

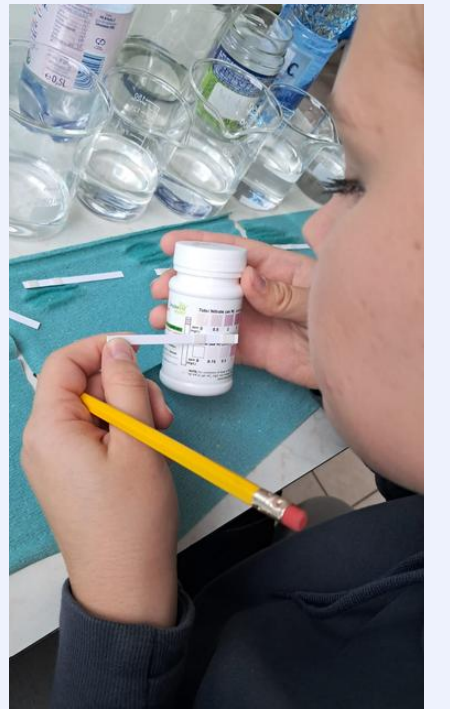
A gaze into the water

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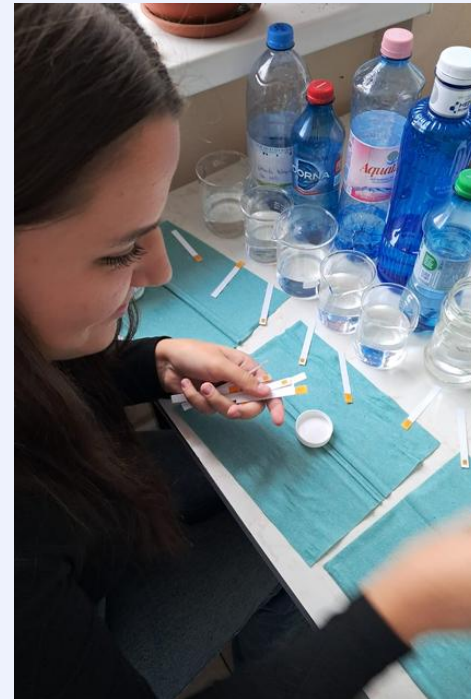
Introduction



Within this study, 22 water sources from different areas of Constanța County were analyzed, specifically selected to ensure a wide diversity of samples. The evaluation of water quality was carried out based on multiple physico-chemical parameters, including pH, salinity, total dissolved solids (TDS), electrical conductivity (EC), oxidation-reduction potential (ORP), chlorine, phosphates, metals, ammonium, nitrates, nitrites, iron, fluoride, hardness, and alkalinity.

In addition, rainwater samples, as well as stagnant rainwater, were included in the analysis to observe the differences between them. Following the initial analyses, 6 locations with concerning results were identified, from as varied areas of Constanța County as possible. Samples from these locations were filtered using a filter designed by us, and were subsequently subjected to a second filtration. After each stage, the analyses were repeated in order to highlight the changes that occurred and the efficiency of the filtration process.

The Purpose



The purpose of the project is to evaluate the quality of water from different sources in Constanța by analyzing relevant physicochemical parameters.

Additionally, the project aims to identify water sources with concerning values and to test the efficiency of a filtration system developed by us, by comparing the results obtained before and after the filtration process, in order to determine the improvement in water quality.

Objectives



- Highlighting the impact of environmental factors and the source of origin on water composition.
- Comparing the efficiency of filtration depending on the type of contaminants identified in the samples.
- Analyzing the differences between natural water and stagnant water in terms of potential risks.
- Identifying the most common water quality issues in the analyzed areas.
- Formulating recommendations regarding water use and treatment based on the obtained results.
- Exploring the possibility of optimizing the developed filter based on experimental results.



Materials used

For carrying out these analyses, the following materials were used:

- Checker devices – for measuring pH, salinity, ORP, and EC
- Test kits containing various reagents – for alkalinity, hardness, and ammonium
- Filter body
- Gauze – supports the filtering layers and prevents larger particles from passing through
- Small pebbles – retain larger impurities and help water circulation through the filter
- White sand – filters fine particles and sediments from the water
- Textile material – retains very fine particles and helps distribute water evenly
- Berzelius glasses
- Pipettes



Methodology

For measuring pH, ORP, EC, salinity, and TDS, the device was immersed in a Berzelius beaker containing the water sample and left for 1 to 3 minutes to obtain the reading.

For ammonium, phosphates, nitrates, and nitrites, test strips were immersed in the water for the indicated time, and the resulting color was compared with the reference chart on the packaging to determine the concentration.

For alkalinity and hardness, the water was mixed with specific reagents and powders in the indicated amounts, after which the cuvette was placed in the checker, and the result was read.

The filtration system was constructed with the following layered materials:

- Gauze – supports the filtering layers and prevents larger particles from passing through.
- Small pebbles – retain larger impurities and facilitate water circulation through the filter.
- White sand – filters fine particles and sediments from the water.
- Textile material – retains very fine particles and ensures even distribution of water.

The water was poured through the filter, and a Berzelius beaker placed at the base collected the filtered water.

It is very important to wash and dry all containers and equipment after each analysis and filtration process to ensure accurate results and prevent contamination.



Results

	pH	Salinity	TDS	EC	ORP	Chlorine	Phosphate	Metal	Ammonium	Nitrates	Nitrites	Iron	Fluoride	Hardness	Alkalinity
1	8	0.7	424	870	284	0.4	36	40	0	0.5	0	0.1	0.6	294	268
2	8.4	0.38	290	730	270	0.1	60	15	0	0.3	0	0.1	0.2	290	203
3	6.9	0.36	312	604	283	0.09	75	20	0.2	0	0	0	0.1	12	205
4	8	0.5	406	802	253	0.2	120	15	0.2	1.5	0	0.1	0	319	272
5	8.3	0.46	377	746	222	0.1	75	9	0.2	0.3	0	0	0.2	294	252
6	7.8	0.46	377	743	249	0.09	75	40	0	0.4	0	0.2	0.1	284	252
7	7.8	0.45	366	731	230	0.09	51	20	0.3	0.3	0	0	0.1	261	249
8	7.8	0.51	409	808	243	0.02	30	3	0	0.7	0	0.1	0	169	276
9	8.1	0.33	276	1034	237	0.2	15	0	0.6	0.1	0	0	0.5	241	201
10	8.3	0.51	411	810	250	0.1	30	75	1	0.6	0	0.1	0.7	246	267
11	8	0.66	529	567	240	0.01	30	10	2	5	0	0	0.2	288	303
12	8.3	0.51	415	821	250	0.2	75	11	0	0.5	0	0	0.1	280	277
13	8.2	0.35	294	588	220	0.01	15	15	0	0	0	0	0	262	210
14	6.8	0.51	410	814	377	0.02	27	30	0	1.3	0	0.1	0.2	316	24
15	8.1	0.35	336	651	241	0	21	50	0.2	0.4	0	0	0	350	203
16	7.8	1.13	827	723	250	0.1	0	25	0.4	15	0	0.1	0.3	246	500
17	7.7	0.34	290	820	176	0.3	3	27	0	0	0	0	0.4	288	203
18	8.2	0.46	380	704	211	0.5	18	150	0.3	0	0	0.1	0.1	267	256
19	8	0.48	385	668	230	0.1	15	10	0	0	0	0	1	287	253
20	7.9	0.4	292	569	262	1.1	75	10	0.5	0.4	0	0	0.3	271	207

Rainwater/ gutter water

	pH	Salinity	TDS	EC	ORP	Chlorine	Phosphate	Metal	Ammonium	Nitrates	Nitrites	Iron	Fluoride	Hardness	Alkalinity
Rainwater	8.4	0	55	0	177	0.2	0	15	0.1	0.1	0	0	0.5	127	24
Apa de polaie stagnanta	8.3	0	58	0	187	0.02	6	17	0	0	0	0	0	120	37

Valu lui Traian

	TDS	ORP	PH	EC	METALE	AMONIU	NITRATI	NITRITI	FOSFATI	ALCALINITATE	CLOR	DURITATE
before	529	240	8	567	10	2	5	0	30	303	0,01	288
dupa	512	138	8	995	5	0	5	0,4	0,3	285	0,3	348

Lunca fountain

	TDS	ORP	PH	EC	METALE	AMONIU	NITRATI	NITRITI	FOSFATI	ALCALINITATE	CLOR	DURITATE
before	892	126	8,1	1590	11	0,1	25	0	27	422	0,1	350
dupa	988	100	8,3	1888	7	0	18	0	7	396	0	342

Navodari

	TDS	ORP	PH	EC	METALE	AMONIU	NITRATI	NITRITI	FOSFATI	ALCALINITATE	CLOR	DURITATE
before	410	377	6,8	814	30	0	1,3	0,5	27	240	0,02	316
dupa	603	128	7,9	1200	0	0	5	0,5	5	319	0	287

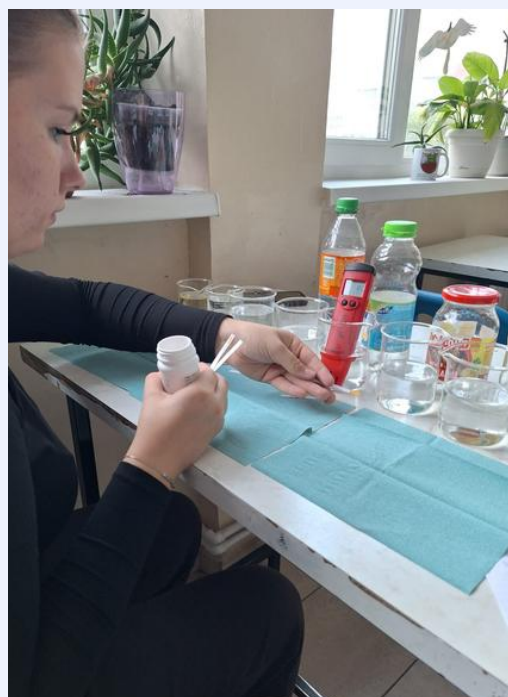
Cumpana

	TDS	ORP	PH	EC	METALE	AMONIU	NITRATI	NITRITI	FOSFATI	ALCALINITATE	CLOR	DURITATE
before	294	220	8,2	588	15	0	0	0	15	210	0,01	262
dupa	253	176	8,4	791	3	0	0	0	5	250	0	293

"Ovidius" Theoretical highschool

	TDS	ORP	PH	EC	METALE	AMONIU	NITRATI	NITRITI	FOSFATI	ALCALINITATE	CLOR	DURITATE
before	380	211	8,2	704	150	0,3	3	0	18	256	0,5	267
dupa	372	131	8,1	811	30	0	2	0	0	247	0,2	294

Conclusions



The project's conclusions indicate that the filtration process generally improved the quality of water analyzed from multiple locations in Constanța County. In most samples, a reduction of important contaminants such as metals, ammonium, phosphates, and chlorine was observed, demonstrating the filter's effectiveness in purifying water. However, in some cases, increases were noted in certain parameters, such as conductivity, TDS, or nitrites, indicating changes in the chemical composition of water after filtration. These variations may be attributed to potential experimental errors, such as incorrect assembly of the filter, loss of filter material, excessive filtration rate, or equipment contamination.

Overall, filtration proved effective in reducing most contaminants and improving water quality, although some results may have been influenced by experimental inconsistencies.

Site-specific observations:

- Location 16 presented the highest number of critical parameters simultaneously (salinity, TDS, nitrates, and high alkalinity).
- Location 14 showed low pH and low alkalinity, indicating chemically unstable water.
- Locations 11 and 6 had elevated ammonium and iron levels, indicating the presence of impurities.
- Other locations showed values within normal ranges.

Rainwater observations:

Rainwater is generally clean and low in minerals, but slight chemical changes occur during stagnation: chlorine decreases, while phosphates and alkalinity increase, suggesting the onset of mild biological contamination.

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Anexe

pH

origin of water	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
pH value	8	8,4	6,9	8	8,3	7,8	7,8	7,8	8,1	8,3	8	8,3	8,2	6,8	8,1	7,8	7,7	8,2	8	7,9

Salinity (ppm)

origin of water	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
salinity value	0,7	0,38	0,36	0,5	0,46	0,46	0,45	0,51	0,33	0,51	0,66	0,51	0,35	0,51	0,35	1,13	0,34	0,46	0,48	0,34

TDS (ppm)

origin of water	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
TDS value	424	290	312	406	377	377	366	409	276	411	520	415	294	410	336	827	290	380	385	292

EC (mS)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
EC value	870	730	604	802	746	743	731	808	1034	810	567	821	588	814	651	723	802	704	668	569

ORP (mV)

Water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ORP value	284	270	283	253	222	249	230	243	237	250	240	250	220	377	241	250	176	211	230	262

Chlorine (ppm)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
chlorine value	0.4	0.1	0.09	0.2	0.1	0.09	0.09	0.02	0.2	0.1	0.01	0.2	0.01	0.02	0	0.1	0.3	0.5	0.1	0.1

Phosphate (ppm)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
phosphate value	36	60	21	120	75	75	51	30	15	30	30	75	15	27	21	0	3	18	15	75

Metals (ppm)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
metal value	40	15	20	15	9	40	20	30	75	10	11	15	30	50	25	27	13	150	10	10

Ammonium (ppm)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ammonium value	0	0	0.2	0.2	0.2	0	0.3	0	0.6	1	2	0	0	0	0.2	0.4	0	0.3	0	0.5

Nitrates (ppm)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nitrate value	0.5	0.3	0	1.5	0.3	0.4	0.3	0.7	0.1	0.6	5	0.5	0	1.3	0.4	15	0	0	0	0.4

Iron (ppm)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Valoarea fierului	0.1	0.1	0	0.1	0	0.2	0	0.1	0	0.1	0	0	0	0.1	0	0.1	0	0.1	0	0

Fluoride (ppm)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Fluoride value	0.6	0.2	0.1	0	0.2	0.1	0.1	0	0.5	0.7	0.2	0.1	0	0.2	0	0.3	0.4	0.1	1	0.3

Water hardness (ppm)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Hardness value	294	290	12	319	294	284	261	169	241	246	288	280	262	316	350	246	288	267	287	271

Alkalinity (ppm)

water origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Alkalinity value	268	203	205	272	252	252	249	276	201	267	303	277	210	24	203	500	203	256	253	207

Thank you!