S.O.S WATER

LIFELONG LEARNING PROGRAMME

COMENIUS MULTILATERAL SCHOOL PARTNERSHIPS PROJECT

S.O.S WATER

National High School of Natural Sciences and Mathematics

Friendrich - Schiller Gymnasium

Genito Lykeio Peristeriou

The National College of Compters Science

Çanakkale Anadolu Lisesi

Education and Culture DG

(Name of the programme)

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CANAKKALE ATHENS MARBACH

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SOS WATER project - summary

Main goals of the SOS WATER project

- to know and to promote the importance of water to the countries involved through research activities, partnerships with environmental institutions and experimental activities;
- to identify environmental problems related to water resources from each country through exchange of information with the partners;
- to identify the possible improvement solutions for environmental problems concerning water use and water quality through exchange of information between partners, study visits, research activities;
- to increase the IT abilities by achieving leaflets, brochures, the project's website, videos posted on youtube and on live@edu/Etwinning;
- to develop civic attitudes concerning ecological problems through scientific and artistic activities to improve water;
- to develop linguistic competencies and communication skills by using, besides English, the national languages of all the partners in the final project;
- to acquire basic transversal competencies: digital by creating the web page, leaflets, brochures; civic and interpersonal competencies by identifying an environment problem that is going to be ameliorated through team work and through working on attracting the interest of the local community; entrepreneurship competencies by creating an improvement

plan for the water wastage problem by developing and disseminating the results within the local community;

- to consolidate intercurricular activities through exchanges of scientific information and practical solutions to environment problems that are common to different countries.

Main activities

- creating and managing a website;
- development of logos, posters, brochures;
- conducting hydrographic maps, comparative charts;
- developing and implementing plans for saving and improving water quality in schools and within the community;
- study visit to a cleaning water station;
- ecological cleaned area of the select river/lake;
- workshop for creating the ECO-dictionary;
- creating the photos exhibition;
- dissemination of results in school and community;
- organizing the mobility in partners countries.

Final products of the SOS WATER project

- the web page, maintained after the closing of the project;
- the saving and water quality improvement plan;
- an ecology club (H2O Club);
- the ECO - dictionary;

- the brochure on CD and on paper;
- ecological cleaning of two river/lakes and their surrounding areas;
- comparative hydrographic maps of the partner regions and evolutional charts;
- “practical methods and tools for saving water” leaflets, exhibitions photos and drawings, the SOS WATER movie.

H_2O Club

Main goals

- Acknowledging and promoting the importance of water through research, experimental and dissemination activities and through educational partnerships with environment institutions, as well as schools.

- Identifying the problems of the local water resources, as well as from different areas of the country or Europe, by sharing information with other schools county or Europe.

Paintings by: *E. Teodorova, M. Angelova, M. Gaydarova, H2O Club Bulgaria*

Visit to the Water Cleansing Station Bistrita, Neamt- Romania

Physical analysis - Turcia

- The development of civic abilities, concerning the ecological problems of the community, by involvement in scientific and practical activities to improve the quality of the water, as well as reducing the amount consumed.

Analyzing the water from the Murr River, Marbach- Germania

Analyzing the water - Turcia

- The growth of the students implication level in educational opportunities, with the aid of practical outdoors activities.

Cleaning the beach - Turcia

Visit to a Bulgarian water station

- Identifying solutions for decreasing the environmental problems, as far as the use and quality of the water is concerned, through shared information, case studies, re-search visits and documentation activities.

members of BULGARIAN H2O CLUB


Tatyana Arnaudova


Mariana Soultanova


Alex Schweizer


BoyanStoya


Boryana Kaneva


Boris Bongalov


Denitsa Hristova

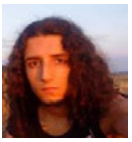

Boris Kyuchoukov


Boyan Levashki


Dario Dionisi


Elitsa Zaharieva


Iliana Djovanova

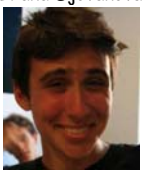

Lyudmil Stoyanov


Iva Vasileva


Magdalena S.


Martin Dimitrov


Lyubomira L.


Stanimir Kalchev


Serkan Pashev


Petya Georgieva


Simona Petrova


Tomas Bayryakov


Yordan Yotov


Tony Koteva


Stanimira G.


Georgi Stoev


Teodora E.


Nikolai Mitov


Vanesa Zlatanova


Alex Farfarov


Yana Vladimirova

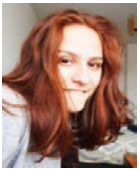

Vesela Koteva


Yana Doncheva


Julita Taskova


Mihaela Georgieva


Maria Georgieva


Ivelina Pavlova


Stefka Padalska

members of GERMAN H2O CLUB

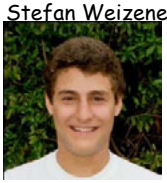
Ms. Nicole Finger

Mr. Christian Johrend

Stefan Weizenegger

Jojo Bergold

Julian Volzer



Kai Kubler

Linda Freiberger

Marcel Blind

Maxi Muller

Maxi Stiegler

Maximilian Rupp

Niels Reinhold

Rebecca Ullrich

Sasha Ley

Talmon l'Armee

Florian Peterson

Vincenzo Carnuccio


Komi Margarita


Mougiakou A.


Manoli E.


Papaioannou E.


Mitropoulos V.


Zace Bjorni


Katsikis A.


Karagianni E.


Papathanakos


Mathiou A.


Mpardani Anna


Vlachakis E.


Desara D.


Velentzas A.


Berberi K.


Adamopoulos D.


Eleftheriadi D.

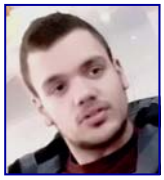

Tsiapa A.

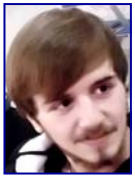

Koumarianos I.


Damala E.


Panagiotou Zoi


Kolia M.


Kattis O.


Chatzipanagiotou Ch.


Markopoulou K.


Mpaliouskas S.


Tatsi E.

members of
GREEK H2O CLUB


Michalopoulou P.


Lazou P.

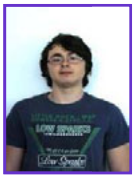

Papapanou A.


Antoniadou M.


Katsiveli S.


Kosmas D.

Aflorei Alexandra



Andrei Măzăreanu

Florina Barbu

Diana Turnea

Laura Onu

Adriana Letos

Alexandru Iovu

members of

ROMANIAN H2O CLUB

Bianca Cojocaru

Ingrid Botescu

Lăm âiţa Traistă

Lorena Strechie

Olivian Savin

Marina Budău

Alina Dumitruț

Țăranu Simona

Raluca Costandache

Roxana Mihăilă

Alexandra Şerban

Daria Şchiopu

Tudor Ciurezu

Andreea Iercoşan

Alexandru Gherghelaş

George Barcan

George Morariu

Mădălina Pascaru

Claudiu Roşu

Raluca Ciobanu

Constantin Pavăl

Maria Berea

Taina Grigoriu

Elena Irimia

Gheorghe Manolache

Mariana Mîndru

MEMBERS OF TURKISH H2O CLUB

İlke Erdoğan

Elif Gönen

İrem Av

Yağız Öztürk

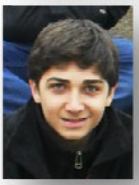
Bora Ateren

Övkü ERTEN

Kaan Sarioğlu

Bihter Çakir

Selda Çetinkaya



Doğa Kılıç

Dilara Yalçın

Osman Kırlı

Kamer Gür Arslan

Caner Çimen

Hydrographic maps

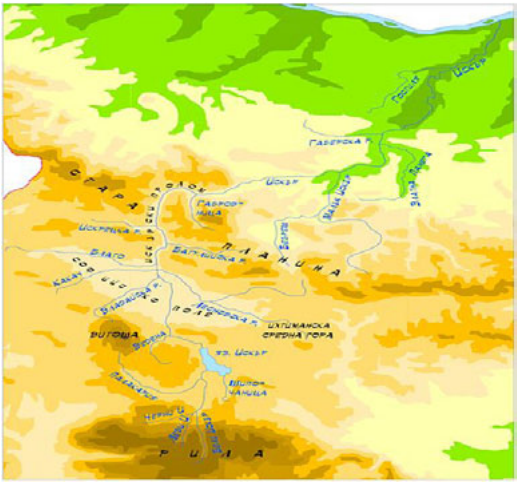
The central idea of the project was to bring into the students' attention the ecological problems that water puts up, by knowing the substances that could affect the quality of the water, but also by opening their way towards constructive and accurate reflections over what we can to do improve the quality of the water, in partnership with the able institutions.

It started from knowing the environment in which we live in and went on to comparing it with different environments from different countries and getting in contact with the better experimental practices, as well solving some water problems.

Thus, each partner country has selected a river which was to be studied from the point of view of physical qualities (temperature, clarity, conductivity), chemical qualities (the existence of various concentrations of phosphates, nitrates, nitrites, Ca, Mg, oxygen, pH, etc.).

The rivers chosen to be studies within the practical activities within the SOS WATER project are: **Iskar** (the river running through Sophia, the capital of Bulgaria), **Murr** (a river near Marbach am Neckar – Germany), **Kiphisos** (a river near Athens, the capital of Greece), **Bistrita** (a river crossing nearby Piatra Neamt – Romania), **Sarıçay Creek** (a river nearby Kanakkale, Turkey).

Hydrografic map of Iskar river - Bulgaria



Fact Sheet:

Longest in BG

Length - 368 km

Source elevation - 2,500 m

Basin area - 8,646 km²

The **Iskar** is formed by three rivers, the Chèrni (black) Iskar, Bèli (white) Iskar and Lèvi (left).

After descending from the north slopes of Rila, it fills the Iskar Reservoir—the largest in Bulgaria and the Lake Pancharevo. The river runs near Sofia and passes through a rocky gorge in the Balkan Mountains. This is the main source of water for Sofiyska voda, the water and sewerage company in Sofia.

Hydrografic map of Marbach am Neckar - Germania

Kifisos river

Basic information

- **River springs** : mountains Parnitha, Penteli .
- **River basin** : 361 Km²
- **Length of river** : 22 Km (14 Km in the city area and 8 Km out of the city)
- **Depth of river:** mouth in Saronikos bay 9,5 m .

In the southern part, the river flows for 14 km under the highway named Kifisos Avenue.

The north part of the river (from the springs to the area called **"Three Bridges"**) is open with rich flora .

MAJOR PROBLEMS

- Over the past decades Kifisos became a flowing garbage dump and repository for toxic industrial waste as well as illegal construction.
- From a "water artery" it became a heavy "traffic artery" as for its final 15 kms it is channelled under a highway.
- Today, the river is inaccessible to the public for most of its length, and no longer seems to belong to the town .

Hydrografic map of Neamț - România

Sarıçay River

Basic information

Sarıçay arises from Mount IDA located in Çanakkale with a length of 40 km.

It is the shortest river in Çanakkale

It flows into the Dardanelles in the center of Çanakkale City.

Its minimum flow rate is 15-20 m3 and its maximum flow rate is 1300 m^3

Atikhisar Dam which is the vital water source for Çanakkale was built on Sarıçay River between 1965-1966 for drinking, irrigation and preventing flood.

In the boundaries of Çanakkale there are approximately 300 companies affecting water resources.

Sarıçay River flows in yellow colour especially when it rains too much that's why we call it Sarıçay (yellow creek) in Turkish.

MAJOR PROBLEMS

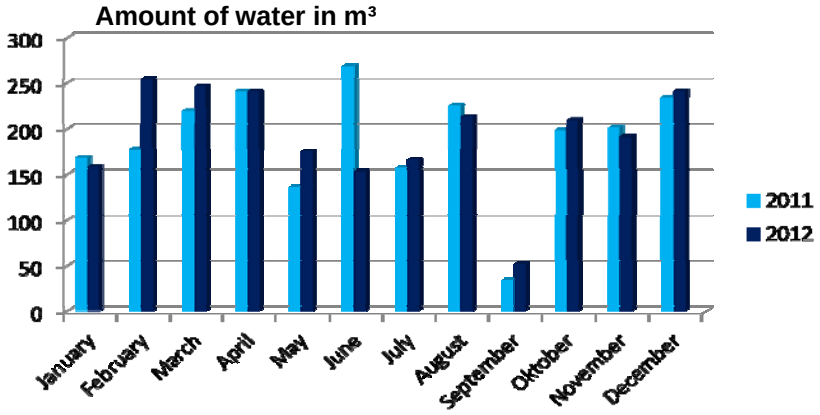
- Sarıçay River is exposed to sewage and waste water from Çanakkale.
- Pesticides used in agriculture by the farmers affects the water quality of the river.

The water saving plan

By Stefan Waizenegger, Sascha Ley, Marcel Blind - Friedrich Shiller Gymnasium in Marbach(Neckar), Germany

One major task of our project is to reduce the water consumption in school.
We have collected ideas for our "***Water Saving Plan***". This simple plan is the work of the last two years and this plan will serve as evidence of our hard work.

To start with, we assessed the water consumption in our school over the last two years and put the data into a diagram to show the amounts more perspicuous.



Our next aim was to find out whether this water consumption is high or low. It turned out that at the time the FSG-Marbach was already saving a lot of water. We then turned our attention to find ideas on how to save even more water. Our first "Water Saving Plan" was finished just before our first mobility. This took place in Bulgaria where we exchanged ideas with the other

participating schools. We updated our “Water Saving Plan”. Until the mobility to Romania our plan was not really based on a lot of facts. To correct this we did some research on the feasibility of our plans. This included looking at the costs and counting and therefore evaluating our present facilities. This additional information has now been added to the “Water Saving Plan”. On the following pages you will find an abridged version of our most up-to-date “Water Saving Plan”.

The complete plan can be viewed on our website: ***www.sos-water.eu***

Methods

Attach a flow reducer to all water taps in the school

- A flow reducer adds more oxygen to the running water, but there is still enough water to wash one’s hands. With more oxygen added, less water from the tap is needed.

- A flow reducer as displayed, is already profitable after one month in use, because it saves up to 60% of water and energy. Also, it only costs Euro 5.90. So it’s very sensible to install them, especially in rooms which have a high usage of water, e.g. chemistry or NwT.

Waterless Urinals

- Waterless urinals work, as you may guess, without water. This is only possible because of the so called “lotus effect”, meaning that the urine just rolls off.

An average flush of a urinal consumes three liters of water.

A waterless urinal saves a lot of water, but on the downside they are very expensive. In the newly renovated buildings, waterless urinals have been installed, but we don't think the school will be able to afford them for the older buildings. The main problem is the cost. The school would have to pay €5500 to €6000 per urinal.

Water save- *Button for toilets*

Modern flushing tanks have got two tanks inside: One with three liters and one with six liters.Or you can just put a brick into the tank.

There are two problems: Firstly, most of the tanks are built into the wall and secondly, you have to buy new tanks. So, therefore not recommended.
But, one can put a brick inside the tank, which is positioned in front of the wall, where one can just open it. A brick is cheap and saves three liters of water.

Use rainwater for toilets

We can use the roofs, but there wouldn't be enough water, so therefore not recommended.

Use rainwater to clean the school

The school is cleaned with water only a few times a year, so we should install a tank for rainwater.
This would save up to 2000 liters a year.

Chalkless boards

There are boards with pens like a felt tip, but you can erase them. Such boards like these are very expensive, so therefore not recommended.

JUST THINK how YOU can save water!

Just think a little bit about your water consumption at school.

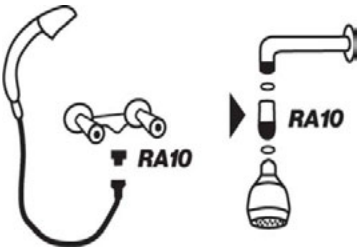
You needn't wash the sponge a hundred times before you clean the board, because half of the water ends up on the floor and not on the board.

When you wash your hands, make sure that the tap is turned off properly, so it doesn't continue dripping.

The Water Saving Plan

by Romanian team

Technical measures:



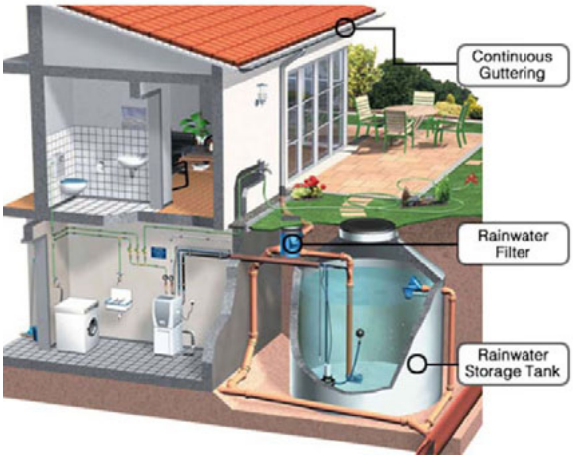
- Installation of shower head aerators which reduce water consumption by up to 30%;
- Replacing classic blackboards with modern white boards or smart boards;
- Installing waterless urinals. Waterless urinals work, as you may guess, without water. This is only possible because of the so called “lotus effect”, meaning that the urine just rolls off;

- Stop all water losses by insulating or changing water pipes;
- Changing the toilet tank with ones of a smaller volume or installing double flush water tanks, to limit consumption. It also works to put a brick in the tank;
- Changing the sink with some special optical sensor / flowlimiter / automatic closing. All these types of sink stop water after a certain time.

Educational measures

- Do not throw trash in the toilete or sink, their removal consume plenty of water;

- Using the dishwasher / washing only full load;
- Organising a March For Water every year to show people the importance of water and how to save it.



Alternative sources

"The Precious Drop" method of obtaining analternative source of water, which can be used to wet thetrees and plants in the park in front of the school, wash the school yard and the sports field;

Using rain water means the school can use this water to things it didn`t before, because of the high cost of water (improving the school`s park, planting flowers, trees).

By ÇANAKKALE ANADOLU LİSESİ

Saving water methods in school

- We put mulch around plants to reduce soil water loss.
- We hang poster and stickers everywhere especially on the mirrors in the toilets
- We put plastic bottles full of water in each of the toilet tanks in our school.

Activities to raise awareness

- We prepared a brochure about tips for saving water and hand out it to people in our town.
- We organized a "Walk for Water" event We walked 6 kilometres to symbolize the daily trek women and children make everyday in Africa to collect water.
- We prepared a funny and informative presentation for kids and present it in a kindergarden. After the presentation we made some experiments with them.

Saving water tips

Install water saving shower heads and low-flow faucet aerators.
Install an instant water heater on/under your kitchen sink.
Use your washing machine and dishwasher only when they are full
Install a drip irrigation system.
Don't use the toilet as an ashtray or a waste basket
Collect the water you use for fruits and vegetables, then reuse it to water plants.

Water quality improvement plan

Ideas about improving water quality

Made by the Turkish team

Water Pollution

- Use environmentally-friendly household products
- Apply natural pesticides and fertilizers
- Avoid littering in rivers, lakes and oceans

Air Pollution

- Choose efficient, low-polluting models of vehicles;
- When possible use public transportation walk or ride a bike;
- Plant trees

Thermal Pollution

- Avoid using more energy than necessary;
- Burn less coal, oil or gas;
- Reduce Temperature and Volume of Discharge;
- Store and Reuse Heated Water.

Soil Pollution

- Use organic, biodegradable herbicides and pesticides whenever possible;
- Plant native species and plan your plantings in a way that minimizes run off;
- Reduce, reuse and recycle minimize the amount of trash to our landfills and recycle, especially like batteries, tires and plastics.
- Dispose of household chemicals properly.

Radioactive Pollution

The disposal of radioactive material must be safe and secure.

Ideas on how to improve water quality

Made by Stefan Waizenegger, the German team

Outline

Introduction

Water is a vital resource. For this reason, it must be protected. Water pollution may not be a it is a huge problem in many other countries and could potentially be one in ours. How can we decrease water contamination? First, it is important to understand the causes of water pollution. These are many and most of them are our fault. The following will show the reasons for water contamination and we will give methods on how to improve the water quality.

Reasons for water contamination

- ***Faecal and waste contamination*** **-** In countries like Germany with high standards of water treatment this is no big problem.Water treatment plants filter our water.

But Germany seems to be an exception: only 5% of the world´s wastewater is cleaned and filtered in water treatment plants. More often wastewater flows directly into the rivers and pollutes the environment. In addition many people are careless when throwing away their rubbish. A lot of garbage ends up in the rivers. Especially plastic is a big problem, as it is not biodegradable. The oceans are polluted by garbage. We have a carpet of plastic particles floating within the Atlantic. Beaches are awash with plastic garbage. Most tragically birds mistake the plastic for food, eat it and die with a full stomach.

- ***Biological contamination***

Biological contamination is often a direct result of faecal pollution. Wastewater is a perfect basis for bacteria to grow on. If it flows directly into our rivers, these start to grow in our streams. This can cause health problems and sicken the flora and fauna.

- ***Agricultural contamination***

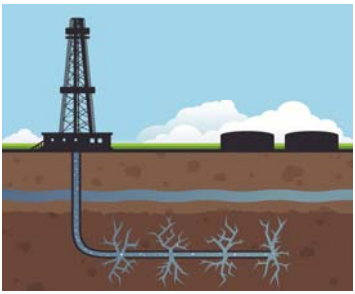
Today's agricultural industry produces far more crop on the same tract of land than a century ago. This is possible thanks to fertilizers and pesticides. These however contaminate our environment. Ammonium is a main component of nearly every fertilizer. The ammonium amount has to be evenly balanced in our water, as a high level leads to excessive plant growth and a very low level decreases plant growth, resulting in the collapse of the food chain.

If one uses too much fertilizer and this gets washed into the rivers by downpours of rain the ammonium amount will increase and the ecosystem will be endangered. The fauna especially will suffer. (*for further information on ammonium cf. "Chemical water quality determination of the Murr - Germany").*

- ***Industrial contamination***

The industry is responsible for most of the water contamination. In many countries the governments do not have laws concerning water protection. Indeed, many governments turn a blind eye to problems concerning water pollution caused by industry. Factories often do not filter their wastewater; hence a lot of hazardous material gets washed into the rivers. Particularly in China this is a great problem.

Thermal pollution is another aspect that should not be forgotten. Factories and power stations use river water to cool their systems. One might ask why this should be a problem. The hot water flowing back into the river heats the water. This results in a lower oxygen saturation, as this is temperature dependent. Lower oxygen saturation can therefore lead to mass fish demise and excessive algae or similar plant growth.



Another big issue is mining. Toxic substances, including heavy metals, can be washed into the ground water or

rivers. Especially the method of hydraulic fracturing is a ticking time bomb that will eventually pollute the environment and our water. What is hydraulic fracturing(in short: fracking)? Since our natural gas reserves are slowly but surely being depleted, the industry has found a new way of extracting the natural gas from shale layers. Enormous rigs are built. They drill holes of up to 5 kilometres in depth to reach the shale. Another hole is drilled horizontally cutting through kilometres of shale. To extract the gas bound in the shale, a mixture of water, sand and chemicals is injected into the holes with a pressure of 600 bar. The shale cracks, the natural gas is released and can be extracted. 40% of the fracking water stays in the earth.

This toxic cocktail eventually begins to rise and can diffuse into the ground water. Furthermore, methane can find its way into the ground water. The toxic cocktail of acids, oxidants, polymers, biocides, even radioactive material and methane pollute the environment. The surrounding waters turn toxic and flora and fauna die. In America it has been shown that the methane content in tap water can become high enough for this to be inflammable. A small spark is enough to set off an explosion of methane trapped inside a well. Trucks have to carry million litres of water to societies near former fracking sites.

- ***Catastrophes***

Everyone has seen the pictures: *The burning Deep Water Horizon,* a disaster of vast magnitude, the largest and most hazardous oil spill in history.

The ecosystem in the Gulf of Mexico was severely damaged. Plants and animals have died and are dying! The use of chemicals to dissolve the oil caused additional pollution. To get rid of the oil carpet, the oil was burned. But this did not only cause severe air pollution, but also left many other pollutants behind. But even so, until this day the oil has not completely disappeared. It will take a long time until the environment has recovered.

Further catastrophes that had and still have terrible effects on the environment were *the explosions in Chernobyl and Fukushima*. The radioactive contamination makes the water undrinkable. The animals die or mutate. The balance of the ecosystem has been hazardously disrupted.

Even global warming can be called a catastrophe. It has a similar effect as thermal contamination. Rivers will warm and plant growth will be increased resulting in lost habitat for fish and other water animals.

- ***Air pollution***

Normally one would not associate air pollution with water contamination. But acid rain is one example for the connection between the two. Particles of the polluted air can be bound in rainwater. This can spread into our ground water and rivers. However, the polluted rain is seldom toxic enough to harm us.

Methods

- ***Faecal and waste contamination***

The most important measure that has to be implemented is the construction of further water treatment plants. Although sewage plants are expensive, they are the only means of cleaning wastewater and ensuring that no toxic substances find their way into our rivers and even ground/drinking water. In addition, toxic or hazardous waste should be discarded of properly.

It is just as important to reduce the amount of waste, as building new sewage plants to clean the wastewater. Although plastic, the bane of our modern world, has its advantages, it is a big problem for our environment. Our drinking water should therefore be cleaned, so that we do not drink plastic particles which endanger our health. Furthermore, the already dumped plastic should be collected and discarded properly. This is where every one of us can help to improve the water quality. Or, one could even take one further step and start using less plastic. Maybe one day, if it is not too late already, we will be able to become independent of this material.

- ***Biological contamination***

If one is to stop faecal contamination, one most likely will stop biological pollution. As

explained in “Reasons for water contamination – faecal and waste contamination” these two causes are interlinked. Solving faecal pollution by building water filtration plants will most probably stop biological contamination to some extent.

- ***Agricultural contamination***

To restrain agricultural contamination, the government needs to act. New bills restricting land close to rivers and areas from which our drinking water is taken, to be used for agriculture, have to be introduced, especially when it comes to the use of pesticides and fertilizers. There is no need to ban the use of fertilizers and pesticides completely. Quite the opposite, we need these substances to grow enough crops for our consumption. But there should be some caution when it comes to our water supplies. Furthermore, one must protect these areas. This is the case with our river, the Murr *(for further information cf. “Chemical water quality determination of the Murr-Germany”*). Our Measurements show clearly that the agricultural use of surrounding fields does not really influence the water quality of the Murr. To ensure that these laws are abided by, the government has to institute annual controls. These will make sure that water quality stays as high as possible.

- ***Industrial contamination***

Again the governments must act. Instituting international laws forbidding water conta-mination by

unfiltered waste water and sewing companies disobeying them, will eventually help to increase the water quality. If the governments do not want to face their responsibility, they must be forced by their people. Every one of us could start or join a campaign wanting to improve the water quality; if not for the environment then for themselves. The companies could and should reduce water pollution. Wastewater should be treated properly. Only cleaned and filtered water should flow back into our rivers. Companies will react if there is global and public awareness of this problem.

Thermal pollution can easily be reduced. Instead of pumping the hot water directly into the rivers one could simply build large pools where the water can cool down to a reasonable temperature. One need not even reach the rivers temperature. The river can compensate some degree of difference.

But far more important than solving the problems mentioned already, is finding a solution for hydraulic fracturing. It is easy to agree that fracking is highly dangerous to our environment. Whole areas are contaminated. The water is undrinkable and fresh water has to be delivered by trucks. We have been exploiting our earth for too long. This is merely a new stage. In our opinion, fracking should be stopped immediately in Germany and in the rest of the world. The environmental costs are far too dramatic for this method to be an acceptable source of energy. It is irresponsible to pollute our environment for economic reasons.

- ***Catastrophes***

A further catastrophe like the explosion of the “Deep Water Horizon” must be avoided at all costs. The ecological damage is disastrous. It would be safest to forbid deep sea oil drilling. Of course this is not feasible. The world depends on a

steady supply of oil. Humanity has to find a way of becoming independent of fossil oil. Until we achieve this, we have to make oil production as safe as possible. In the case of the “Deep Water Horizon”, certain circumstances were ignored.

The so-called “Blowout-Preventer”, which should have stopped the leaking oil, had several deficiencies. If there had been controls the catastrophe could have been reduced to a lesser extent and may not have had the same devastating effect on the ecological system. Tougher penalties should be inflicted upon those who risk the health of our environment for economic advantages.

There is only one safe way to prevent nuclear catastrophes. We have to become independent of nuclear power. This will take time and will be expensive.

After the explosion at Fukushima, the German government decided to slowly, but surely, shut down German nuclear power stations, replacing them with renwable energy sources, including wind, solar, and water energy.

Some countries are following suit. However, many still rely on nuclear power. It is a cheap but dangerous way to create energy.

- ***Air pollution***

Humanity is currently trying to reduce air pollution by using renewable energy sources and filtering the fumes of factories and cars. Every one of us can help to reduce air pollution by supporting renewable energy and using ecological means of transport, such as cycling instead of driving.

Conclusion

One can easily agree that water pollution is a very important issue. Industrial nations, like Germany, will have to help nations that cannot, or will not stop water pollution. But most important, every one of us can help to make a difference. Do not rely on others to make the start. Take it into your own hands to improve water quality and save us and our environment from water pollution. Many methods may take some time to implement. But that invested time will be worth it. The world´s wastewater has to be cleaned properly, so that people can have drinkable ground water. Nothing is more important than having a good water quality. Water is a vital resource.

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Ideas on how to improve water quality

by 3° Geniko Lykeio Peristeriou – Greece team

- **Do we have good quality of water ?**

	K^+	O_2	NO_3^{-1}	gH	T	PH	Ca^{+2}	Mg^{+2}	$PO4^{-2}$
water from Kiphisos river	15° dHK	5ml/l	25ml/l	>120	24° C	8,4	>350 mg/l	20 mg/l	1ppm
Vikos bottle water	6° dHk	8ml/l	0ml/l	5	33° C	7	75 mg/l	7 mg/l	1ppm
water from school	7°dHK	8ml/l	5ml/l	11	30° C	7,6			

- **What is pollution?**

Household water pollution

Water pollution can cause many problems within and around the home. Common problems often occur with drinking water and pond water .

Agricultural pollution in Greece

Contamination of surface water and groundwater has emerged as an important environmental problem in last decade.

Greece has drained many lakes completely to generate hydroelectric power or to expand agricultural land.

Industrial Pollution

Industrial pollution is pollution which can be directly linked with industry, in contrast to other pollution sources. This form of pollution is one of the leading causes of pollution worldwide

Acid rain in Athens

Sulfur dioxide, contributed chiefly by industrial effluents, has severely damaged stone buildings and monuments.

- **Consequences**

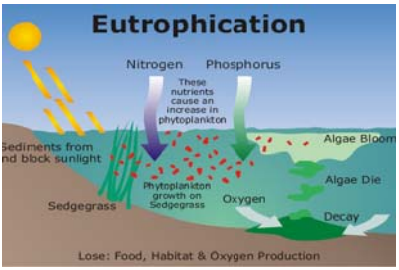
- Hard water is water with high levels of calcium and magnesium which causes erosion and blockage problems.
- Suspended particles are related to discoloration and an unpleasant taste of drinking water.
- If infants consume nitrates, they can die from blue baby syndrome.
- Gastrointestinal diseases are caused by polluted drinking water with sewage or manure runoff.

Solutions in household water pollution

- Recycling;
- Organic products against using pesticides, herbicides and fertilizers;
- Getting rid of hazardous materials;
- Installing water filters.

Eutrophication

Is the ecosystem response to the addition of artificial or natural substances, such as nitrates and phosphates, through fertilizers or sewage, to an aquatic system



Effects on Human Health

- Increased incidence of tumors, ulcers due to nitrate pollution.

- Increased incidence of skin disorders due to contact with pollutants.
- Increased incidence of constipation, diarrhea and infections to intestine.
- Dangerous effects on growing foetus in pregnant women.
- Concentration of pollutants due to bioaccumulative pesticides. through secondary and tertiary food chain in case of non – vegetarians.
- Still births, abortions and birth of deformed children.

Effects on Animal Health

- Large scale death of aquatic and terrestrial animals;
- Reduced reproduction rate;
- Increased incidence of diseases;
- Imbalances created in secondary food chains;
- Some organochlorine pesticides (like DDT, BHC, Endrin) are known for bioaccumulative characters.

Methods of treatment

Bioagriculture

In simple terms, bioagriculture means farming using sustainable methods. This can mean better use of fertilizers, biological pesticides and microbial fertility enhancers to naturally produce healthier crops and improve yields.

Benefits of bioagriculture

- Bio-agricultural farming methods have been proven to halt and reverse soil erosion.
- Organic biological agriculture focus on feeding the soil.
- Industrial agriculture focusses on feeding the plant

Water pollution cannot be altogether checked, but measures can be taken to reduce it:

a) Primary treatment

In this method mechanical screening and sedimentation of un-dissolved solids in raw sewage is done. But it fails to remove any dissolved substance from water.

b) Secondary treatment

Sewage treated in primary treatment is brought in contact with oxygen and aerobic micro-organisms. They break down the organic matter into harmless materials as CO_2 and H_2O. Further, chlorination is done to reduce the bacteria. It may be further treated to tertiary level zero measures are adopted

for secondary treatment. They are: Trickling filter method and activated sludge process.

Trickling filter method

In this case sewage water passes through a thick bed of gravel stones so that bacteria consume most of the organic matter.

Activated sludge process

Here the sewage water is pumped into an aeration tank. The tank contains sludge consisting of bacteria and algae. The bacteria is able to decompose most of the organic matter and algae produces oxygen to promote the growth of these decomposers.

Ideas on how to improve water quality

Made by the Romanian team

What does pollution mean?

Pollution occurs when the introduction of some substances happens – solid, liquid, gaseous, radio-active; The water suffers physical, chemical or biological modifications that make it dangerous to public health.

Forms of pollution

Pollution due to biological agents

It's a powerful bacteriological contamination of water, which results in spreading diseases such as hepatitis, typhoid fever, etc.

Pollution due to chemical agents

Results from the discharge in waters of various compounds such as: nitrates, phosphates and other chemicals used in the agriculture industry.

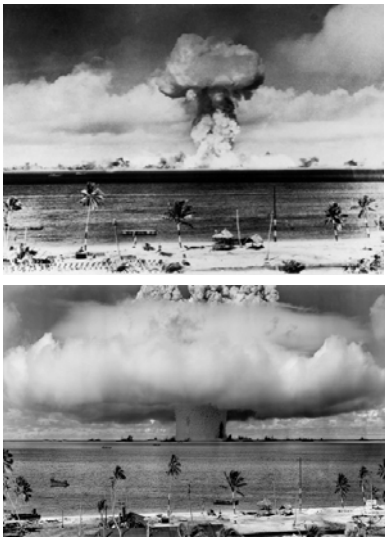
Is due mainly because of detergents and pesticides. Equal is the degree of water pollution with PCBs (polychlorinated biphenyls), which are used a lot in the plastics industry.

Radio-active pollution

It may occur as a result of the discharge of radioactive materials in the atmosphere and especially due to incorrect releases of radioactive liquid and solid waste from industries using atomic energy or nuclear researches.

This type of pollution is met in the Cernavoda area.

Example of a nuclear accident



Original pictures from Bikini Island

On January 22, 1954 the sailors on the ship "Fukuriumarii no.5" noticed an unusual phenomenon: the fire ball made by the thermonuclear explosion on Bikini Atoll. Therefore all crew members and fish caught were affected by radioactive ash on skin and inside the body.

Another result of this explosion: radioactive rain was falling in May of the same year, the radioactivity remaining at a considerable level by September 1954.

Pollution in agriculture

In agriculture, the main sources of water pollution are:

- untreated waste water coming from the livestock industry;

- land administration of excessive amounts of fertilizer, which causes the accumulation of nitrate in ground water and spread them;
- use of chemical fertilizers (mainly nitrogen) in large doses and in inappropriate moments plant growth;
- application of chemicals to protect plants by diseases and insects.

Pollution due to physical agents

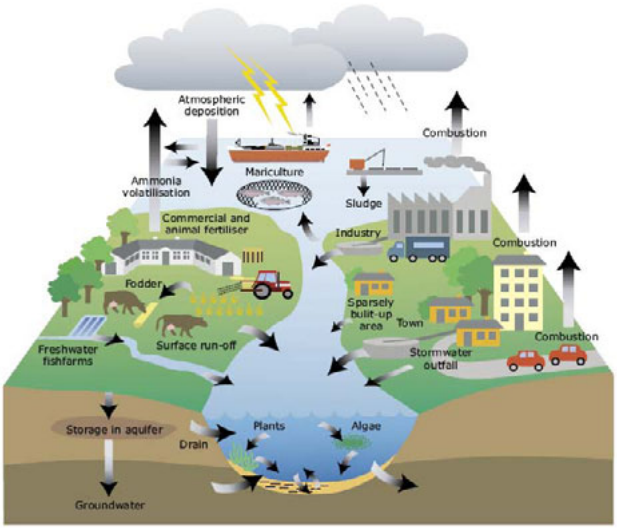
- Represents the contamination of water with solid, minerals or insoluble materials. It is usually found in:
  - Sawmills;
  - Nuclear power plants;
  - Thermal power plants.

Industry pollution

Usually found in major industries. The number of pollutants for a particular industry is usually small.

For example:

- Wastewater from food industry mainly contains organic pollutant matters;
- Waters comming from coal laundry, inorganic materials in form of suspensions, etc.

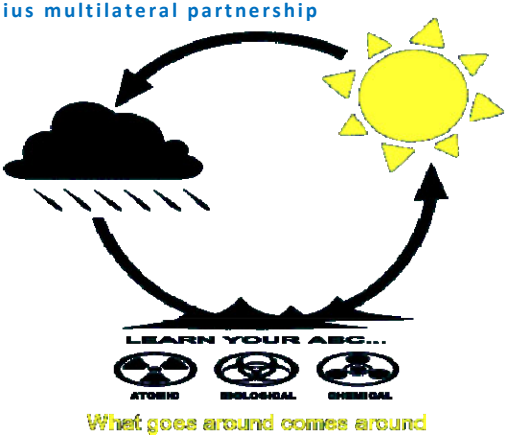


Pollution in urban areas

It is a mixture of water from households and industry (usually local).That is why these waters can be found in almost all types of pollutants above, their production depends from case by case.

How pollution occurs?

- Pollutants get into the water.Because of sunlight, polluted water evaporates cycle ends with the fall back of water in to the earth as precipitations.
- Polluted waters affects soil, plants and animals causing mutations.



„Water! You have no taste, no smell, no color, no smell, you can not be defined , we taste you without knowing you. You are not only required for life: you are life itself. You are the most valuable wealth in the world and you are the most tender, you, so pure deep in the earth. "

Antoine de Saint- Exupéry

Methods to reduce pollution

The general ways to be followed to reduce pollution are :

- Fast and efficient waste recycling;
- Industrial development using less polluting means;
- Safely storing the waste that is not biodegradable;
- Application of rules and sanctions much higher;

Reduce pollution in agriculture

To reduce this type of pollution we need:

- Supervision of an expert in the application of fertilizers.
- Corect use of fertilizers and pesticides.
- Cultivation in the correct time period to help regenerate soil resources, in order to reduce the need for fertilizers.

Reduce pollution in agriculture

Introduction of machinery and equipment that would not pollute

Methods to improve water quality

- No oil disposing into the sink;
- Sewage plants must be improved;
- Septic tanks should be provided with concrete walls and a drain hole;
- Bathrooms must be provided with a garbage bin to avoid spreading waste in groundwater.
- 20% of our town has no access to sanitation. Improper use of septic tanks pollute ground water.
- Installing and using filters within public institutions (especially schools)

Hard detergents with a lot of perborates for bleaching are useless if we wash at 40-60°C, because perborates are inactive under 70°, and go into the sewage unmodified, affecting the quality of water.

It is preferable to not use disinfectants and special solutions for cleaning toilets . Also don't use them excessively and keep in mind that "deodorizing" pills may do more harm to the water. Use them with

moderation and don't use excessive concentrations of solutions for cleaning utensils.

- Avoid throwing toxic substances (pesticides, insecticides, poisons, mercury, petroleum products) in the sink, toilet or channels. Bottles and the rest of the non-biodegradable waste must be stored in special places.

Reducing the industrial pollution

- construction of dams;
- wastewater treatment (using filters for chemicals or bacteria to biodegrade etc.).
- construction of waste-water treatment plants in villages.

The dam from Bicaz,Neamt-Romania

Reducing the industrial pollution

- Building special waste collection tanks, to prevent their direct discharge into waters surface.

Siret river

Source: SC METADET SA Falticeni (industrial polluter);
Cause: The production of detergents and polymethyl methacrylate ;
Measures: Supplementation of Siret's river flow in order to reduce the concentration of the pollutant wave. Therefore the treatment plants can filter the polluted water faster.

Polluters in Moldova

In Neamt the most important factors of pollution are factories and chemical institutions.

Moldova river

Source: SC ARCELORMITTAL TUBULAR PRODUCTS SA Roman(industrial polluter)
Cause: Damaging the stations viscous oil supply pipeline led to the matter's download in the Moldova river

Measures:

- repairing the pipeline where the leaks occurred; cleaning the pipes;
- building a series of dams from boards, bales of straw and absorbent materials in the Moldova river

Bistrita river

Source: SC GA PRO CO CHEMICALS SA (chemical polluter)

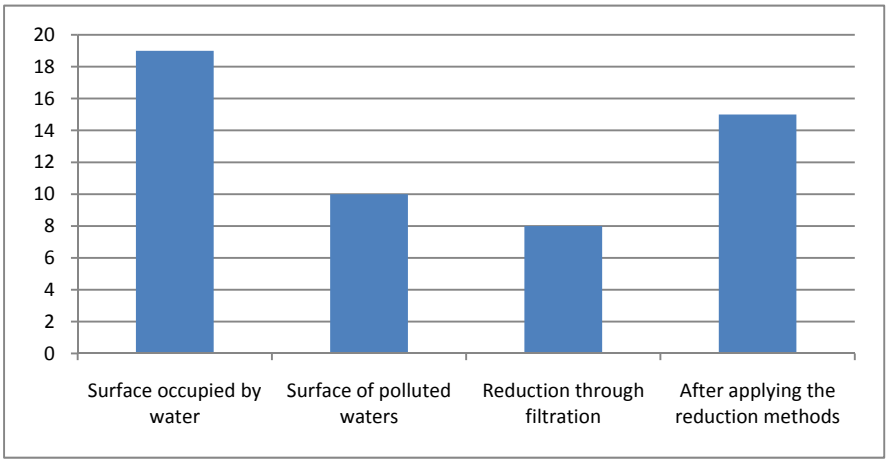
Cause:

- repeated starts and stops of the chemical installations;
- defictarig technologies for neutralizing pollutants from residual waters

Measures:

- the treatment and recovery of nutrients from the effluent coming from the granulation tower;
- Liquid and solid loss recovery systems;
- ammonia reduction from the emission gases.

In Neamt county



Ideas on how to improve water quality

Made by Lyudmil Stoyanov from the Bulgarian team

Current water treatment and it's quality

Sofia citizens drink one of the most qualitative waters in Europe.The water from *the Beli Iskar* dam and lesser water sources is decontaminated with chlorine, and the *Iskar* dam water passes through a few stages of treatment in the sewage – treatment plants *Bistritsa* and *Pancharevo*.

Why do we have to add chlorine?

In order to have a clean water and to guarantee it's drinking qualities, chlorine is being added to it. The quantities of it are large enough to destroy harmful microorganisms and small enough to be completely harmless to people. This is the oldest and most efficient method for purifying water.

Stages of purification of water in water treatment facilities

- Chlorine is added to the water in order to exterminate the bacteria in it.
- When necessary, a reagent that enlarges undissolved substances is added in the water to entrap them in filters in the next stage of treatment.
- Water is filtered through a layer of quartz sand.

In the end the water is being chlorified once more before release to ensure the optimal content of remaining chlorine necessary to prevent secondary bacterial contamination.

Water qualities are being strictly controlled by the accredited Laboratory testing complex of "Sofia water", as well as by the Metropolitan regional health inspection.

That way all of the water qualities are monitored strictly and match the normative standards of the country and the EU.

Qualities of drinking water in Sofia

Factors	Measure	Allowable values	Approximate values
pH	pH	6,50 - 9,50	7,41
Natrium	mg/l	200,00	<5,10
Calcium	mg/l	150,00	<12,50
Ferrum	µg/l	200	<128
Manganese	µg/l	50	<10
Fluorides	mg/l	1,50	<0,20
Nitrates	mg/l	50,00	<0,99
Nitrites	mg/l	0,500	<0,015
Residual chlorine	mg/l	0,30 - 0,40	<0,31

Plans for improving the quality of drinking water

All in all improving water quality means keeping water sources clean, monitoring carefully the transfer of water, using non – harmful to the environment and to us (preferably with less energy usage) ways to disinfect water and not wasting already clean water.

1. The most common cause for worsening drinking water's quality is outdated inner – built plumbing in buildings. In order to have better drinking water we must renew or replace it, as well as warily maintain it.

The importance of keeping a clean living environment

In other words, you can help by simple means such as keeping the space around your home swept and without debris, cleaning after your dog when you take it for a walk, and using cars as rarely as possible.

2. Don't drain motor oil or antifreeze down storm drains

- If you change your car's oil, be careful to avoid spills or residual drips.
- Take your old motor oil to a garage or auto parts store that recycles it.
- Consider having your car's oil changed at a quick lube or garage.
- Keep your car maintained to avoid oil and gas drips and leaks.

3. Minimize fertilizer use

Over-application of fertilizer contributes to eutrophication, the choking of our lakes and streams by overgrown algae and weeds. Proper use of fertilizer can reduce the environmental impact on our city waters.

- Take a soil test to determine how much fertilizer to apply.
- Fertilize in early fall, when it is most beneficial to the root system. But be sure to fertilize before the grass goes dormant, after which it can't take up the fertilizer.
- Buy only what you need and follow the instructions.
- Don't fertilize just prior to a rainstorm.
- Leave grass clippings on the lawn to act as a natural fertilizer.

4. Minimize pesticide use

Pesticides include chemicals that kill insects (insecticides), weeds (herbicides), and fungi (fungicides). These chemicals can be toxic to humans, pets and other animals, hence they can have many harmful effects throughout the watershed.

- Consider alternative methods such as using non-toxic sprays, beneficial predators, or spraying off pests with a forceful stream of water. Also, consider hand picking off small infestations of pests.
- Buy only what you need to avoid having to dispose of or store the product.
- Choose pesticides that are the least toxic. Look for signal words on the package: warnings which read "Poison" are highly toxic and the most dangerous. "Danger" means extremely flammable, corrosive or highly toxic. "Warning" means moderately hazardous. "Caution" means low to moderately hazardous

*5. Report Illegal Dumping or Unusual Conditions in Lakes or Stream*s

Be a watchdog over your lakes and streams. Contact local authorities if you notice any of the following unusual conditions in your lakes and streams:

- A change in color of the water
- An unusual or foul odor
- Suds when there is no precipitation occurring
- Any unusual-looking substance discharging from a storm outlet
- Illegal dumping activity
- Unusual discharges from construction sites or industrial sites
- Large number of dead or dying fish or crayfish

Spread the word

There's strength in numbers, they say. In 21st century there are countless ways to involve others in taking actions for the environment.

You can:

- Hand out flyers with short presentations on them.
- Organise cleaning events (via internet for massive ones or simply gathering a dozen aqcuaintainces and cleaning public places) to give an example.
- Making shirts, stickers, badges, writing articles, focusing different forms of art on the subject, organising events, doing what you're best at for gathering attention to the topic.
- Believing in the cause.

As you can see, there can be done much and we are the ones to guide others to creating healthy habits for protecting water and the environment on the whole. It's up to us to give an example and start the change. Once we teach others how to spread the word, we are bound to succeed.

Chemical analysis

Chemical water quality determination of the Murr-Germany

using the NSF Water Quality Index

Outline:

- Introduction
- Measuring methods and materials
- Results
- Assessing the results/ Comparative assessment of biological macro analysis
- Conclusion

Introduction - *The Murr*

A length of 51.5 km and a catchment area of about 500 square kilometres make *the Murr* the seventh largest tributary to the Neckar. The source is near Murrhardt from where it flows into the Neckar, the Rhine and then into the North Sea.

The Murr can look back on an eventful history: in the

15th century it was used primarily as a transport route for local rafter companies. The importance as a means of transport decreased greatly after that. In the era of industrialization for a period of nearly 100 years a railway line ran through *the Murr* valley.

The Murr valley therefore became attractive to residents and especially the industry. In the context of flood protection the course of *the Murr* was straightened in many places. Only a few sections of the river match the original course of water.

Most parts of *the Murr* are protected areas. However, it flows through areas which are used for agriculture. Additionally, purified wastewater from sewage treatment plants flow into it.

Whether the water quality is affected thereby, and whether *the Murr* can be categorised as an average clean river in Germany, our water analyses during the mobility to Germany will show.

Measurement, methods and materials

To determine the amount of ammonium, nitrate, nitrite, phosphates, total hardness and the pH value of the water in *the Murr*, we used the Viscolor-School water analysis kit.
Using a conversion table the total hardness enables us to calculate the amount of calcium dissolved in the river water.

The electrical conductivity was measured with a multimeter. First one has to measure the electric resistance

and then form the reciprocal of the acquired data. The oxygen content was determined by a quick test of the producer JBL.

Measurements

The measurements were taken during the Comenius mobility to Germany on 2nd October 2012. The following data is the average of 9 measurements, each of which was taken at 10 meter intervals. The water temperature at the time was about 9 ° C.

The results may contain minor measurement errors or insignificant deviations from the actual value.

	Murr (average value)
Oxygen content (mg/l)	13,2
Oxygen saturation(%)	<100%
Ammonium (mg/l)	0,15
Nitrate (mg/l)	7,5
Nitrite (mg/l)	0,0875
Water hardness (°dH)	28
Calcium (mg/l)	200,1
PH – value	8,25
Phosphate	approx. 1 mg/l

Assessing the results

In our introduction we asked whether the water quality of *the Murr* is affected by purified wastewater from sewage treatment plants and the agronomic use of the surrounding plains.

To answer this important question ammonium and phosphate levels should be considered first. The values turned out to be very positive. The extremely low *ammonium* amount of 0.15 mg/l is extremely significant. This is well below the limit of 0.5 mg/l. Ammonium found in rivers are mainly part of the nitrogen cycle. It is a result of the decomposition of organic material such as dead plants or dead animals. Organic material also passes through faecal contamination into rivers like the Murr, e.g. by fertilizers. These contain ammonium as it is well known to increase the growth of crop or other plants and therefore the main component of many fertilizers. A too high an amount of ammonium, resulting from faecal pollution and fertilizers may lead to an uncontrolled plant and algae growth, which then might result in eutrophication of the water.

Another danger is the possible conversion of ammonium to ammonia, which is highly toxic to the entire ecosystem.

However, if the ammonium level is too low, other problems arise: a low ammonium level decreases plant growth and the whole food chain may collapse. The ammonium content of *the Murr* therefore can be classified as optimal. It cannot confirm the suspicion of agricultural or faecal pollution.

The low *phosphorus* content indicates a similar result. The phosphorus amount of 1 mg/l is far below the limit of 5 mg/l.

Like ammonium, phosphorus, coming from organic material, finds its way into the rivers.

It also increases the growth of plants but can, in high concentrations, lead to eutrophication. For this reason, ammonium and phosphorus are the primary indicators of agricultural or faecal contamination.

Both indicate that our suspicion was wrong: The water of *the Murr* is not, or only to small a degree, polluted by biological contamination. Only the slightly elevated pH-value may indicate a biological pollution. However, a slightly elevated pH-value can be a result of many other reasons. This good water quality may also be the result of the strict regulations regarding the discharge of sewage water and the whole catchment area being protected as nature reserves.

Furthermore, it was highly interesting assessing the water quality in relation to the habitat *river Murr*. Strikingly positive is the high oxygen level, indicating a saturation of 100%. This is a good basis for a healthy ecosystem. However, one must assume that there is a measurement error, as water cannot dissolve 13.1 mg of oxygen per litre at a temperature of 9 ° C.

Likewise, the water hardness can indicate a healthy aquatic environment. On the other hand hard water means a relatively large amount of calcium ions, which increases the toxicity of various substances.

Nutrients such as ammonium and nitrate including its preliminary nitrite are present. However, these values are not beneficial or even optimal for waters inhabited by fish. Ammonium and nitrate also serve as a basis for plant growth and nitrate even as a nutrient for fish.

Moreover, the slightly higher pH-value and the just mentioned amounts of ammonium and nitrate indicate a strong plant growth within the Murr. Presently this will however not endanger the fauna.

Based on our data, we can also calculate the water quality index. According to the NSF-standard the Murr reaches a quality index of 76. This is average for German waters. Thus, *the river Murr* is sufficiently chemically clean and hereby also counts to the clean rivers of Germany.

Comparative analysis

Why is the water quality, according to the methods of the Saprobicindex, better?

Comparing the two methods for the determination of water quality, it is striking that the results diverge: while the Murr is a river with a moderate to a high degree of cleanliness, according to the methodology of the Saprobicindex, the chemical analysis indicates a rather average water quality.

Now the question is: ***How do these different results come about?***

The data of chemical analyses provide an instant value of the water quality: they change quickly when a nearby field is fertilized, more sewage water is introduced or if the waters were affected by rainfall.

Following the example of the fertilized field the ammonium nitrate and nitrite values rise quickly but only for a short period. This has a negative impact on the water quality index according to NSF-standards.

Furthermore, chemical water quality determination depends on ones measuring point: close to the riverbanks, from where the samples were taken, one will find other conditions than in the middle of the river.

On the other hand, the results determined by saprobic standards, offer long-term information on the water quality. It takes a while until the ecosystem has adapted to new conditions. For example, it takes time until organisms indicating a good water quality die and are replaced by organisms indicating the opposite, or vice versa. Also, the local dependency is less important.

Conclusion

As we want to make a general long term statement about the water quality of the Murr and as the results of the saprobic index provide longterm information on the water quality, we will give this method a higher weighting.

Finally one has to agree that the Murr offers a biologically healthy habitat for flora and fauna and its cleanliness can be referred to as "mediocre to good".

By Sascha Ley, SOS Water Germany

Biological analysis

made by the Romanien team

Protocol – Zoobenthos

We had collected some little variuos creatures that live in waters of the lakes in our area, in some eprubets. Each group will choose an eprubet. The tubes are containing alcohol in wich the little creature are preserved. The creature will be taken by a pippete and placed on a watch glass. The next step is to identify the chosen specimen and his features(name, species, kingdom, special features) on the maps desplayed on the work office. Each group will have to make a drawing to represent each creature and informations obtained, wich then they must submit to the other mates.

Haemopsis

- There are 25 species in Romania
- Dimensions: from 6 to 200 mm
- Body shape: linear, oval and cylindrical
- Majority live in freshwater
- Habitats: under the rocks, in mud and on aquatic vegetation
- Feeding: carnivores and hematophagous

Scientific classification:

- Kingdom: Animalia
- Phylum: Annelida
- Subclass: Hirudinea

Saprobiologically importance:

The Medicinal leech, at the top of the page, is the biggest freshwater leech in the UK. It used to be fairly widespread but once bridges replaced fords and drinking troughs replaced ponds it became very difficult to find in the wild as it no longer had easy access to its victims. Medicinal leeches are raised commercially to obtain hirudin - the anti-coagulant used to prevent blood clots. For more details see the table below.

Baetis

- Acvatic larvae
- Habitats: Oxygenated freshwaters, lakes and clean ponds
- In Roumania there are 101 species

Scientific classification:

- Kingdom: Animalia
- Phylum: Arthropoda
- Class: Insecta
- Subclass: Pterygota
- Division: Palaeoptera
- Superorder: Ephemeropteroidea
- Order: Ephemeroptera

Saprobiologically importance:

Baetis nymphs are found in almost every trout stream, but they produce more broods and thicker hatches in cold, unpolluted,alkaline waters.

Ecdyonurus

- Ecdyonurus is a genus of mayflies of the Heptageniidae family;
- Over 500 described species;

- Distributed in the Oriental and Afrotropical regions, and also present in the Central American Tropics and extreme northern South America;
- These are generally rather small mayflies with two long tails;
- The wings are usually clear with prominent venation although species with variegated wings are known;
- They use a wide range of food sources with herbivorous, scavenging and predatory species known.

Scientific classification

- Kingdom: Animalia
- Class: Insecta
- Order: Ephemeroptera
- Family: Heptageniidae
- Genus: Ecdyonurus

Saprobiologically importance:

This is an important group as both stages in the life cycle are important for fish development. The larvae take a year to develop in water, feeding on a variety of plant debris, algae and diatoms.

Atherix

- They don't have true legs, some of theme show just pseudopodia
- Feeding: saprophagous, detritivore

Scientific classification

- Kingdom: AnimaliaPhylum: Arthropoda
- Class: Insecta
- Superorder: Panorpida

Saprobiologically importance:

Larvae are predatious. pupation akes place out of water. some rhagionid adults are blood-suckers, including possibly some species of Atherix.

Comparative charts

Made by the Romanian team

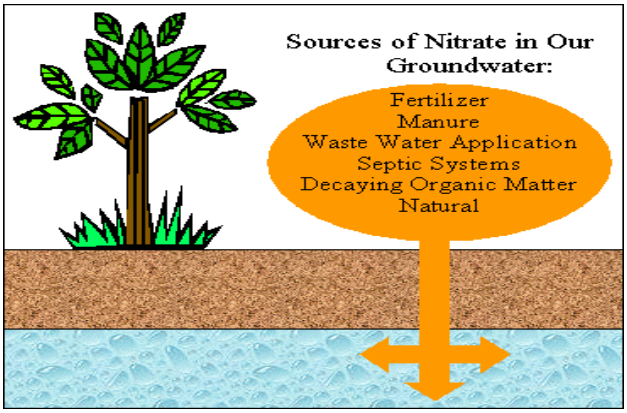
The determination of nitrate in water

Nitrate are chemical components without color, smell or taste and they are the natural form of nitrogen found in the soil which is essential for all forms of life;

Sources of nitrate in water are natural and anthropogenic.

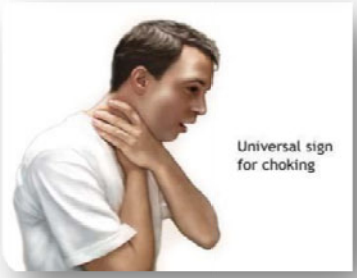
Natural sources are:

- Rainfall;
- Ammonium nitrification (by microorganisms) and nitrite (by nitrobacteria);
- Soil erosion containing nitrate;
- Anthropogenic sources are:
- Decomposition of organic matter, and man-made pollutants such as sewage waste and fertilizer.

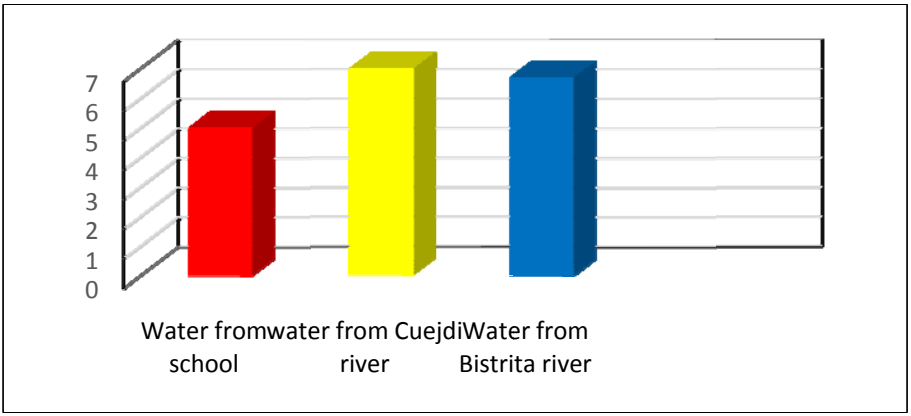


The influence of nitrates

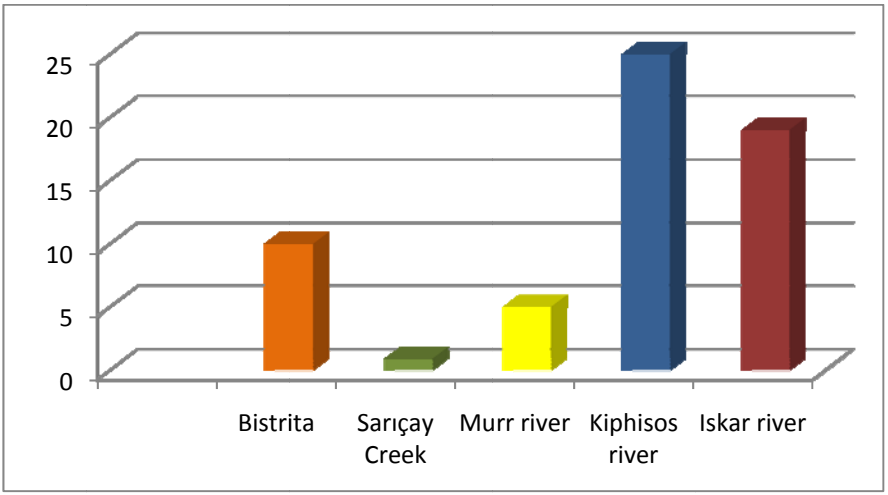
- hypertension;
- headache;
- hives;
- intoxication;
- suffocation;
- cancer;
- circulatory and thyroid gland dysfunction.



Comparative diagrams of nitrate in Romania



Comparative diagrams of nitrate between Romania, Turkey, Germany, Greece and Bulgary



The determination of pH and water temperature

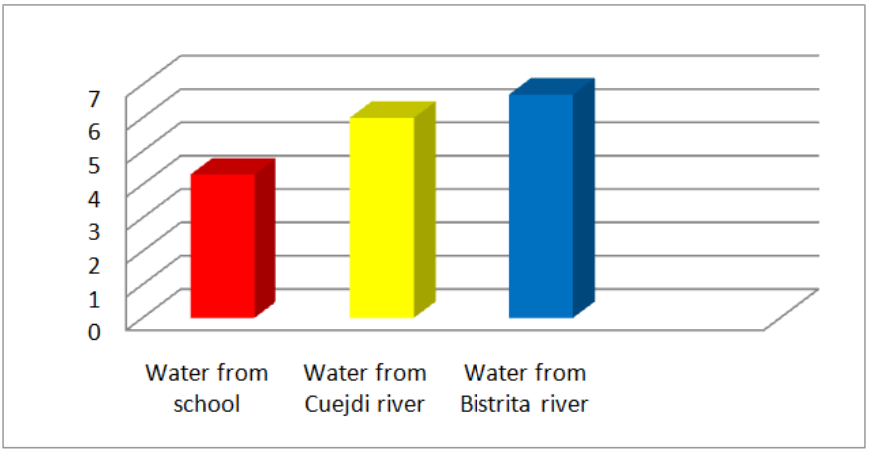
pH stands for "pondus hidrogenii". The concept was introduced by the Danish scientist S.P.L. Sorensen, in 1909 to express the low concentration of hydrogen ions and was defined as the pH is defined as the decimal logarithm of the reciprocal of the hydrogen ion activity.

Temperature is a phisical property of matter that quantitatively expresses the common notions of hot and cold.

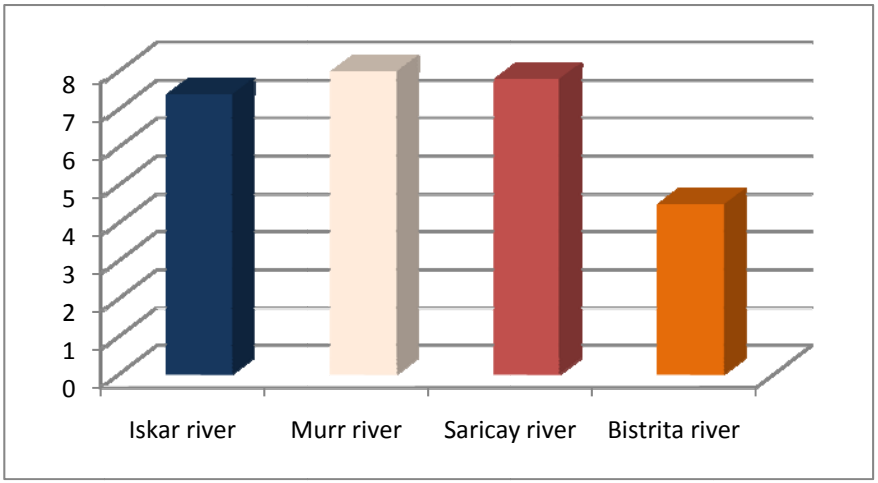
The influence of pH and temperature

If the pH is below 5.6, water is acidic and causes irreversible changes at the level of epithelial tissue, and if the pH is above 11, the water is alkaline and irritates the eyes, skin and the mucous membranes.

Comparative diagrams of pH in Romania



Comparative diagrams of pH between Bulgary, Germany, Turkey and Romania



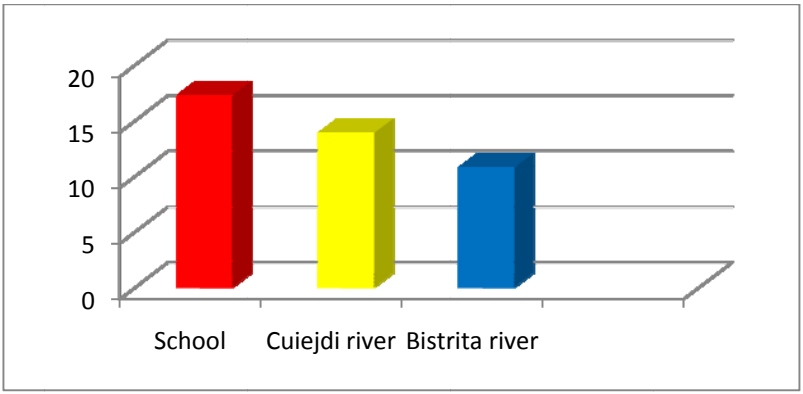
The determination of temperature

Temperature is a physical property of matter that quantitatively expresses the common notions of hot and cold.

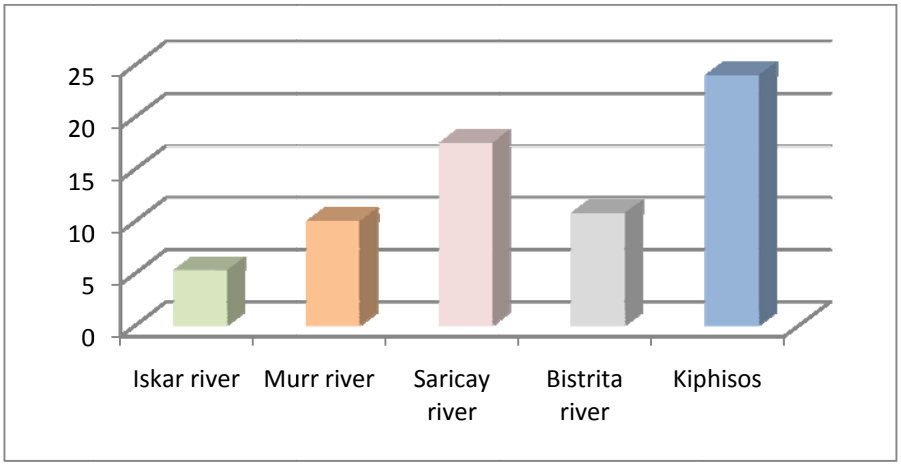
The influence of temperature

- Temperature is also important because of its influence on water chemistry. The rate of chemical reactions generally increases at higher temperature.
- Water, particularly groundwater, with higher temperatures can dissolve more minerals from the rocks it is in and will therefore have a higher electrical conductivity.
- It is the opposite when considering a gas, such as oxygen, dissolved in the water. Warm water holds less dissolved oxygen than cool water, and may not contain enough dissolved oxygen for the survival of different species of aquatic life.
- Some compounds are also more toxic to aquatic life at higher temperatures.

Comparative diagrams of temperature in Romania



Comparative diagrams of temperature between Bulgary, Germany, Turkey and Romania



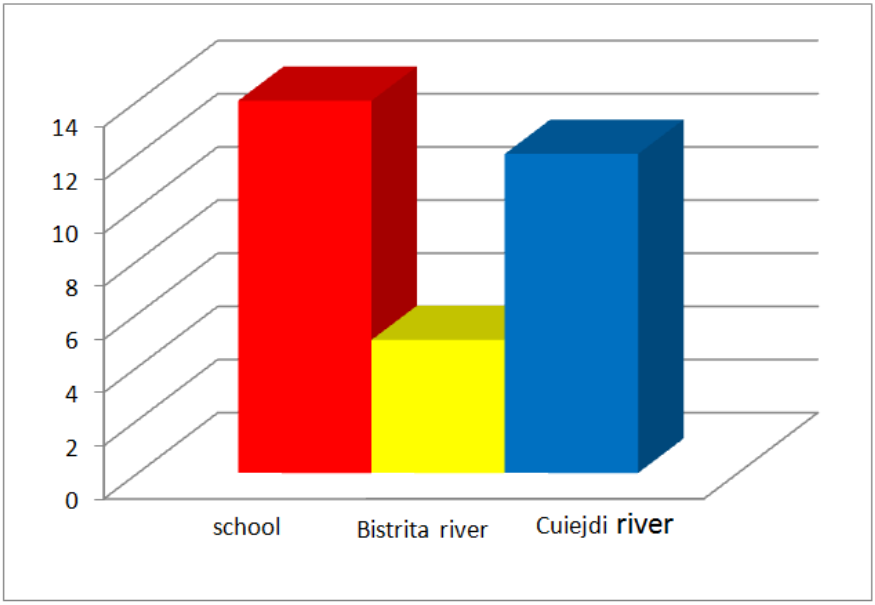
The determination of oxygen levels in water

The quantity of oxygen is disolved in the water depending on the temperature of the water, air pressure and the content of oxidizable substances and microorganisms.

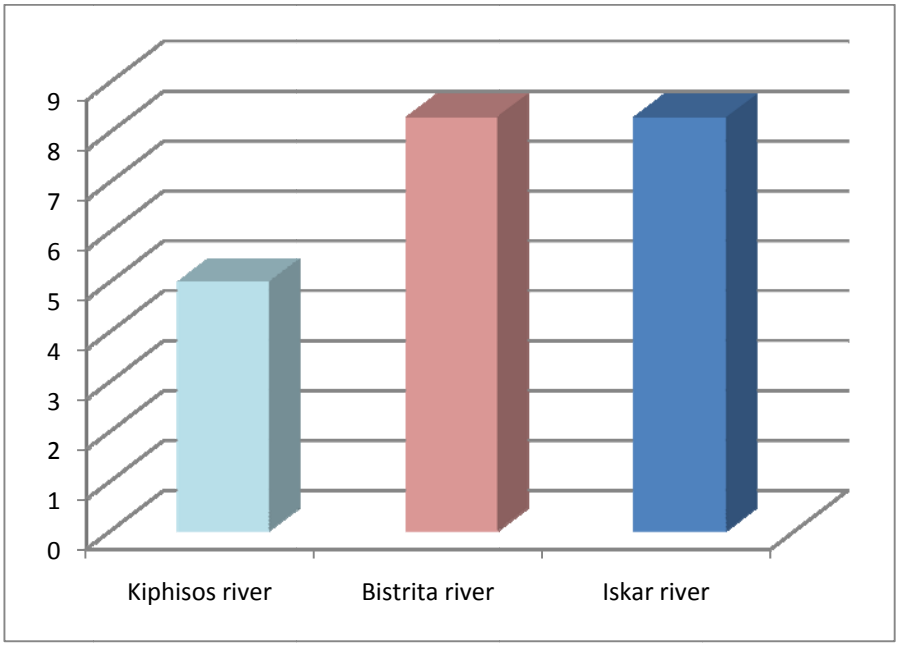
The influence of oxygen

- Dissolved oxygen is an important determinant for stability of waters and survival of water organisms.
- Micro organisms may decompose organic substances in water by means of oxygen.
- Organic pollutants may negatively influence water organisms, because they decrease BOD (Biochemical Oxygen Demand
- In eutrophic lakes and relatively enclosed sea areas, oxygen concentrations decrease strongly with depth. In some cases conditions may even be anaerobic.

Comparative diagrams of oxygen in Romania



Comparative diagrams of oxygen between Greece, Romania and Bulgary



The determination of phosphate in water

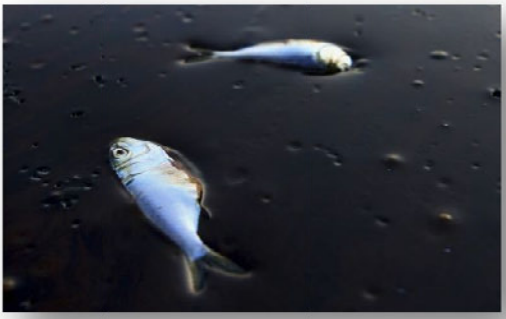
Phosphate are salts or esters of phosphoric acid, obtained by its reaction with a base.

The influence of phosphate

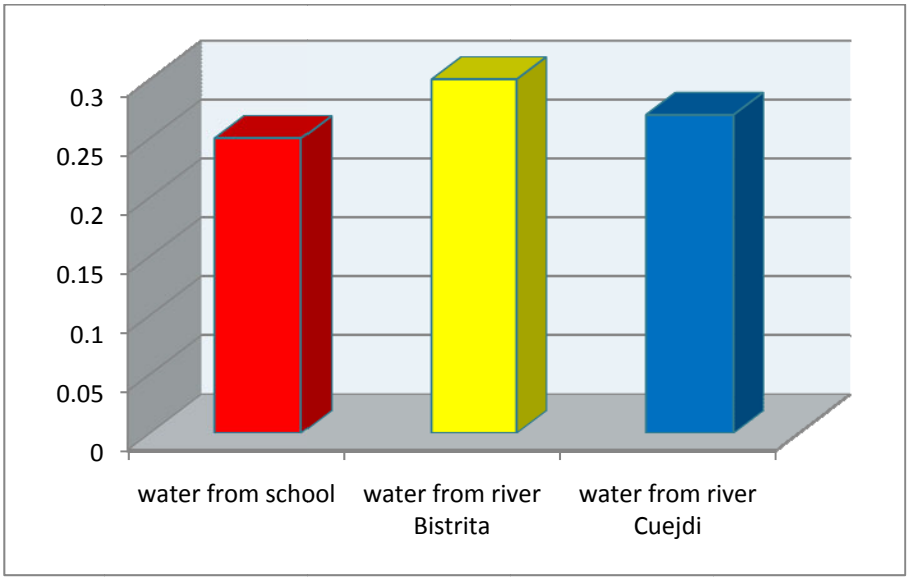
Phosphate stimulate algae growth in water basins. Rapid growth of algae launches a process called eutrophication, which leads to lack of oxygen in local waters and as a result to the decline of biodiversity in water tanks.

The high concentration of phosphate in the water causes

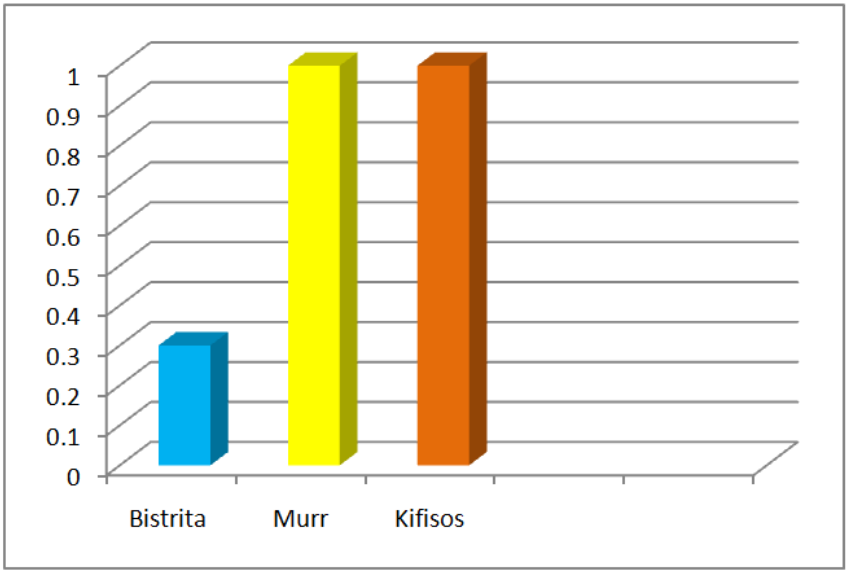
not only the flora and fauna to perish in the interior of basins, but even in the coastal areas near major cities. The emission of phosphate in water leads to the formation of "dead zones" - areas of water with very low biological activity.



The determination of phosphate in Romania



Comparative diagrams of phosphate between Romania, Germany and Greece



The determination of water hardness

Water hardness is the property of water which contains mineral salts of calcium and magnesium, principally as bicarbonate, chloride, and sulphate, and sometimes iron.

The effects of water hardness

Bathing in hard water gives a feeling of soap on the skin. This prevents rinsing and causes irritation. The hair is dirty and dry;

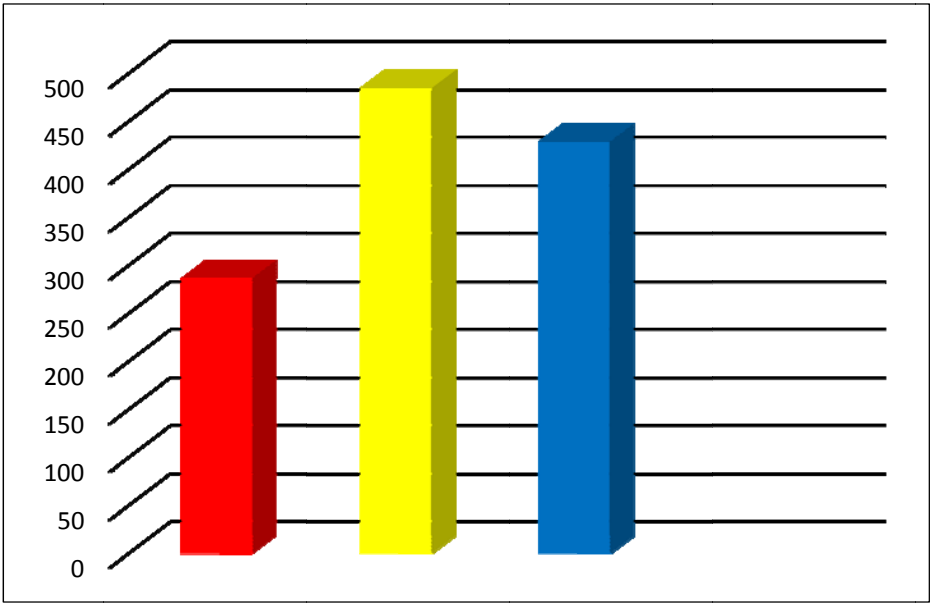
With soap it forms insoluble salts which stay on sanitary objects;

Laundry is not clean enough, it loses its color and brightness and requires

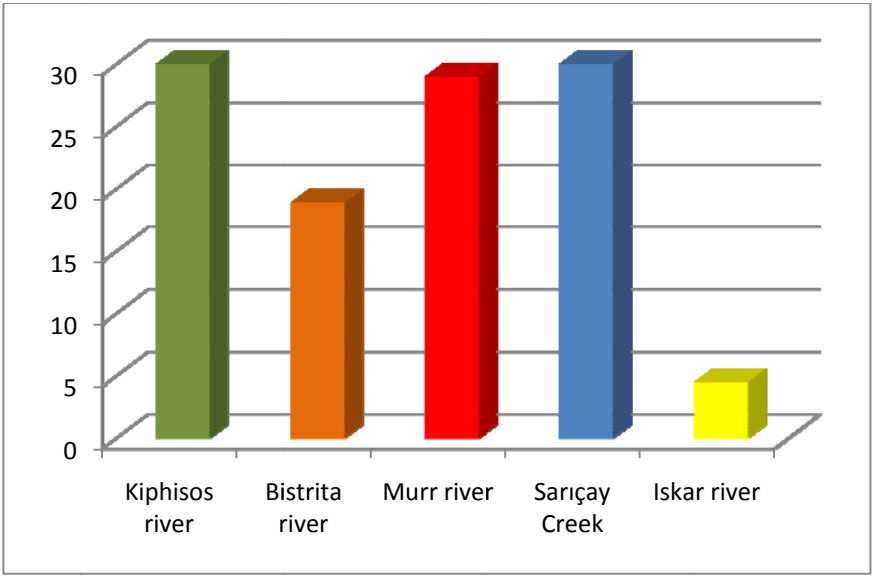
more detergent;

- Household appliances break down quickly, reducing thermal conductivity;
- Stone deposits on pipes reduce water flow while on the other hand there is an advantage in that these deposits protect the pipes from corrosion and the assimilation of these materials in water.

The determination of Water Hardness in Romania



Comparative diagrams of water hardness between Greece, Romania, Germany, Turkey and Bulgary



The determination of sulfate in water

In inorganic chemistry, a sulfate is a salt of sulfuric acid;

Many examples of ionic sulfates are known, and many of these are highly soluble in water.

The effects of sulfate in water

•Sulfates are important in both the chemical industry and biological systems;

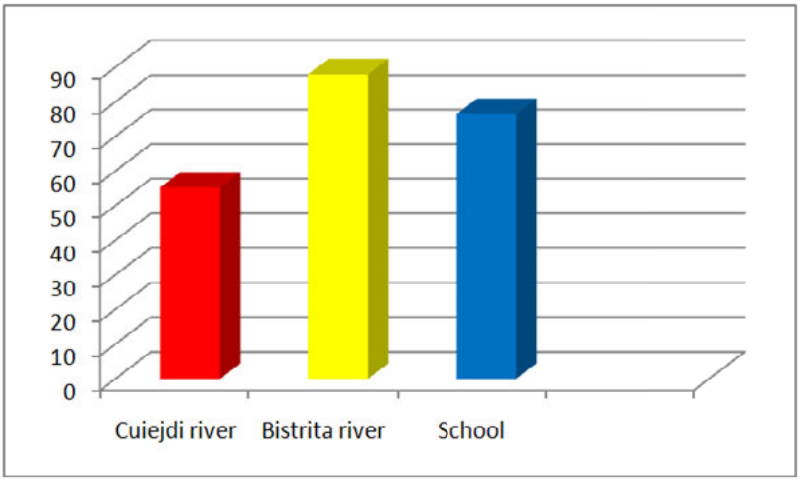
•Copper sulfate is a common algaecide;

•Magnesium sulfate, commonly known as Epsom salts, is used in therapeutic baths;

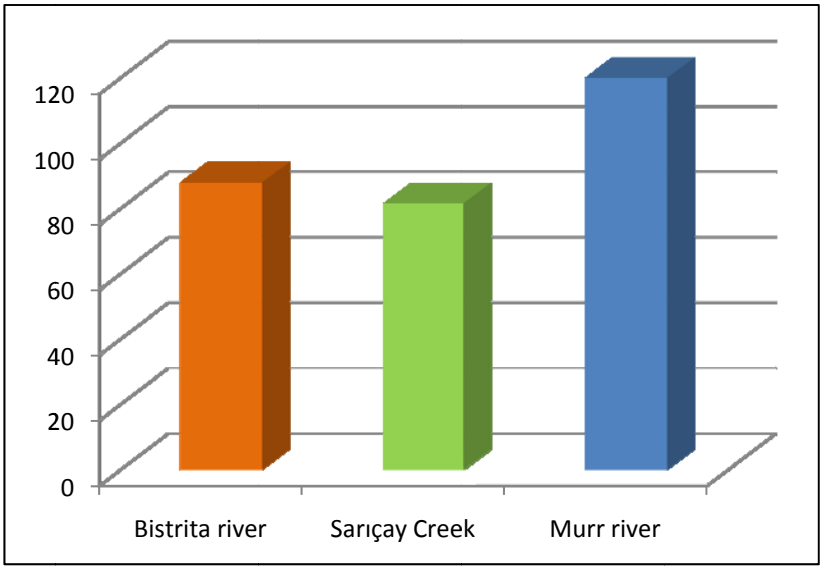
•Gypsum, the natural mineral form of hydrated calcium sulfate, is used to produce plaster;

•The sulfate ion is used as counter ion for some cationic drugs.

Comparative diagrams of sulphate in Romania



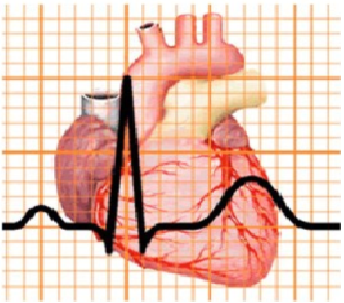
Comparative diagrams of sulphate between Romania, Turkey and Germany



The determination of magnesium in water

Magnesium together with calcium and other ions are involved in water hardness;

In surface waters, magnesium appears both from natural sources and spilling of industrial waste waters.



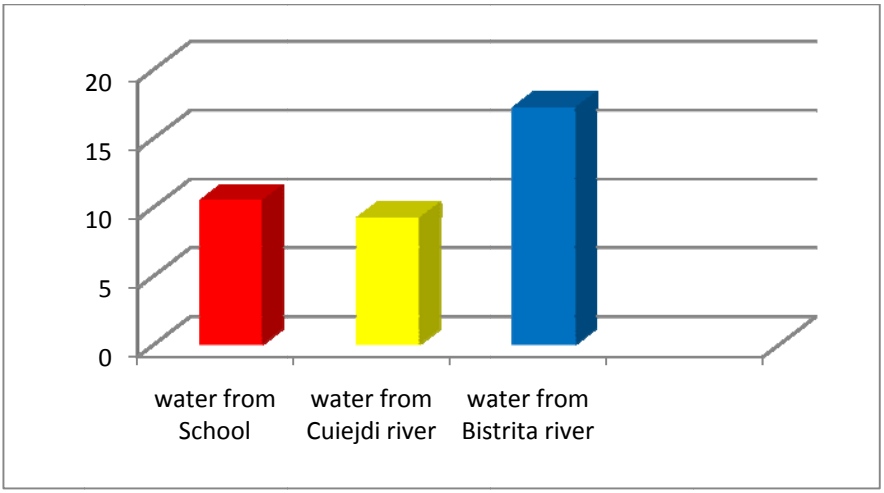
The effects of magnesium

Magnesium :
- Helps for the normal function of muscles and nerves;
- Keeps the constant heart rhythm;
- Supports immunity system and bones'resistance;
- Hepls for the regulation of sugar level in blood;
- Maintains a normal blood pressure.

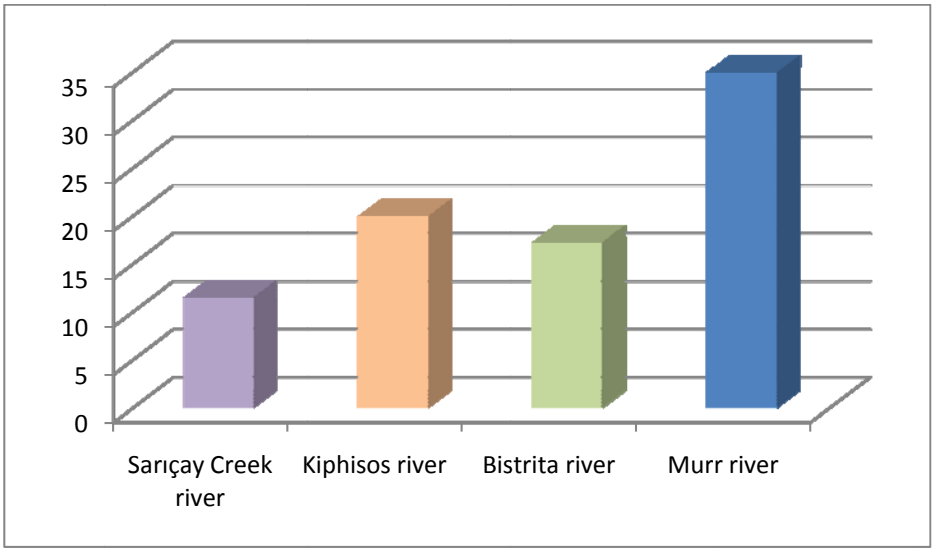
Magnesium carbonate used excessive may cause:

- central nervous system depression;
- cardiac disturbances;
- respiratory and digestive tract irritation in case of ingestion or inhalation.

Comparative diagram of magnesium in Romania



Comparative diagrams of magnesium between Turkey, Greece, Romania and Germany



The determination of corbonate in water

In chemistry, a **carbonate** is a salt of carbonic acid, characterized by the presence of the carbonate ion**;**

At ambient tempera-ture carbonate remain in their solid crystallized form. In this form, they are not color and smell;

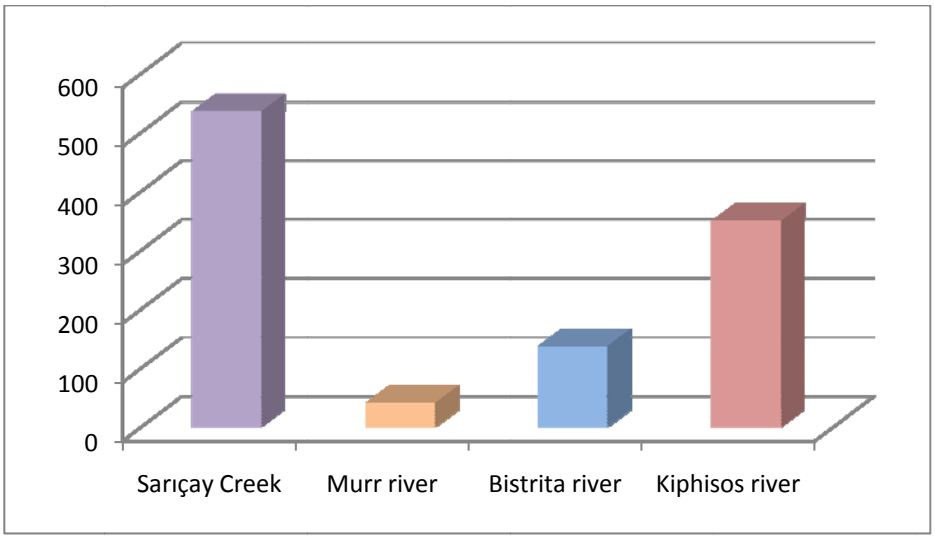
Alkaline carbonate are hardly dissolved in water.

The effects of carbonate

Calcium carbonate is used:

- As gastric antiacid;
- For the treatment of cronic renal failure;
- In the pharmaceutical industry as an inert filler for tablets and other pharmaceuticals.

Comparative diagrams of carbonate between Turkey, Germany, Romania and Greece



Made by the Romanian team

Protocol
Making a model towards using water from precipitations for irigating a field

Step I: Theoretical basis

The making of graphic representations which show:

a) The average monthly quantity for each country member of the project regarding the precipitation levels in the rainy season (from march to october).

b) A graphical representation of the average monthly temperature for each partner country in the project regarding the quantity of precipitations, would give us a better picture of the evaporation process,towards better identification of drought periods.

c) Data will be taken by students using as a source specialised sites.

Step II : Field teams (creating a number of teams)

Material resources: tape, rope, notebooks, pencils.

Target: ***measuring the surface of buildings in order to measure the quantity of water that can be obtained out of precipitations***.

Step III : Calculating the suface of buildings (exposed surface)

1. Calculating the exposed area for precipitations.
2. Corelating the collecting surface with the quantity of average monthly precipitation, quantity which is later

3. used to find the maximum quantity of water we can collect.
4. Measuring (theoretically) the capacity of the recipients regarding the quantity of precipitations.
5. The approximate landmass of vegetation that could be irrigated with the obtained quantity of water.
6. Economical evaluation-"How much would it cost to irrigate the specific surface if we would use water from the network? Are we saving money? How do we know? We'll see the price per cubic meter in each country.

Advantages: Level differences in the school courtyard could irrigate, by using natural rainfall, the grass patches or the trees (including washing the alleys and the sports field).

Step IV : Making the model

Technologycal process of making the model

Crt issue	Operation name	Neccesary materials	Observations
1	**Picking materials**	Polyester boards,polyester blocks,hoses,glasses ,adhesive, tape, matches, scissors, green space, green pens, branches, paper clips	Each member of each team is assigned to his/her respective role.
2	**Placing the model of the polyester houses and the roofs**	Polyester board, polyester blocks,roofs, glue, scissors, glue, clips, adhesive tape	In the constructed buildings there must be at least one element specific of each country.

3	**Placing the chimneys on the roofs**	Hose, scissors, glue, tape	
4	**Creating green areas around the houses**	Green space,glue,matches, branches for trees	Each team can make its own green space like a park, alley, or recreational space.
5	**Establishment and installation of rain-water collection vessels**	Glue, scissors, glasses, hose	
6	**Collected water pipe route planning to green areas or other destinations**	Straw or thin hose	
7	**Testing the route for the collected water**	Bowl of water	At the end every team will test if the instalation works and the water can be gathered and directed towards the green zone. Other purposes can be found for the collected water.

The solution of the teams during the Romanian mobility

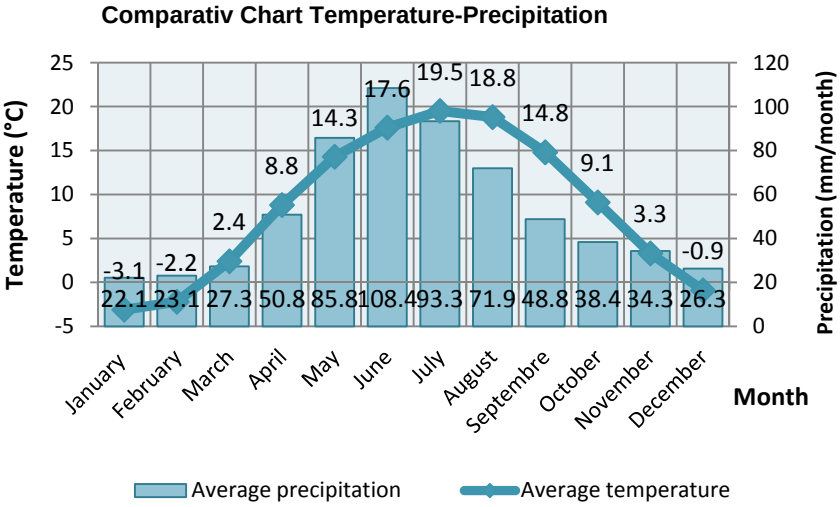
L=50m, l=10m

1. The maximum capacity of the recipients needed to water 2500 m^2 of turf.
   Deficit of water of 45 l/m2
   Max capacity = 2500m^2 x 45 l/m^2 = 112500 liters= 112.5 m^3
2. The capacity of water collected from the building:
   S = 50 x 10 = 500m^2

Month	Water collected
June	500 x 108,4=54200
July	500 x 93,3=46650
August	500 x 71,9=3595
September	500 x 48,8=24400

3. The reduction of expenses per month:

Month	The reduction
June	54200 x 0,8=4337,6
July	46650 x 0,8=37320
August	3595 x 0,8=2876
September	24400 0,8=19620


Comparativ Chart Temperature-Precipitation
Temperature (°C)
Precipitation (mm/month)
Month
25
20
15
10
5
0
-5
120
100
80
60
40
20
0
-3.1
-2.2
2.4
8.8
14.3
17.6
19.5
18.8
14.8
9.1
3.3
-0.9
22.1
23.1
27.3
50.8
85.8
108.4
93.3
71.9
48.8
38.4
34.3
26.3
January
February
March
April
May
June
July
August
Septembre
October
November
December
Average precipitation
Average temperature

Content

Lifelong Learning Programme

LIFELONG LEARNING PROGRAMME

COMENIUS MULTILATERAL SCHOOL PARTNERSHIPS PROJECT

S.O.S WATER

National High School of Natural Sciences and Mathematics

Friendrich - Schiller Gymnasium

Genito Lykeio Peristeriou

The National College of Compters Science

Çanakkale Anadolu Lisesi

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