



AUSTRIA



THE
NETHERLANDS



SWEDEN



BELGIUM



POLAND



SLOVAKIA



SLOVENIA



CROATIA



EU Programme Lifelong Learning
Multilateral Schools Partnerships
COMENIUS EURO BIKE PROJEKT MEETING
Zagreb, May 14 – 18, 2013



INTERNATIONAL EURO BIKE LABORATORY

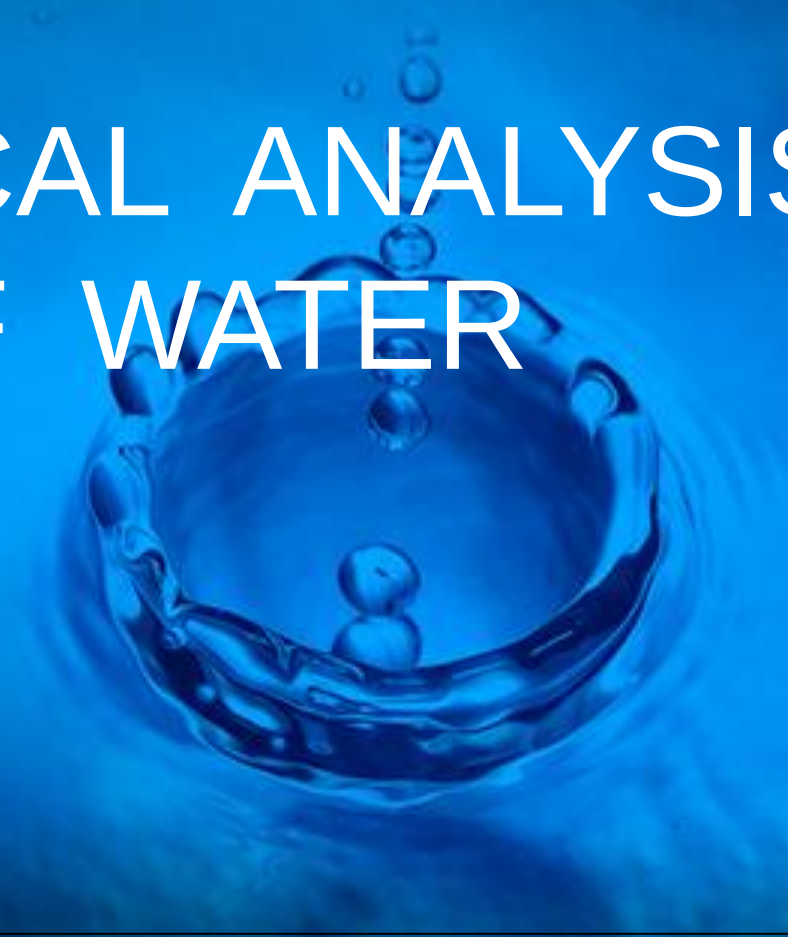
Analysis of Water Quality

Vladimir Prelog Science School
Zagreb, Croatia, 16 May 2013



LIFE is not
possible
without
water...

CHEMICAL ANALYSIS OF WATER



International EURO BIKE laboratory background

Approach

Gathering of samples by students from all participating schools in all project participations countries

Precise instruction given in advance for correct water sampling

Sample of tap water from one`s apartment/house

Sample of fresh water from the local lake or river/creek

INSTRUCTION HOW TO TAKE THE WATER SAMPLES:

- 1 The water samples should be collected on the day of the trip or the day before the trip and directly into clean 0.5L plastic water bottles .
DO NOT USE JUICE BOTTLES!
- 2 Before sampling, rinse the bottles with sampled water!
- 3 Tap water has to run for at least 10 minutes before sampling.
- 4 When sampling freshwater (in a creek, river or lake) submerge the bottle 15cm below the surface.
(The mouth of the bottle should be held 15cm below the surface.)

THE WATER SAMPLES LABELS:

COUNTRY _____
TAP WATER FROM _____(town/city)

COUNTRY _____
FRESH WATER FROM _____(river/brook or lake)

International EURO BIKE laboratory

Analysis of Water Quality

was performed in the laboratory of chemistry in Vladimir Prelog Science School in Zagreb. The programme was created, prepared and conducted by the teachers and students from Vladimir Prelog Science School.

Analysis of water samples was done by the students and teachers from all participating schools:

CROATIA

School: Vladimir Prelog Science School, Zagreb

Teachers:

Mara Husain, Mirela Ivić Zenko, Jasmina Novak

Students:

Ivan Balaić, Borna Bednjanec, Elvis Djedović, Ferry Van Dijck,
Marin Đaković, Adriana Gaščić, Vilim Herc, Karlo Lončarić,
Nikolina Kramarić, Lucija Terihaj, Domagoj Velički,
Brigita Vidaković Lucija Vrđuka,

PARTICIPANTS FROM OTHER COUNTRIES

AUSTRIA

School: Höhere technische Lehranstalt für Informationstechnologie der Stadtgemeinde

Ybbs an der Donau/

Teachers: Hans Müller, Michael Pölzl, Franz Wögerer

Students:

Teufel Marcus, Zülfügarova Elnara, Spielleuthner Theresa, Barthofer Elisabeth

BELGIUM

School: ATHENEUM WISPELBERG annex FREINET ATHENEUM DE WINGERD

Gent

Teacher: MIEL CHARLES

Students:

Lennart Verstraeten, Lennert Verhulst, Midas Van Dorpe,

Lucas Van Dorpe, Pieter-Jan Heggeric

THE NETHERLANDS

School: Valuascollege, Venlo

Teacher: Astrid Bons

Students: Joellen van Soest, Imke Driessen, Bram Sijbers, Lars Curvers

POLAND

School: I Liceum Ogólnokształcące im. Kazimierz Wielkiego,
Zdunska Wola

Teachers:

Anna Kwasniewska Szulc, Chwiałkowski Zbigniew

Students:

Anna Kwasniewska Szulc, Michalina Skotnicka, Agnieszka Andruszewska,
Aleksandra Waligorska, Agnieszka Szulc, Karolina Poisol, Anna Kaminska

SLOVAKIA

School: Gymnázium Milana Rúfusa,
Ziar nad Hronom

Teachers: Sarlota Vincencova, Vanessa Camara Arquero, František Skokanek

Students: Nina Holickova, Lenka Crchova, Martin Žurav, Vladimira Mlyncokova
Simona Dulajova, Alzbeta Klimanova

SWEDEN

School: Fridagymnasiet, Vanersborg

Teachers:

Karin Helmerson, Jerker Sagfors, Mikael Sunnanquist

Students:

Hampus Alchrona, Elin Johansson, Adis Arnautović, Pontus Ollaka Persson

CHEMICAL CONTENTS OF WATER SAMPLES

WHICH CONTENTS WAS BEING ANALYSED

1. SAMPLE OF TAP WATER

The carbonate water hardness

- the dissolving / formation of calcium carbonate:



Hard water – high mineral content

- (especially Ca^{2+} , Mg^{2+} and HCO_3^-)
- not harmful to health
- serious problems in industrial setting
- can be removed by water softeners



1. SAMPLE OF TAP WATER

The measure for water hardness is 1 °dH
(1 °dH = 10 mg CaO/dm³ water).

Classification:

0 – 5 °dH very soft water
5 – 10 °dH.... soft water
10 – 20 °dH.... medium soft/hard water
20 – 30 °dH.... hard water
over 30 °dH.... very hard water

1. SAMPLE OF TAP WATER

Determination of carbonate hardness of tap water



2. SAMPLE OF NATURAL WATER

Determination of:

- NO_2^-
- NH_4^+
- NO_3^-
- PO_4^{3-}
- general water hardness



- Sources of pollution:
 - rotting organic materials
 - feces...





Concentration of ammonium ions/mg/L	Water quality
< 0,01	I non-polluted water, very small pollution
0,1-0,3	II small pollution-middle strong pollution
0,3-3	III very strong pollution-critical pollution
>5	IV too much polluted water,non hygienic water



- the major polluters of ground water
- Sources of pollution:
 - industrial pollution (meat industry, metal industry,...)
 - artificial manures
 - intensive stockbreeding



Concentration of nitrite ions/mg/L	Water quality
< 0,001	I non-polluted water, very small pollution
0,001-0,1	II small pollution-middle strong pollution
0,1-0,5	III very strong pollution-critical pollution
>0,5	IV too much industrial pollution, toxic



Concentration of nitrate ions/mg/L	Water quality
< 0,1	I non-polluted water
1-10	II very small pollution
10-25	III small pollution-middle strong pollution
25-50	IV very strong pollution-critical pollution
>50	V too much industrial pollution



- Natural unpolluted water contains less than 0,02 mg/L of the PO_4^{3-}
- Sources of pollution:
 - industrial pollution
 - phosphoric manures
 - washing and detergents



Concentration of phosphate ions/mg/L	Water quality
< 0,02	I non-polluted water
0,02-0,07	II very small pollution
0,07-0,18	III small pollution-middle strong pollution
0,18-0,4	IV very strong pollution-critical pollution
>0,4	V too much industrial pollution

GENERAL WATER HARDNESS

- General hardness is a measure of the concentration of divalent metal ions such as (Ca^{2+} , Mg^{2+}) per volume of water.
- $1^\circ\text{dH} = 17,8 \text{ mg} / \text{L CaCO}_3$
- Concentration of calcium and magnesium salts in water give food and drink taste (coffe,mineral water...) and they are important for structure of teeth and bones.
- Too much salt in water makes your life much more expensive because of buying more soap and paying more for your cooling, heating or washing properties.

GENERAL WATER HARDNESS

GENERAL HARDNESS (°dH) (17,8 mg/L CaCO_3 = 1°dH)	Water quality
< 0,01	I soft water
0,1-0,3	II middle hard water
0,3-3	III hard water
>5	IV very hard water

RESULTS

1. SAMPLE OF TAP WATER

2. SAMPLE OF NATURAL WATER

1. SAMPLE OF TAP WATER

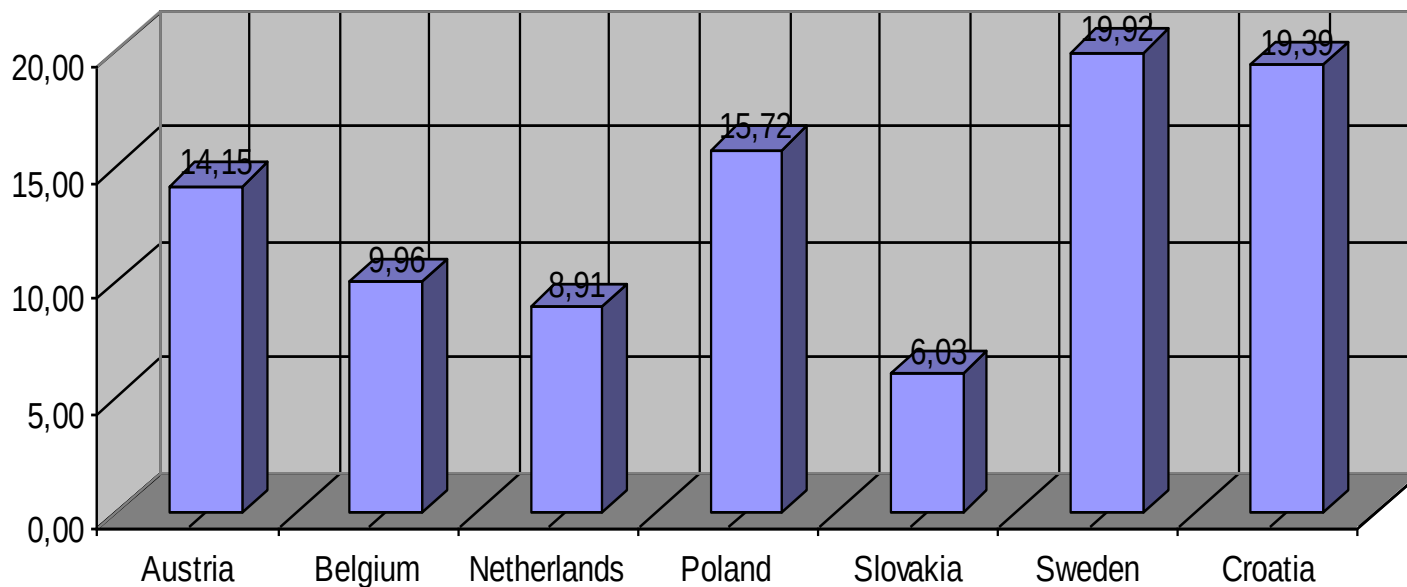
RESULTS

Country team	AUSTRIA	BELGIUM	THE NETHERLANDS	POLAND	SLOVAKIA	SWEDEN	CROATIA
TEMPORARY HARDNESS (°dH)	14,15	9,96	8,91	15,72	6,03	19,92	19,3 9
Classification	medium soft/hard water	soft water	soft water	medium soft/hard water	soft water	medium soft/hard water	medium soft/hard water

1. SAMPLE OF TAP WATER

Hardness of tap water

Hardness / °dH



2. SAMPLE OF NATURAL WATER



Country team	$\chi(\text{NH}_4^+) / \text{mg/L}$	Water quality
AUSTRIA	0,2	II small pollution-middle strong pollution
BELGIUM	0,2	II small pollution-middle strong pollution
THE NETHERLANDS	<0,01	I non-polluted water, very small pollution
POLAND	<0,01	I non-polluted water, very small pollution
SLOVAKIA	<0,01	I non-polluted water, very small pollution
SWEDEN	<0,01	I non-polluted water, very small pollution
CROATIA	<0,01	I non-polluted water, very small pollution

2. SAMPLE OF NATURAL WATER



Country team	$\gamma(\text{PO}_4^{3-})/\text{mg/L}$	Water quality
AUSTRIA	0,1	III small pollution-middle strong pollution
BELGIUM	<0,02	I non-polluted water
THE NETHERLANDS	<0,02	I non-polluted water
POLAND	0,02-0,07	II very small pollution
SLOVAKIA	0,02-0,07	II very small pollution
SWEDEN	0,07-0,18	III small pollution-middle strong pollution
CROATIA	<0,02	I non-polluted water

CONCLUSION

1. SAMPLE OF TAP WATER

Determination of carbonate hardness of tap water:

- most of the samples - soft or medium soft/hard water
- carbonate hardness of water also depends on the amount of rainfalls in area before sampling
- all the samples were taken in spring time, after heavy rainfalls

CONCLUSION

2. SAMPLE OF NATURAL WATER

Determination of ions: NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-}

- all samples of freshwater were taken from the local lake or river/creek, or even a pool
- analysis of every sample indicates that some kind of pollution is present, mainly NO_2^- , NO_3^- , and some PO_4^{3-}
- in very few cases in which the analysis demonstrated that the pollution was of inadequate level the participants were instructed to make the co-relation to the possible sources of such high concentration of pollution
- general water hardness analysis - all samples - hard water



Euro-Bike Project is focusing on
ecology / the environment and a sustainable society

Advantages of Analysis of Water Quality for Students:

- learning about the relationship of poor water quality and safe environment
- learning about methodology of water sampling
- team work
- laboratory work
- teachers' lectures on importance of safe water



Euro Bike Project

How is the water analysis exercise related to the project purpose of Euro-Bike Project?

WATER

IS A BASIC PRECONDITION OF LIFE !

ITS PURITY MUST BE PRESERVED !

All participants of this project are aware of the importance of a clean environment (air, WATER and soil), they want to contribute to its preservation and will always encourage people to do the same.

Using a bicycle as a means of transport for daily use, sports and tourism will not only preserve the nature from pollution but it will help us improve our health.

We encourage everyone to be eco-friendly and use bicycles, an eco-friendly ride !