

Colegiul Economic "Virgil Madgearu" Galați

Nr. 3995/30.06.2021

Avizat,

Director Prof. Râpă Marilena



FINAL REPORT "URBAN CHALLENGES"

Title: "Study of the variation regarding the physicochemical parameters of the Danube water in the area of Galați Municipality - establishing water quality through quality indices"



School: "Virgil Madgearu" Economic High School, Galați

Teachers*: 6






Team members *: 11





Scientific reporters *: 4


School team:

1		Râpă Marilena Supervisor, headmaster, tenured teacher of Chemistry, teaching degree I Graduate of the Faculty of Chemical Technology, Chemistry department, Bucharest Polytechnic Institute Graduate of the Faculty of Economics and Business Administration, "Dunărea de Jos" University, Galați 37 years of experience in education
2		Dinică Daniela Liliana Mentor of the scientific research team, tenured professor of Physics and Chemistry, teaching degree I Graduate of the Faculty of Sciences, specialization in Chemistry and Physics, "Dunărea de Jos" University, Faculty of Sciences, Galați 25 years of experience in education

3		<p>Hărăbor Iulia Mentor of the scientific research team, tenured teacher of Physics and Chemistry, teaching degree I Doctor in Chemistry, University of Bucharest Graduate of the Faculty of Sciences, specialization in Chemistry and Physics, “Dunărea de Jos” University, Galați 23 years of experience in education</p>
4		<p>Ciupitu Cristina Elena Mentor of the team of reporters, tenured teacher of socio-human disciplines, teaching degree I Doctor in Philosophy, University of Bucharest Graduate of the Faculty of History and Philosophy, specialization Philosophy 17 years of experience in education</p>
5		<p>Negraia Nicoleta Mentor of the team of reporters, tenured teacher of economic disciplines, teaching degree I Graduate of the Faculty of Economic and Administrative Sciences, specialization in Public Administration, “Dunărea de Jos” University, Galați 20 years of experience in education</p>
6		<p>Căpățînă Mihaela Mentor of the team of reporters, tenured teacher of English, teaching degree I Graduate of the Faculty of Letters, History and Theology Master of Translation and Interpreting 16 years of experience in education</p>
7		<p>Luiza Dobre Leader of the scientific research team Captain of challenges in the research team I got involved in this project because I want to live in a cleaner environment. I am a persevering person, with a team spirit and I am very attentive to details. These are some of the qualities that recommended me for the role in this project. I want to learn how to help humanity live in a clean and healthy environment.</p>

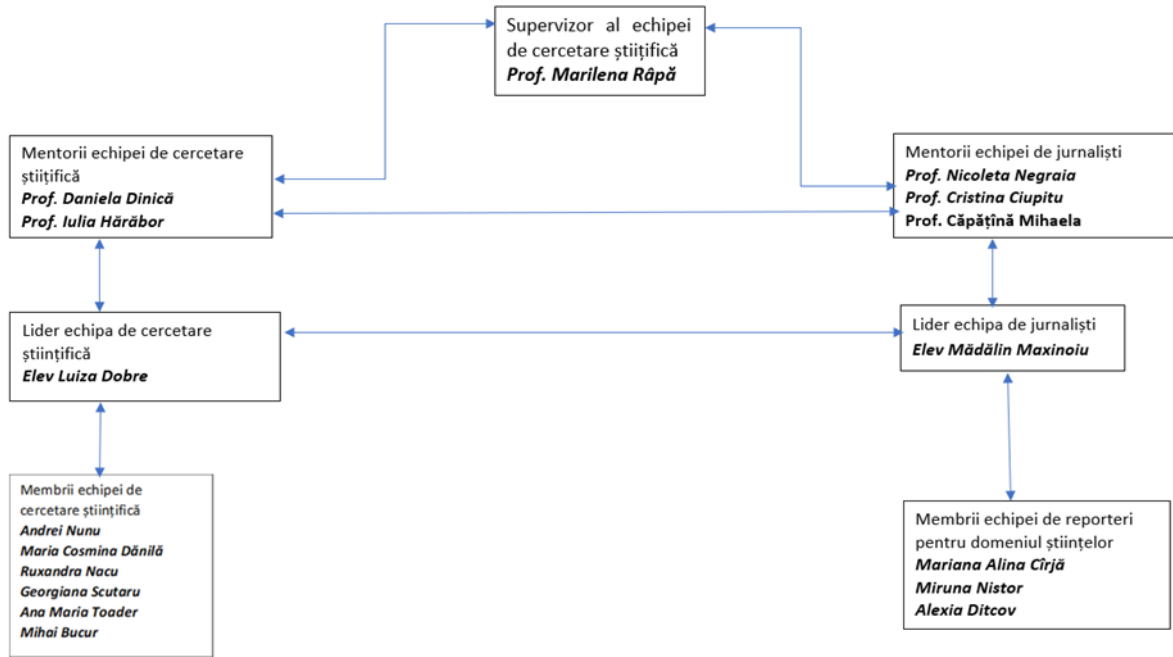
8		<p>Andrei Nunu Member of the scientific research team Researcher in the research team I joined the project because I want to see a change for the better in my city. I am a very communicative person, I like to work in a team and I am very hardworking. I expect to see more changes for the better in my city starting from this project.</p>
9		<p>Maria Cosmina Dănilă Member of the scientific research team Researcher in the research team I want to help protect and improve the environment. I am a responsible and creative person, helping the team with many ideas. My expectations from this project are to find solutions in terms of Danube pollution, in particular and the environment, in general.</p>
10		<p>Ruxandra Nacu Member of the scientific research team Researcher in the research team The major environmental problem in my city is the pollution of the Danube, which is also the main source of drinking water. I am punctual, you can count on me to work in a team, understanding, attentive, responsible, I come up with ideas and solutions to any topic or problem. My expectations are to change something in my city about pollution or at least reduce it.</p>
11		<p>Georgiana Scutaru Member of the scientific research team I want to help solve environmental problems and I also like Chemistry and the projects that involve it. The qualities that recommend me for this project are originality, the ability to work in a team and organizational skills. I have quite high expectations from this project because I really think we can change something about the environment and I am glad that I have the opportunity to learn new things.</p>
12		<p>Ana Maria Toader Member of the scientific research team Expert in the research team I want to contribute to saving the Romanian environment. I am a hardworking and creative person. I expect participants in this project to come up with a solution to change the quality of water in my city.</p>

<p>13</p>		<p>Mihai Bucur Member of the scientific research team Explorer in the research team I wanted to join this project to change something in this community. I am very sociable and I like working in a team. The main expectation after participating in this project is to change something for the better in relation to the pollution in my city.</p>
<p>14</p>		<p>Mădălin Maxinoiu Leader of the team of journalists for the field of science Communicator in the team of reporters The reasons that determined me to get involved in this project were the environmental problems in our city and the desire to motivate people to contribute to creating a healthy environment. The qualities that recommended me for this role are: special language skills, the ability to synthesize information, empathy and attention to detail.</p>
<p>15</p>		<p>Mariana Alina Cîrjă Member of the science reporter team Editor / Translator within the team of reporters The reasons that determined me to get involved in this project were the environmental problems in our city and the desire to change something for the better, because this city has a great potential. The qualities that recommended me for this role are: my English knowledge, correctness and calmness. The expectations I have from this project are first and foremost, to succeed in convincing as many people as possible to be more careful and to protect the environment in which they live and secondly to make them aware of the importance of a healthy environment.</p>
<p>16</p>		<p>Miruna Nistor Member of the science reporter team Creator in the team of reporters The reason that led me to get involved in this project is the desire for knowledge and integration into a group. The qualities that recommended me for the role of creator are: my ability to be creative and to be always open to the new. My expectations from this project focus on people's ability to reduce environmental problems and draw the attention of Galati citizens to the health consequences of pollution.</p>

17		<p>Alexia Ditcov Member of the science reporter team Reviewer and spokesperson for the reporters' team The environmental problems in my city were the main factors that determined me to be part of this project. The qualities that recommended me for the role in the team are seriousness, dedication and curiosity. The expectations I have from this project focus on the improvement of the urban space to connect people in a healthy environment.</p>
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Organization chart of the PULCHRA team of the "Virgil Madgearu" Economic High School, Galați



Support members (experts, tutors, mentors, volunteers):

1		<p>Iticescu Cătălina - university professor, Dr. habil "Dunărea de Jos" University of Galați, Faculty of Science and Environment, Department of Chemistry, Physics and Environment Graduate of the Faculty of Chemistry, „Al. I Cuza ”Iasi, Master in Environmental Monitoring and Management, Faculty of Sciences, "Dunărea de Jos" University of Galați Doctor in Science, Faculty of Metallurgy and Materials Science, "Dunărea de Jos" University of Galați</p>
2		<p>Mioare Enache - Galati County Council - member The county council is an autonomous authority of the county public administration elected by the inhabitants of a county, which has the task of administering through the acts it adopts, the local issues, respectively the carrying out of the public services of county interest. The quality of county councilor offers the possibility to participate in the specific activity of the county public authority, respectively County Council, activity that has a public and legitimate character, being in agreement with the interests of the community from Galati county. Through the attributions provided by law, the county councilors have the obligation to inform the citizens of all the facts and administrative acts that interest the county community.</p>

3	 A portrait of a man with short grey hair, wearing an orange and grey jacket. The name 'DUMITRESCU DORIAN' is visible on the jacket. In the background, there is a banner with text: 'Businesses depend on you. We seek to attract you. We want you to deliver the best for our customers.'	<p>Dorian Dumitrescu - head of Communications at Liberty Galați</p> <p>Graduate of the Faculty of Mechanics within the "Dunărea de Jos" University</p> <p>He worked in the press for the "Orientări" magazine, he was then, among the founders of Radio Galați, he worked for the daily newspaper called "Viața liberă", he worked in the Media Pro Trust and in 2006 he joined the communication team Liberty Galați Romania.</p>
4	 A portrait of a woman with long dark hair, wearing a light-colored patterned blouse.	<p>PhD student Călmuc Mădălina</p> <p>"Dunărea de Jos" University of Galați, Faculty of Sciences and Environment</p>
5	 A portrait of a woman with long dark hair, wearing a light-colored top.	<p>PhD student Călmuc Valetina - Andreea</p> <p>"Dunărea de Jos" University of Galați, Faculty of Sciences and Environment</p>

6		<p>Dragu Ionica – Methodist teacher Graduate of the Academy of Economic Sciences - Bucharest, specialization in Tourism, Hotel and Commercial Management. She followed the professional conversion program at Univ. Lower Danube Galați (FEAA). Economist teacher at “Virgil Madgearu” Economic High School, Galați Since April 2012, she has been a Methodist expert at the Galați Teaching Staff House. National trainer in the projects of the Ministry of Education (ICOS, MATEDIDACTICA and CRED), program manager and regional and county trainer in projects with European funding POSDRU, POCU</p>
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Identifying the challenge:

PULCHRA project - "The development of community centers for urban and participatory learning through research and activation" with the research theme "Study of the variation regarding the physicochemical parameters of Danube water in the area of Galați - establishing water quality through quality indices."

Proposed objectives

- Anthropic influences on the water quality of the Danube in important areas for Galați:
- Danube Dam (DD) - monitoring the water quality in the water catchment area intended for drinking;
- Danube-Siret Confluence (DS) - evaluation of the influence of Siret on Danube water quality;
- Danube – Libertatea restaurant (DL) - monitoring the impact of commercial activities (restaurants) carried out on the shore on water quality;
- Cat's Elbow (CE) - establishing the quality of the Danube water before the Danube-Prut confluence area;
- Danube-Prut Confluence (DP) - assessment of the influence of the Prut River on Danube water quality
- Monitoring of the main pollutants: N-NH₄⁺ (ammonium), N-NO₃⁻ (nitrates), SO₄²⁻ (sulphates), Cl⁻ (chlorides), N-total (total nitrogen), P-PO₄³⁻ (orthophosphates), Fe-total (Total iron)
- Calculation of water quality indices
- Determining the quality of the water body

Research questions:

1. What are the main factors that determine the pollution of the Danube water in the area of Galati Municipality?
2. Which of the studied parameters have a greater impact on water quality?
3. What is the quality of the Danube water in the area of Galati Municipality?

Activity	Description	Resources needed	Location
Online research	Searching for online information on platforms indicated by the teacher	Keywords (water, drinking water, purification, biodiversity, pollutants, Danube)	Online, in google classroom courses
Lectures	<ol style="list-style-type: none"> 1. Introduction to research 2. Documentation, establishing the theoretical and thematic foundation. 3. Scientific research. 4. LEAP project - learning, exploring and activity path. 5. Drinking and purifying water. 	Teachers: Râpă Marilena, Dinică Daniela, Hărăbor Iulia	Online, in google classroom courses
Lectures	<ol style="list-style-type: none"> 1. Stem and root activity. Students answer the following 2 questions asked by the teacher: <ol style="list-style-type: none"> 1. How can we avoid water pollution? 2. What are the consequences of water pollution? Students write down the answers. The teacher collects the information and the students become interviewers (roots) and find out the opinions of the other students in the group. At the end, the "stem" summarizes the answers to the questions. All answers will be posted on the platform! 2. Building a mental map by generating associations in connection with environmental issues in Galati. 3. Belbin test for weakening the place in the team 	Teachers: Negraia Nicoleta, Căpățîna Mihaela, Ciupitu Cristina	Online, in google classroom courses

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classroom.google.com/u/0/c/MjQ2NzE2MTI2NTgx

PROIECT PULCHRA - "Dezvoltarea de centre c... Flux Activitate la curs Persoane Note

PROIECT PULCHRA - "Dezvoltarea de centre comunitar...

Codul pentru curs f4tsxf

Linkul Meet <https://meet.google.com/lookup/gt3le4ml5e>

Selectați o temă
Încărcați fotografia

În curând
Scadență astăzi
Activitatea Tulpină și rădăc...
Afișați tot

Faceți un anunț pentru clasă

Nicoleta Negraia a postat o temă nouă: Activitatea Tulpină și rădăcini
10:46

Nicoleta Negraia
30 Ian.
Bună seara, dragilor!
Luni, la ora 10, 30, ne întâlnim pe meet!

Adăugați un comentariu la curs...

classroom.google.com/u/0/w/MjQ2NzE2MTI2NTgx/t/all

PROIECT PULCHRA - "Dezvoltarea de centre c... Flux Activitate la curs Persoane Note

+ Creați Meet Dosar de curs in Drive

Activitatea Tulpină și rădăcini

Termen limită: Azi

Data postării: 10:46

Elevii răspund la următoarele 2 întrebări adresate de către profesor:

1. Cum putem evita poluarea apei?
2. Ce urmări poate avea poluarea apei?

Elevii notează răspunsurile. Profesorul(tulpina) colectează informațiile, iar elevii devin intervievați(rădăcinii) și află opiniile celorlalți elevi din grup.
La final "tulpina"rezumă răspunsurile la întrebări.
Toate răspunsurile vor fi postate pe platformă!
SPOR!

9 Predat
1 Cu temă atribuită

Afișați tema

- MATERIALE Data postării: 28 Ian.
- MATERIALE PROIECT Data postării: 27 Ian.
- Activitati pentru sustinerea reportorilor pen... Ultima editare: 27 Ian.
- PREZENTAREA PROIECTULUI Ultima editare: 27 Ian.



Exploring the challenge

1. GALATI HIGH SCHOOL STUDENTS ARE INVOLVED IN THE RESEARCH ACTIVITY FOR A HEALTHY ENVIRONMENT / CEVM IN THE PULCHRA INTERNATIONAL PROJECT. The Danube river is the main source of drinking water supply for the city of Galati, so the research topic chosen by the project team is " Study of the variation regarding physico chemical parameters of the Danube water in the area of Galati. Establishing water quality through quality indices". Thus, 11 students involved, together with the coordinating teachers, participated in a research course conducted by the Faculty of Sciences and Environment of "Dunărea de Jos" University of Galați. A series of activities were carried out here that captivated the students, who were actively involved in the research stages.

After being presented with the CREDENTIAL laboratory of the European Center of Excellence for the Environment (ECEE), the research team determined the physico-chemical parameters of the water, namely temperature, pH, conductivity and dissolved oxygen (OD), using multiparameter HANNA HI9829. This was followed by the experimental determination of the concentration of nitrites and nitrates in a water sample taken from the Danube (Siret-Danube confluence monitoring station). These two parameters were determined using the Spectroquant NOVA 60A spectrophotometer in the laboratory. The spectrophotometric determination of free chlorine from a water sample collected from the local drinking water network was another experiment that aroused the interest of high school students.

Continuing the activity, the academics considered it necessary to present the XRF (X-ray Fluorescence Spectrometer) ElvaX Mobile equipment, which can be used to analyze the concentration of metals in the Danube water sediment.

Finally, there was a debate on the legislation in force on the quality of drinking water, surface water, industrial and domestic water, respectively, Law 458/2002 on drinking water quality, Order 161/2006 for the approval of the Regulation on quality classification surface water in order to establish the ecological status of water bodies, NTPA-001/2002 on the establishment of pollutant loading limits for industrial and urban wastewater for discharge into natural receptors, NTPA-002/2002 on the

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conditions for the discharge of wastewater into the sewerage networks of the localities and directly in the treatment plants.

Brief description of the actions for the involvement of stakeholders and experts (direct contact, public workshop for the presentation of the project), meetings with experts for the preparation of field research activities, description of experiments performed or questionnaires. Also consider photos, videos, charts and infographics, and a summary sheet to list your activities.





2. THE STUDENTS OF "VIRGIL MADGEARU" ECONOMIC HIGH SCHOOL ARE INVOLVED IN THE ENVIRONMENTAL PROBLEMS IN THEIR CITY BY ADMINISTRATING A QUESTIONNAIRE REGARDING THE DANUBE WATER QUALITY. Within the PULCHRA Project - "The development of community centers for urban and participatory learning through research and activation" with the research theme "Study of the variation of physico-chemical parameters of Danube water in the area of Galati - establishing water quality through quality indices", students of "Virgil Madgearu" Economic High School administered an online questionnaire on Danube water quality.

The questionnaire had a wide addressability, targeting several age categories and including a series of questions that aroused the interest of a number of 120 respondents.

The purpose of this questionnaire was to identify the degree of information of Galați citizens regarding the quality of drinking water in their municipality. Thus, a less polluted environment and implicitly cleaner waters can become a reality only by increasing the degree of involvement and awareness of all citizens.

3. THE "RESEARCHERS" OF "VIRGIL MADGEARU" ECONOMIC HIGH SCHOOL FROM GALATI ANALYZED THE QUALITY OF THE DANUBE WATER. The research team of "Virgil Madgearu" Economic High School from Galați carried out a new activity within the PULCHRA Project - "Development of community centers of urban and participatory learning through research and activation" with the research topic "Study of the variation of physico-chemical parameters of water Danube in the area of Galati Municipality. The activity aimed to take water samples from several points of interest located along the Danube River, respectively, the Galati Shipyard, the area near the Libertatea restaurant vessel, as well as the area known as "The ferry transit area".

The experiments performed with the help of the portable determination kit and under the close supervision of the coordinating teachers were very interesting and materialized in a series of determinations.

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The determined physico-chemical parameters were: temperature, nitrates, nitrites, oxygen, phosphate, carbonate, residual hardness, pH, carbonate hardness, ammonium.



4. Research activity: Construction of the Danube water treatment plant



Communicate the solution and the results of the project

Research conclusions

□ According to the results of the WQI index obtained, in March - May 2021 (spring season), the quality of Danube water in the riparian sector of Galati was mostly classified in class II quality ("Good" quality), except for the DS monitoring station (the confluence of the Danube - Siret), where the water was classified in class III.

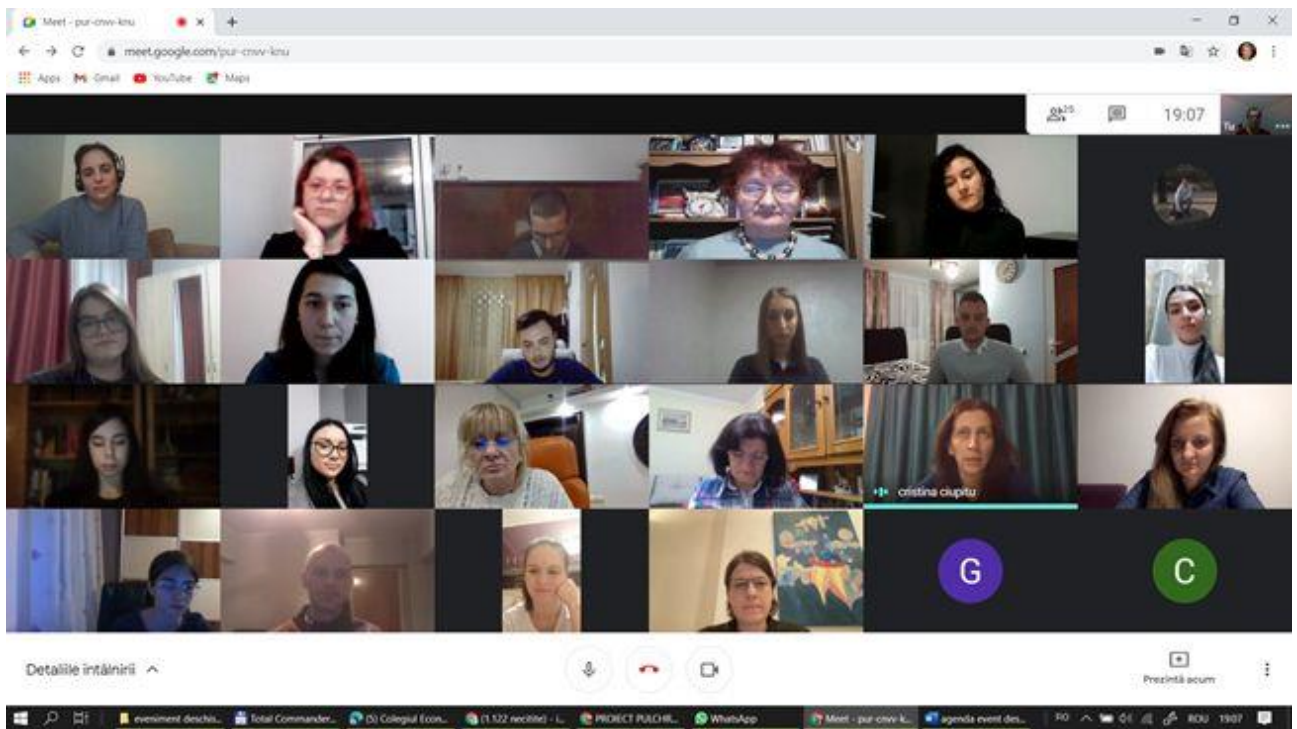
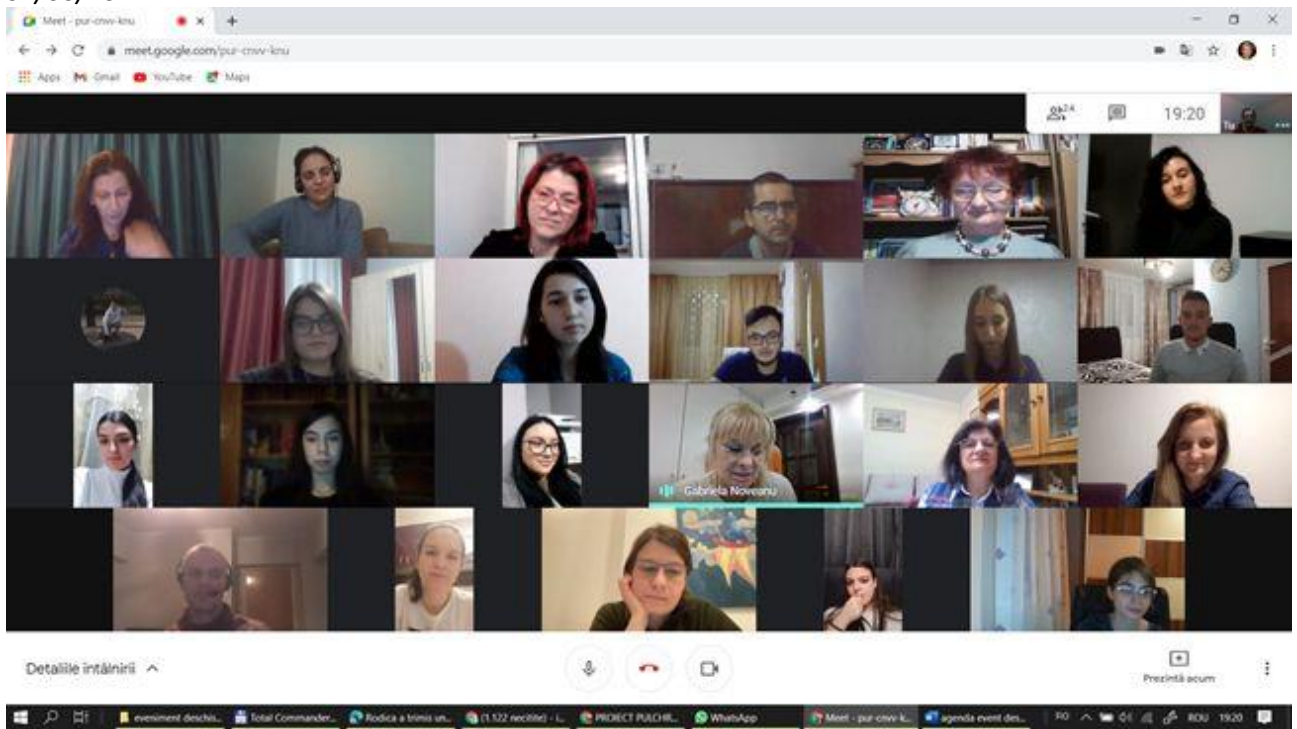
- Water quality according to the WQI index was influenced to a significant extent by the following quality indicators $N-NH_4^+$, $N-NO_3^-$ and $P-PO_4^{3-}$
- Regarding the spatial distribution of water quality, the results of the three indices highlighted the contribution of the Prut and Siret tributary rivers on the Danube water quality. In the monitoring stations placed at the confluence areas, values corresponding to lower qualities were recorded than in the other areas.
- At the same time, the spatial variation of the WQI results highlighted the self-purification capacity of the Danube, the values being different from one station to another.
- The main sources of pollution are agricultural activities (use of chemical fertilizers) carried out in adjacent areas and at the same time, the Wastewater Treatment Plant of Galati.
- To reduce nutrient pollution caused by agricultural activities, it is recommended to replace chemical fertilizers with natural fertilizers. A feasible alternative is the controlled / rational application of sewage sludge on agricultural land. Thus, the problem of large quantities of sewage sludge is solved, which are currently not recovered, but are stored in the landfill.
- For a global assessment of the quality of the Danube River, it is recommended to monitor other classes of pollutants such as heavy metals, pharmaceutical compounds, micro plastics and pesticides from both water and sediment and aquatic biota.

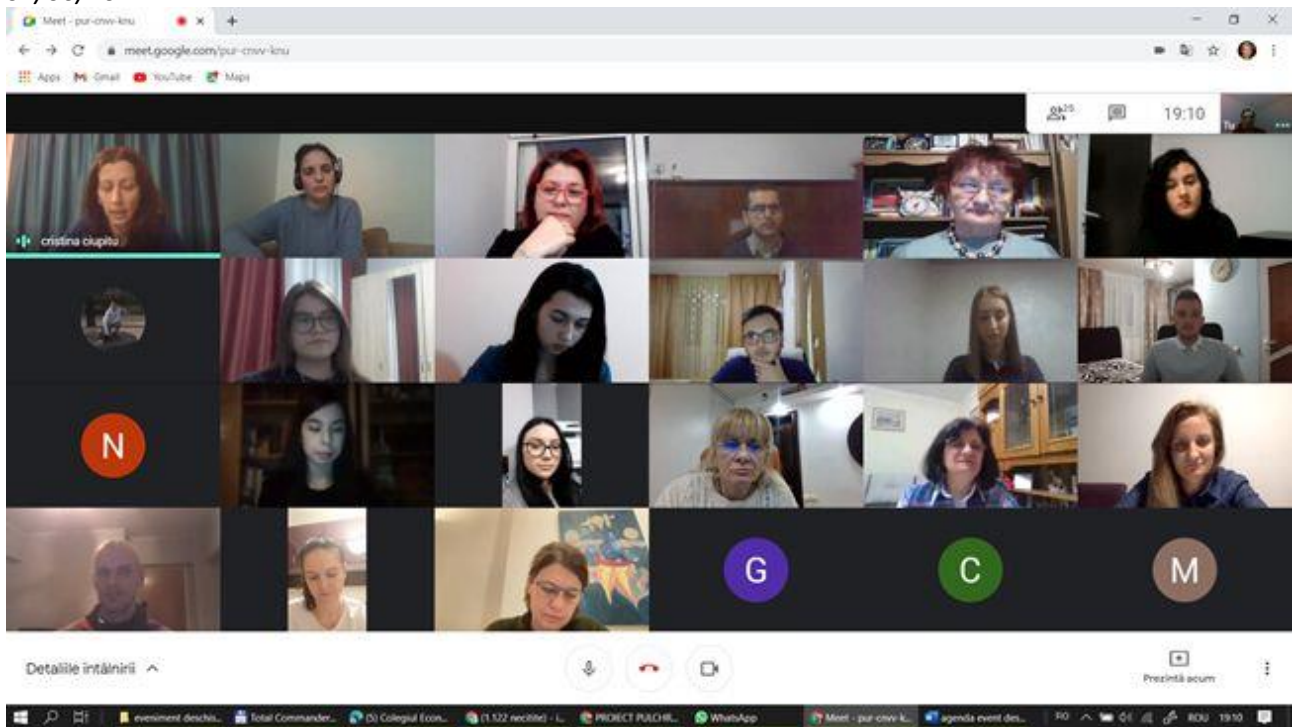
Proposals and recommendations

- Preparation of the so-called river basin management plans based on natural geographical river basins, as well as specific programs of measures to achieve the objectives.
- Increasing the quality of drinking water and water supplied, thus contributing to reducing the number of plastic bottles due to increased confidence in tap water.
- Informing the public through “bathing water profiles” which contain, for example, information on the type of pollution and the sources that affect the quality of bathing water
- Protection of waters against pollution caused by nitrates from agricultural sources, by permanent monitoring of water quality

Activity	Description	Resources needed	Location
Public event	Two public events hosted by ‘Virgil Madgearu’ Economic High School together with the project partners, on 24.02.2021 and 07.07.2021.	Invitation posters. Oral presentation of the project results. https://scientistsromanian.weebly.com/	Online

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Lessons from the project approach

Proposals and recommendations

- Preparation of the so-called river basin management plans based on natural geographical river basins, as well as specific programs of measures to achieve the objectives.
- Increasing the quality of drinking water and water supplied, thus helping to reduce the number of plastic bottles due to increased confidence in tap water.

Drinking water from the Danube

<p>POTABILIZAREA APEI DIN DUNĂRE</p>	 <p>Echipa de cercetare a școlii PULCHRA - Colegiul Economic "Virgil Madgearu" Galați</p>
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The PULCHRA Handbook of Educational Materials

Întrebarea de cercetare: Cum se obține apa potabilă din Dunăre?

- Vizita la Uzina de apă nr. 2



- Apa înseamnă viață. Apa acoperă 71% din suprafața Pamantului iar corpul uman conține 60% apă.



Obținerea apei potabile Operația de sitare

- Apa captată dintr-o sursă naturală trebuie să treacă printr-un sistem de grătare fine sau printr-o sită cu ochiuri mari, pentru a se reține particulele mari plutitoare sau aflate în suspensie. Reținerea acestor particule, înca de la intrarea în stația de epurare este importantă pentru că pot apărea diferite probleme ca: blocarea conductelor și a garniturilor, blocarea instalațiilor de aerare și pompare.
- Operația de reținere a nisipului și a particulelor de mici dimensiuni (peste 0,2 mm) care plutesc în apă în suspensie se numește **deznisipare**.



2. Grătar mecanic rotativ

1. Apa brută de Dunăre este captată de la Priza de Apă și este transportată la Uzina de apă 2

Apa brută este pompată printre spațiile grătarului, iar tamburul pornește automat. Separarea optimă a materialelor plutitoare, sedimentabile și în suspensie este asigurată cu ajutorul grătarului mecanic rotativ.



3. Spălarea grătarului mecanic rotativ

Operația de coagulare



Adăugarea soluției de sulfat de aluminiu în apa brută din Dunăre



Dozarea sulfatului de aluminiu se face automat

Operația de coagulare este necesară atunci când în apa brută sunt suspensii foarte fine, coloidale, ce nu pot fi reținute de către deznisipatoare. Procesul de coagulare consta practic în aglomerarea substanțelor coloidale și formarea de particule mai mari ce pot fi mai ușor separate.

Prin dispersarea în apă a unor particule numite substanțe coagulante, care au sarcini pozitive (ioni pozitivi), se produce această neutralizare a particulelor aflate în suspensie în apă și astfel particulele se pot aglomera.

În urma introducerii de substanțe coagulante se formează un fel de precipitat, numit "precipitat flocos", și care de regulă este un hidratat metalic, care se aglomerează în cadere sau în timpul agitării lente în camerele de reacție. În acest mod se elimină și o parte din substanțele organice și în multe cazuri și o serie de coloranți din apă.

Coagulanții cei mai utilizați sunt : sulfatul de aluminiu; clorura ferică; sulfatul feros; sulfatul feric .

