

It is an increase in the earth's temperature due to the buildup of gases such as carbon dioxide in the atmosphere. Carbon dioxide and other gases, known as **greenhouse gases**, reduce the escape of heat from the planet, but they block radiation coming from the sun. Because of this, the temperatures will be rising 1° to 3.5° C (1.8° to 6.3° F) by the year 2100.

Thus, this global warming would affect climate, crop production, it would disrupt wildlife, and raise the sea level because more glaciers would melt into the ocean.

However, some people are against a negative interpretation of changes in weather. They say that if you look far back in the world history, this is not unusual.

Using logic and your knowledge of prehistoric times, can you farther explain this point of view?

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### OZONE:

Excessive production of chlorine-containing compounds (CFCs) (compounds used in refrigerators, air conditioners, and in the polystyrene production) has depleted the **ozone layer**, creating a hole above Antarctica. This lasts for several weeks each year. Consequently, as the earth is not protected, during this time, against the negative rays of the sun, aquatic and terrestrial wildlife, human health in high-latitude are threatened.

What can you do to protect yourself against negative sunrays? To protect plants?

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### Air quality:

However, air quality is improving because of national laws setting air quality standards. It is estimated that new cars of the 21<sup>st</sup> century will emit 99% less hydrocarbons and carbon monoxide than in the 1970's.

Greater use of electricity replacing other sources of energy in manufacturing, services and household appliances. New technologies allow businesses to recycle gases and particules before their release into the air.

### Indoor air:

If we are doing something nationally, the effort must continue inside our own homes!

What is indoor air quality?

ETS is a mixture of the smoke given off by the burning end of a cigarette, pipe, or cigar and the smoke exhaled from the lungs of smokers.

The health effects can start after few years; they are eye, nose, and throat irritation; headaches; lung cancer; may contribute to heart diseases. Specifically for children, increased risk of lower respiratory tract infections, such as bronchitis and pneumonia, and ear infections; build-up of fluid in the middle ear; increased severity and frequency of asthma episodes; decreased lung function.

Particle levels in homes without smokers or other strong particle sources are the same as, or lower than, those outdoors. Homes with one or more smokers may have particle levels several times higher than outdoor levels.

The steps to reduce indoor pollution are simple.

Do not smoke in your home or permit others to do so. Do not smoke if children are present, particularly infants and toddlers. If smoking indoors cannot be avoided, increase ventilation in the area where smoking takes place. Open windows or use exhaust fans. Do not smoke in the car.

The high concentration of smoke in a small, closed compartment substantially increases the exposure to other passengers. Respect yourself, respect those who live with you. Even though smoking is not a great problem among Muslims, still some families re exposed to this problem, and we must be aware that the practice is not recommended in Islam because it endangers our health and the health of our families, of our neighbors too!

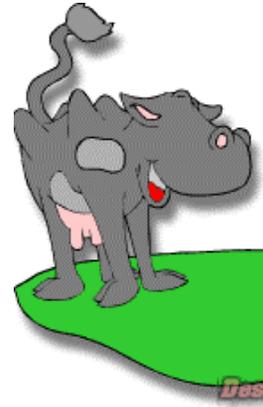
Another problem we might consider as far as indoor air is concerned is that the usage of chemicals inside the house can be dangerous, especially the use of pesticides and sprays. Reduce their usage as much as possible and replace them by natural products like repellents or natural detergents.

Dust also can provoke or worsen asthma and conditions inside the house. Make sure you clean the house thoroughly to get rid of the dust; some machines or filters help as well. Ask around!

**NITROGEN**  
**Cycle:**



**NITROGEN** in air  
( $N_2$ ) from Nitrate( $NO_3$ )



Animals eat plants

Go back to Earth



**AMMONIA** ( $NH_3$ )



(eat nitrate)



**NITRATES**  
( $NO_3$ )



(Dead or feces)

Organic materials decompose  
Produce Amonia ( $NH_3$ )



**THE SOIL,**

**THE GROUND, THE EARTH**

Photo: [www.freestockphotos.com](http://www.freestockphotos.com)

### **How is the earth or soil viewed in Islam?**

First of all, Allah Ta'alah created human beings from clay. Contrary to the angels made of a delicate fire, humans were made out of a common piece of earth. Not only was Prophet Adam (PBUH) created from the Earth, but also Allah Ta'alah built the Earth for him and his offsprings, so that they may enjoy it and be tested on it. The Earth was made for us so that we could prove ourselves as human beings and be selected among the best men and women to go to Paradise.

In order to be selected as “honor students” of the teachings of Allah Ta'alah, humans were made the guardians of the Earth. Men will be judged considering what they have done to protect it and to make it a more enjoyable place for every living creature. Those who fail to protect the Earth and Islam on Earth consequently will be the dwellers of Hell in the Hereafter.

Many times the Qur'an tells about men who are not grateful for the gift of the Earth, and how they will be punished for that.

Many times it is revealed that nothing can be done or grown without the permission of Allah. When we plant trees or vegetables, anything, we should say *Insha Allah*, “In the name of Allah” because we cannot make these plants grow unless Allah ears our duas and help them grow.

Many times it is mentioned that the earth could not live without water, that water is sent by Allah in order to revive what was dead.

*Verily! We made that which is on earth as an adornment for it, in order that We test them (mankind)- as to which is best in deeds.*

*Verily what is on earth we shall make but as dust and dry soil (without growth or herbage)*

[Qur'an 18:7-8]

*Who has made the earth your couch, and the heavens your canopy; and sent down rain from the heavens; and brought forth therewith Fruits for your sustenance; then set not up rivals unto Allah when ye know (the truth).*

[Qur'an 2:22]

But the earth, the possession of land, can be a reward for those who show piety and obedience to Allah:

*And We made a people, considered weak (and of no account), inheritors of lands in both east and west, - lands whereon We sent down Our blessings. The fair promise of thy Lord was fulfilled for the Children of Israel, because they had patience and constancy, and We leveled to the ground the great works and fine buildings which Pharaoh and his people erected (with such pride).*

[Qur'an 7:137]

The earth in Islam is therefore a witness of our actions. This idea is confirmed in the following verses. When the son of Adam saw that he could not cancel into the earth his brother that he had killed, the earth was the witness of his exaction.

*Then Allah sent a raven, who scratched the ground, to show him how to hide the shame of his brother. "Woe is me!" said he; "Was I not even able to be as this raven, and to hide the shame of my brother?" then he became full of regrets.*

[Qur'an 5:31]

The earth reveals also the truth about the soul of some people who have deeply provoked the wrath of Allah Ta'alah. When the earth rejects the bodies of some people, it means the person did not deserve to be buried there; even the earth does not want of it.

*There was a Christian who embraced Islam and read Surat-al-Baqara and Al-Imran, and he used to write (the revelations) for the Prophet. Later on he returned to Christianity again and he used to say: "Muhammad knows nothing but what I have written for him." Then Allah caused him to die, and the people buried him, but in the morning they saw that the earth had thrown his body out.*

*They said, "This is the act of Muhammad and his companions. They dug the grave of our companion and took his body out of it because he had run away from them." They again dug the grave deeply for him, but in the morning they again saw that the earth had thrown his body out.*

*They said, "This is an act of Muhammad and his companions. They dug the grave of our companion and threw his body outside it, for he had run away from them." They dug the grave for him as deep as they could, but in the morning they again saw that the earth had thrown his body out. So they believed that what had befallen him was not done by human beings and had to leave him thrown (on the ground).*

[Hadith (Sahih Bukhari) (English Translation by M. Muhsin Khan) 004.056.814-  
Virtues and Merits of the Prophet (PBUH) and his Companions- Narrated Anas]

The Qur'an reveals that bad people would destroy plants and trees on Earth; it is a sign of a bad heart and a soiled soul. On the contrary, Muslims were always forbidden to cut trees or kill anything living on earth, except in dear emergency or out of necessity.

*When he turns his back, His aim everywhere is to spread mischief through the earth and destroy crops and cattle. But Allah loves not mischief.*

[Qur'an 2:205]

Everything coming from the earth must be pure for the Muslims. Muslims do not pollute their bodies with food that is forbidden like pig, and Muslims do not pollute their souls by eating of foods that have been stolen or taken unjustly.

Not only the products of the earth must be shared with the poor and those who ask from it like the birds or animals, but also the soil itself does not belong to the peasant. Actually, the one who can revive the land possesses the land. Private property does not exist in Islam, so the earth belongs to everyone who can take care of it!

*O you people! Eat of what is on earth, Lawful and good; and do not follow the footsteps of the evil one, for he is to you an avowed enemy.*

[Qur'an 2:168]

*O you who believe! Give of the good things which you have (honourably) earned, and of the fruits of the earth*

[Qur'an 2:267]

Finally, the earth is a place to learn and discover. Muslims are encouraged to travel and ponder about how the natural environment works and has been created by Allah, so they may be grateful.

*Many were the Ways of Life that have passed away before you: travel through the earth, and see what was the end of those who rejected Truth.*

[Qur'an 3:137]

The earth is diversity, diversity of its people, its geography, its fauna and flora; it has been spread out for us to explore it and meet with different people so we might learn to respect each other and help each other:

*"He Who has, made for you the earth like a carpet spread out; has enabled you to go about therein by roads (and channels); and has sent down water from the sky." With it have We produced diverse pairs of plants each separate from the others.*

[Qur'an 20:53]

### **THE SOIL: POLLUTANTS AND FACTS:**

The soil is a mixture of mineral, plant, and animal materials that accumulate during thousands of years. The soil is essential for most plant growth because it contains the plant food!

Soil pollution is an accumulation of toxic chemical compounds, salts, pathogens (disease causing organisms), or radioactive materials that have a negative effect on the environment.

Pollution was often due, in the past, to ignorance: people did not know good soil management methods, so they have contributed to the degradation of soil quality by sheer ignorance.

Pollution and erosion are the main consequences of this ignorance.

Peasants overused chemical fertilizers, pesticides, and fungicides that upset the natural way of things, and destroyed useful organisms such as bacteria, fungi, and other microorganisms along with the pests.

Bad irrigation practices in areas with poorly drained soil have caused salt deposits that inhibit plant growth.

Problems of soil erosion existed since the Middle Ages. People had noticed that crop rotation was the best way to let the earth take a rest as people go to sleep. Earth is alive; it needs to regenerate itself after harvest. Now, we know a great deal about how to take care of the soil.

Some people in the world have already implemented natural ways of getting rid of pests and cultivating crops without destroying the soil.

In USA some people practice **sustainable farming**, called “regenerative agriculture”. They are expert in ridge-tilling. They do not use herbicides anymore, but they turn the ground into rows of tiny ridges and valleys. Before fall harvest, they plant oats, hay in the valleys. During winter, the plants protect the soil from erosion and inhibit weeds before it is time to plant the crops on the ridges. They practice crop rotation. They compost manure to enrich the soil. They do not let their cattle graze but feed them on grains.

Only 25 % of ice-free land is suitable for agriculture in the world. We use half of it for crops. Soil replenishes itself and renews itself indefinitely if well cared of. In Southeast Asia, rice paddies are as fertile as before because the soil is constantly nurtured.

They are ways to prevent soil erosion and water runoff:

- 1) contour plowing: plow across the hill instead of up and down
- 2) strip-farming: plant different strips of crops so that when one sort of crops is harvested, the other one stays in the soil to keep from running downhill.
- 3) Tied ridges blocks the water from leaving the field. They are strips crossing each other at right angles.
- 4) Terracing: shapes the land to create level shelves of earth to hold water and soil.
- 5) Planting perennial species, i.e., that grow for more than 2 years like forest, tea, coffee crops.
- 6) Leaving crop residues.

#### ACTIVITY:

Create your own terracing like in this picture! Have fun creating your own botanical garden. It is useful as well as beautiful. Build your own garden for real or build a model, making sure you have a water drainage system available. Then pour water on it; see how the earth absorbs the water.

### Forests:

Nearly 5% of New York City street trees die every year.

Urban trees are usually planted where it fits, not where it is most suitable for them!

Often the concrete has already been laid, so crews tear out a 4-by-4 foot piece of concrete, put in a 4 by 4 by 4 plant and hope for the best!

The average life of a tree in urban environment is 4 to 7 years, a real disaster if one considers that trees, in good conditions, can live many centuries! What a waste!

The problems are:

Insufficient soil and nutrients for growth; insufficient space for the root structure to grow (either roots crack the sidewalk or their growth will be stunted); insufficient water or excess water in the tree pit; insufficient oxygen: tree roots need enough air to capture a sufficient amount of carbon dioxide to convert Carbon into Oxygen.

Furthermore, the salt used to treat roads, especially when it snows, damages the tree; the heat as well: concrete radiates heat and the reflections from the shop panes are not good either. Bumps and bruises damage the trees since people are in the habit of tying heavy objects such as bicycles to them. Pollution plays its role: smog, ozone, and urine.

Finally, a road or sidewalk joint repair severs roots, especially those of older trees that are more sensitive; roots of young trees can still grow back. Some trees however still thrive in cities going to 15 years of age! But is that enough?

Knowing what precedes, what advises and solutions would you provide for the urban architect who designs towns?

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But this is not all. Americans are so interested in very big things that the Sequoia trees can well be in danger. When the biggest trees in the world are discovered, people come to see them from all over the US and from abroad. Tourists destroy other trees by using their cars around the non-frequented paths, bringing buses of tourists, and walking around the trees, so the earth becomes packed around the roots, making it impossible for the trees to breathe through their roots.

What do you think of this craze about the tallest trees in the world? If you were a forest guard, what would be your attitude? Would you try to hide the trees, mislead people by giving them false directions or would you create ways of making them happy without endangering the trees?

Propose your solutions in both cases:

Deforestation is a crucial problem on Earth since we draw the oxygen that we breathe from the forest, plants and algae. Many species from the **fauna** and **flora** have already disappeared due to this problem.

While **temperate forests** slightly expand due to reforestation and abandonment of marginal farmlands, **tropical forests** are shrinking rapidly and 1 or 2 species are lost every day. People look for tropical forest wood because the quality of the wood is good, and the countries that sell it do not have fixed regulations concerning cutting down trees. If they have regulations, these countries are developing countries and need the money, or they are so corrupted that they can do whatever suits their greed.

In 1990, Brazil cut down 8 million of hectares of trees.

In the 1900's, it has been estimated that 20 million square km of tropical lands covered with canopy forest existed, i.e., an area twice as big as the US.

200,000sq km are cleared each year due to farmers and commercial logging or fuel wood gathering.

However, some countries made a real effort to counteract deforestation.

China reforested 4.5 million hectares per year during the last decade.

Korea and the Soviet Union seem to have reforested effectively.

Annual timber growth in the US now exceeds harvest by 37%. The number of wooded acres in the US has grown by 20% between the 70's to the 90's. This is most encouraging, but still there is much to do concerning the protection of Nature.

	Total cleared forest area (thousands of hectares)	Annual clearing rate	Annual reforestation	% lost annually
Brazil	357,80	8,000	561	2%
Indonesia	362,40	1,500	173	4%
Indonesia	113,95	900	164	0.3%
Ivory Coast	4,48	290	8	6%
Costa Rica	20,96	255	25	1%
Malaysia				

What can we do to prevent tropical countries to sell away their forests? What kind of measures could be taken? Use logic and your imagination to answer these questions:

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## Answers about water pollution:

Because of sewage problems, the Thames, England, in 1850 was badly polluted. Untreated sewage can act as a damaging fertilizer causing excessive growth of plants and algae. The organic matter in sewage acts as food for bacteria and as they use it they withdraw all the oxygen from the water, thereby killing the fish. This is called EUTROPHICATION="over-enrichment:

Industrial wastes may contain chemicals and contaminants.

Drums of toxic wastes dumped at sea or washed overboard in a storm are washed up on the beach. Those lost in the deep may leak.

Phosphates play the same role.

But Kudzu -vine plant cleans the water from pollution as a part of being beautiful.

Water may become choked with decaying algae, which severely depletes the oxygen supply.

This process, called eutrophication, can cause the death of fish and other aquatic life.

Agricultural runoff may be to blame for the growth of a toxic form of algae called Pfiesteria piscicida, which was responsible for killing large amounts of fish from the Delaware Bay to the Gulf of Mexico in the late 1990s.

The wearing away of topsoil by wind and rain causes water pollution. Soil and silt are washed away from logged hillsides, plowed fields, or construction sites, then when falling in water ways can clog them. This process can also kill aquatic vegetation and alter reproductive cycles of fish by covering the gravel beds that fish use for spawning.

The Amazing Story of Kudzu:

Kudzu was introduced to the United States in 1876, at the Centennial Exposition in Philadelphia, Pennsylvania. Many countries exhibited to celebrate the 100th birthday of the U.S.

Japanese built a beautiful garden filled with plants from their country.

The large leaves and sweet-smelling blooms of kudzu were loved by American gardeners who used the plant for ornamental purposes.

It was also used as forage.

It was also promoted for erosion control.

Farmers were paid as much as eight dollars an acre as incentive to plant fields of the vines in the 1940s. It was even called "the miracle vine."

But soon, it grew too well and could grow as much as a foot per day during the hot season, and as much as 60 feet per year. It grew like this all over the South, climbing trees, power poles, houses, etc.

While they help prevent erosion, the vines can also destroy valuable forests by preventing trees from getting sunlight and breathe.

Kudzu plants may take as long as ten years to kill, even with the most effective herbicides.

However, animals can graze on it, so it is useful.

People make beautiful and strong baskets out of the vines, as well as paper, medicine, jelly, syrup, dishes, since it is highly nutritive.

#### Answers about Chemical Reactions:



#### Answer: Origin of nitrogen oxide:

Source	Human	Natural
Combustion of oil, coal, gas	X	
Bacterial action in soil		X
Forest fires	X	X
Volcanic action		X
Lightning		X