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# WATER ISSUES

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PHOTOG ACHIM RUHNAU

MADAGASCAR – DROUGHT IN THE KINGDOM OF LEMURS. ON THE SUPPORT OF PAH AND SAND DAMS

FARM TO FORK STRATEGY – MONITORING INDICATORS

AI ON GUARD FOR MANATEES. REVOLUTION IN THE PROTECTION OF MARINE GIANTS

GLOBAL OCEAN GENOME. HOW MANY GENES ARE IN THE OCEAN?

# SCIENTIFIC AND TECHNICAL CONFERENCE ENTITLED. WATER - A KEY FACTOR IN THE DEVELOPMENT OF CIVILIZATION

*Posted on 14 March 2024 by Izabela Łuba*

From September 18 to 20, 2024. in Krakow at the Institute of Geography and Spatial Management of the Jagiellonian University, will be held a Scientific and Technical Conference entitled. Water - a key factor in the development of civilization. Water Matters was pleased to provide media coverage. The event is unique in that on the second day it will move from the capital of Malopolska to the Podhale region, to Bialka Tatrzanska, where a field session will be held. We invite you to this meeting today, which will provide an opportunity for all theoreticians and practitioners related to the use of water in the economy, as well as the protection of its resources, to exchange experiences and discuss.

**Categories:** Issue 5/2024, News

**Tags:** Conference, development, water

From September 18 to 20, 2024. in Krakow at the Institute of Geography and Spatial Management of the Jagiellonian University will host a Scientific and Technical Conference entitled *Water - a key factor in the development of civilization*. *Water Matters* is pleased to assume media patronage over it. The event is unique in that on the second day it will move from the capital of Malopolska to the Podhale region, to Bialka Tatrzanska, where a field session will be held. We invite you to this meeting today, which will provide an opportunity for all theoreticians and practitioners related to the use of water in the economy, as well as the protection of its resources, to exchange experiences and discuss.

## Scientific and technical conference in Krakow - objectives

Scheduled for the penultimate week of September, the Scientific and Technical Conference entitled *Water - a key factor in the development of civilization* is organized by Jagiellonian University, the Association of Polish Hydrologists and the Hydrological Commission of the Polish Geographical Society, in cooperation with the Institute of Meteorology and Water Management - PIB, as well as the Water Management Committee of the Polish Academy of Sciences. The main purpose of the event, covered under the honorary patronage of the Rector of the Jagiellonian University in Cracow and the Rector of the Stanisław Moniuszko University of Agriculture. The goal of the Hugo Kołłątaj University of Science and Technology in Krakow is to draw attention to the most important challenges currently facing hydrology.

They concern both the quantity and quality of available water resources, studied not only in a basic context, but also in an applied one. These include, first and foremost, rational water management, which has a significant impact on the functioning of the economy, society and ecosystems. The event will also address the issue of the rate of water circulation, both in the natural environment and in conditions transformed by human activity, which is increasingly affecting the state of the resource. In addition, the Science and Technology Conference will present the results of research related to the impact of climate change on water resources and their quantity in recent years. There will also be plenty of discussions, including on strategies related to water conservation and opportunities to increase water resources.

The Scientific and Technical Conference " *Water - a key factor in the development of civilization* " will therefore be an excellent opportunity for many experts representing different cognitive perspectives and research approaches at different temporal and spatial scales to meet and exchange experiences. Participants will cover a broad spectrum of hydrology issues, and will also benefit from opportunities for networking and fruitful collaborations.

## The themes of the conference, titled "The importance of the conference. Water - a key factor in the development of civilization

The topics of the conference, entitled *Water - a key factor in the development of civilization*, will include not only scientific, but also practical aspects, related to the management of water resources and the search for effective solutions for the sustainable use and protection of water.

Among them are issues related to:

- Legal aspects of water resources management;
- ways of rational use of available water resources in the economy;
- opportunities for reusing gray water, the potential of which is still underdeveloped;
- extreme events in catchments, occurring in catchments regardless of their size;

- occurrence of droughts and floods and how to minimize their effects;
- The impact of climate change on water resources;
- Aquatic habitats in the form of peatlands and wetlands;
- Water circulation in agricultural and urban catchments;
- Hydrological and chemical monitoring of water quality in experimental catchments.

## *Water - a key factor in the development of civilization*. Framework program of the Scientific and Technical Conference

The Science and Technology Conference will last 3 days. On the first one, paper and poster sessions will be realized, during which participants will have the opportunity to hear about various cognitive perspectives and research approaches related to the use of water in the economy. The day will also see the announcement of the results of the 16th edition of the Sakharov competition. K. Debski for the best thesis in hydrology.

On the second day, the Science and Technology Conference will move to Bialka Tatrzanska, where a field session will be held along with a panel discussion. On the third day, the event will again return to the capital of Malopolska for more paper sessions and an official closing ceremony. Together with the Jagiellonian University, the Association of Polish Hydrologists and the Hydrological Commission of the Polish Geographical Society, we invite you once again to Krakow for an event on September 18-20, 2024. will bring together in one place many experts in the field of hydrology.

For more information on the conference *Water - a key factor in the development of civilization*, among others, visit the website.

# LIQUID WASTE MANAGEMENT IN MUNICIPALITIES - TIME FOR REPORTING!

*Posted on 14 March 2024 by Karol Kucharski*

Under the new provisions of the Law on Maintaining Cleanliness and Order, a new reporting obligation has been imposed on municipalities regarding liquid waste management. The first report on liquid waste management in 2023 must be submitted no later than April 30, 2024. to the relevant Provincial Inspectorate for Environmental Protection and to the Regional Water Management Board of the Polish Waterways. It is worth mentioning that if the mayor of a municipality does not carry out controls in this regard, the municipality can be fined from 10 to 50 thousand dollars. PLN.

**Categories:** Issue 5/2024, News, Onet
**Tags:** liquid waste, municipalities, report

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## Report on liquid waste management

According to the provisions of the Law on Maintaining Cleanliness and Order in Municipalities, the mayor of a municipality, mayor or city president has been obliged to submit annual reports to the provincial environmental protection inspector and the director of the regional water management board of the State Water Management Company Wody Polskie. Among other things, the document is to include information on:

1. The number of non-drainage tanks and domestic wastewater treatment plants in the municipality;
2. the number of property owners from whom liquid waste has been collected and the number of people registered at the address of the property where the given no-tank or the given domestic sewage treatment plant is located;
3. The number of liquid waste disposal contracts entered into during the reporting period, as well as before the reporting period, if they include activities carried out during the reporting period;
4. the number of no-outflow tanks or domestic wastewater treatment plants, the emptying of which has been organized by the municipality;
5. Frequency of emptying of the no-tank or settling tank at the domestic wastewater treatment plant;
6. The amount of liquid waste collected from the municipality's area, broken down into domestic and industrial liquid waste;
7. the amount of water withdrawn by users not connected to the sewerage system; the number of document inspections carried out and the results of these inspections.
8. of the transfer stations to which the liquid waste collected from the municipality was transferred (in the form of a list of these stations);
9. The number of inspections carried out on the documents referred to in Art. 6 paragraph. 5a, and the results of these inspections.

## Liquid waste management - obligations of owners of properties not connected to a sewage system

Property owners who dispose of liquid waste from their property, in accordance with the provisions of the Law on Maintaining Cleanliness and Order in Municipalities, are required to:

1. possession of documents in the form of:

2. a contract concluded with an entrepreneur who has a valid permit to conduct the business of emptying out the out-of-bottom tanks or settling tanks in domestic sewage treatment plants and transporting liquid waste;

3. Evidence of payment of fees for the aforementioned services.

4. Disposal of liquid waste:

5. not less often than once a quarter - in the case of collection of sewage in non-drainage tanks;

6. at least once every 2 years - in the case of collection of sewage in settling tanks of domestic sewage treatment plants.

According to the aforementioned regulations, the mayor should conduct an inspection in the above-described scope at least once every two years, in accordance with a plan that includes at least a list of entities to be inspected during a certain period.

The amendment to the Law on Maintaining Cleanliness and Order in Municipalities also introduced a specific provision on how inspections should be carried out. According to it, the inspector is authorized, among other things, to demand written or oral information and to summon and question persons to the extent necessary to establish the facts, and to demand production of documents and access to any data relevant to the scope of the inspection. A protocol is drawn up from the inspection activities, one copy of which should be delivered to the relevant individual or the head of the entity.

We wrote about the regulation detailing the requirements for an entrepreneur applying for a permit for emptying out the septic tanks or settling tanks in the installation of domestic sewage treatment plants and transporting liquid waste in a previous article in *Water Matters*: An update on septic tank and sludge disposal regulations pending.

## How should the report be submitted?

In order to make it easier for obligated entities to fulfill their statutory obligation and submit the required data, the State Water Company Wody Polskie, in cooperation with the Chief Inspectorate of Environmental Protection, has developed a reporting questionnaire template in MS EXCEL spreadsheet.

The completed and signed reporting questionnaire, bearing a qualified electronic signature or a trusted signature of an authorized person, should be sent to the locally competent Provincial Environmental Inspectorate via the ePUAP electronic sub-box. Detailed information on how to fill out the liquid waste management reporting form and its template can be found on the website of the State Water Company.

# WATER SUPPLY. WATER UTILITIES FACING CRISIS - LATEST NIK REPORT

*Posted on 13 March 2024 by Katarzyna Biegun*

Do public authorities and water providers ensure security of supply in case of emergencies? This was the question asked by the Supreme Audit Institution when defining the purpose of inspections in local government units. NIK inspected 10 urban and urban-rural municipalities from five provinces: the Lower Silesian, Mazovian, Podlasie, Podkarpackie and West Pomeranian provinces. What lessons have been learned?

**Categories:** Issue 5/2024, News, Onet
**Tags:** control, crisis, NIK, water

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## Emergency situations - what can we expect in terms of water supply?

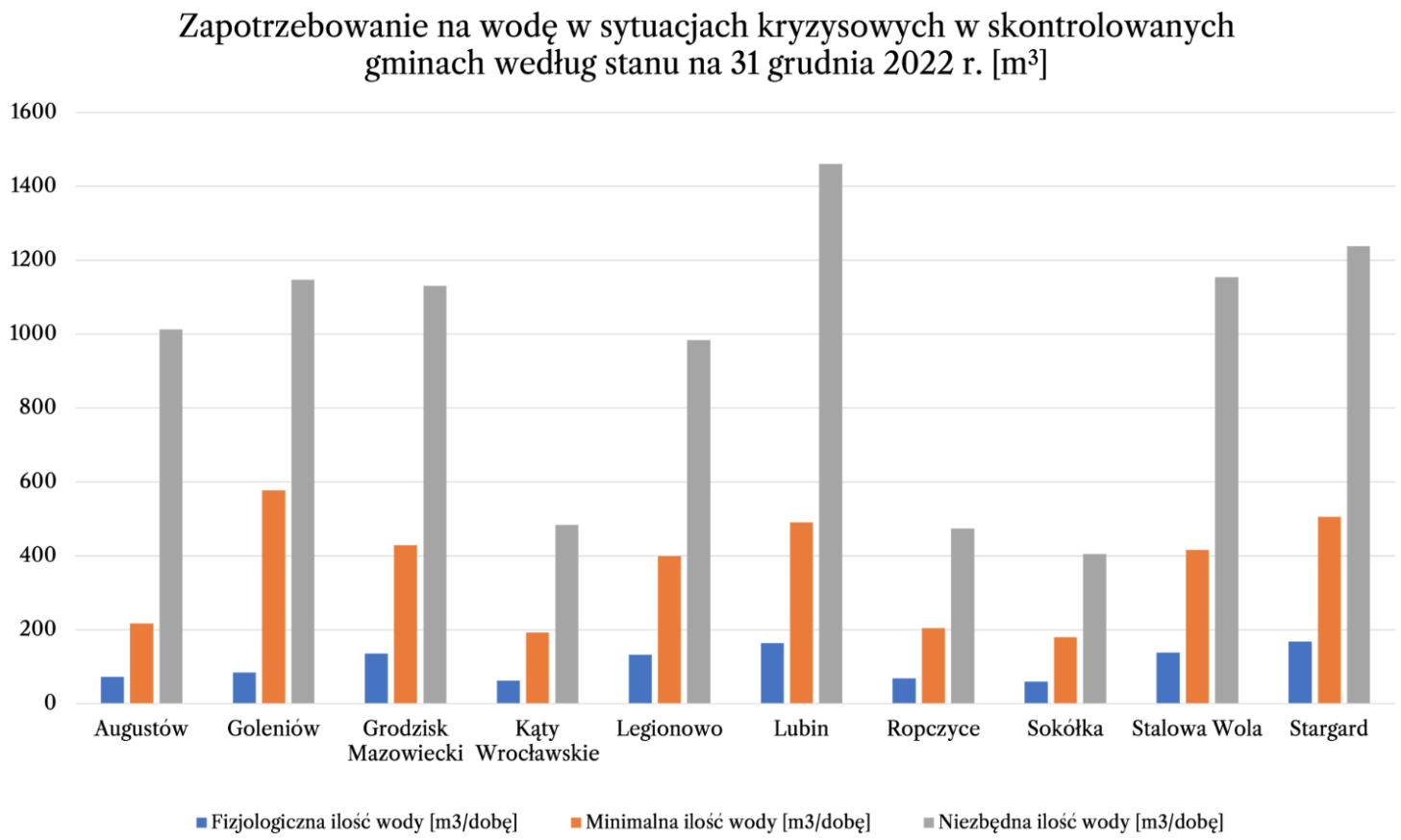
Emergencies must be prepared for carefully and in advance. Destruction, contamination or immobilization of water supply infrastructure carries a number of risks to the safety of residents. Flood events or, for example, contamination of water with legionella bacteria testify to the fact that, in the face of an emergency situation, it is necessary to provide residents with drinking water by means other than directly from the tap. The current situation of armed conflict in Ukraine and the destruction of the Novaya Kakhovka dam show that we can expect such extreme situations as well, and we should be prepared for them.

## Conclusions of the NIK report

So what are the key findings of the NIK audit in this regard? To quote the report: in the inspected municipalities, a safe water supply for emergencies was not guaranteed. Current needs have not been identified and comprehensive measures have not been planned for events that could significantly reduce the ability to supply water to residents. The resources necessary for their implementation have also not been secured. The planned emergency measures in the municipalities were incorrect. Resources for supply have not always been available during emergencies, and the quantity has been adjusted to meet needs.

The Supreme Audit Office is trying to explain the lack of preparation of municipalities for emergencies. As pointed out in the report, one of the reasons for this state of affairs was the lack of statutory regulations defining the rules for securing water supplies during emergencies. The audited units did not have up-to-date and reliable calculations of possible needs. In most cases, they also lacked up-to-date and complete data on usable resources.

Administrative units, according to data obtained during the audit, did not analyze the status of securing emergency water supplies in municipalities. Demand in $m^3$ as of December 31, 2022. is as follows:




*Source: data from NIK based on expert opinions, own study*

The conclusion of the NIK audit: *None of the 10 municipalities audited analyzed the status of water supply security. Seven municipalities did not have up-to-date and complete data on resources available for use in emergencies*. This information, the report indicates, was obtained only in the course of the audit itself. This was mainly due to the lack of obligation to identify and document the status of such resources in municipalities, the entrustment of water supply to water companies, and the lack of communication with them.

## Why aren't administrative units ready for the water crisis?

In the report, the Supreme Audit Institution indicates that during the audit period, there were no universally applicable regulations governing the calculation of water requirements under crisis conditions. The only regulations in this regard were the provisions of the National Emergency Management Plan, which determines the amount of water needed to meet the basic living needs of citizens.

## Suggested solutions according to NIK

Despite the lack of regulations, the results of the audit indicate that during the first days of a crisis that would prevent the use of basic water intakes, municipalities can use supplies stored in water supply reservoirs. The supply of water stored in this way in all municipalities was sufficient, i.e. enabled the physiological water needs of residents to be met for at least 14 days. The NIK notes that water utilities, despite the lack of legal regulations in this regard, have taken measures to prepare water supply facilities for crisis conditions. The activities were diverse and included. on providing emergency power to water supply equipment, installing equipment to disinfect the water supply network, or

determining procedures for storing and locally securing hazardous materials.

According to the NIK, in order to guarantee the security of water supply, it is essential:

- unambiguous definition by the Council of Ministers of the government administration department that will cover matters of the collective water supply system;
- Take effective measures by the chief and central public administration bodies to establish rules for ensuring the security of water supply under crisis conditions, including on the preparation of the necessary documentation in this regard.

These regulations should define in a precise and unambiguous manner the roles of the various entities responsible for the operation of the water supply system under crisis conditions.

# MEETING WITH WORLD BANK REPRESENTATIVES ON NEW PROJECT IN WATER MANAGEMENT

*Posted on 12 March 2024 by Izabela Łuba*

Poland has been working with the World Bank Group on water management activities for more than 25 years. Last Friday, March 8, 2024, another meeting of the parties involved took place. The main issues discussed were those related to the new project in water management.

**Categories:** Issue 5/2024, News, Onet

**Tags:** Vistula, water management, World Bank

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## What is the World Bank?

The World Bank, or rather the World Bank Group, is an organization of five institutions - IBRD, IDA, IFC, MIGA and ICSID. Their common goal is to reduce poverty, increase shared prosperity and promote sustainable development in developing countries. It is one of the key sources of venture funding and has been in operation since 1947. Since its inception, the World Bank has financed more than 12,000. development projects by providing loans, interest-free loans, and grants. In Poland, more than 70 projects have so far been carried out in cooperation with the organization, many of them related to water management. The so-called. The new project, for which a recent meeting was held with World Bank representatives, will increase this number.

## How did the meeting with World Bank representatives on water management go?

On March 8, 2024. Meetings were held in Warsaw with representatives of the World Bank - the regional director for the World Bank. Sustainable development for the Europe and Central Asia region Samehem Wahba and program leader Marc Sadler. One of them, concerning a new project in water management, was attended by, among others. Deputy Minister of Infrastructure Arkadiusz Marchewka and representatives of the Board of Directors of the Polish Waters: Joanna Kopczyńska and Mateusz Balcerowicz. The main topic of discussion at this meeting was the possibility of obtaining funding from the World Bank for the implementation of the so-called "World Bank". new project. Representatives of the organization not only showed interest in the topic, but also declared the possibility of co-financing in the amount of 500 million euros.

In addition, the meeting with representatives of the World Bank was an opportunity to discuss potential ways of obtaining additional financial support for road transport entrepreneurs (who have lost access to eastern markets) and for carriers showing a desire to obtain funds for the purchase of low- or zero-emission vehicles. Deputy Infrastructure Minister Arkadiusz Marchewka took the opportunity to thank representatives of the World Bank for the fruitful cooperation so far, which has lasted for 25 years. In particular, he appreciated the support for flood management projects in the Oder and upper Vistula river basins.

*pic. gov.pl*

## What does the new project in water management involve?

The so-called. a new project in water management, which Friday's meeting, deals with the expansion, modernization, as well as construction of new hydrotechnical infrastructure in Poland. It is intended to provide protection from flooding. With this implementation, three main goals are to be achieved, improving water management in our country.

The first is to reduce flood risk and improve flood management for the upper and middle Vistula river basin area, as well as to strengthen the protection of important urban and industrial centers from the effects of flooding. The second - to reduce the risk of drought in areas and sectors that are particularly susceptible to such a phenomenon, including agriculture, industrial and drinking water supplies, and nature. And the third is to strengthen institutional capacity in mitigating the effects of floods and drought, as well as in more effective monitoring of river water quality, which will enable better protection of biodiversity and the environment. The total cost of implementing the new water management project has been set at an estimated €1.5 billion.

## How has Poland's cooperation with the World Bank on water management been so far?

The planned cooperation on a new project in water management, in connection with which a meeting was held between the Deputy Minister of Infrastructure and representatives of the Polish Waters and representatives of the World Bank, is another joint venture in this area in Poland.

The first joint activities took place more than 25 years ago, as part of the Flood Mitigation Project. These included the reconstruction of technical and social infrastructure in areas affected by the 1997 millennium flood. The second project, however, was the Oder River Basin Flood Protection Project. The World Bank Group's support enabled faster and more effective implementation. As part of it, the Racibórz Reservoir was built and the Wroclaw Water Junction was modernized.

*Main Photo: Anna Dziedzic*

# POLAND IS BETTING ON GEOTHERMAL. ANOTHER GEOTHERMAL HEATING PLANT OPENED

*Posted on 11 March 2024 by Izabela Łuba*


Projects based on the use of geothermal energy are becoming a reality and offer new opportunities for the Polish heating industry. The opening of Poland's eighth geothermal heating plant, located in Kole, is another important step toward sustainable energy production. Especially when you consider that there are geothermal reservoirs beneath the surface of nearly half of our country, which could be used to extract clean energy for heating.

**Categories:** Issue 5/2024, News, Onet
**Tags:** geothermal, geothermal heating plant, heat, heat

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## Eighth geothermal heat plant in Poland

After almost four years since the signing of the grant agreement for the construction of the geothermal heating plant in Kole, it was officially opened on March 1 this year. The ceremony was attended by Climate and Environment Minister Paulina Hennig-Kloska and Robert Gajda, vice president of the National Environmental Protection and Water Management Fund, among others.

The project called *Construction of a geothermal heating plant in the city of Kolo with its connection to the existing heating system of MZEC Sp. z o.o.* was carried out with the support of PLN 62 million from the National Fund. The work consists of two stages. The first was the drilling of a geothermal well with a depth of 2,950 meters, and the second was the construction of a geothermal heating plant, which was equipped with all the necessary regulatory, safety and measurement equipment necessary to ensure proper operation of the plant. The total cost of implementing the investment is more than PLN 80 million.

The completed investment will reduce the carbon intensity of the district heating system in the region. Geothermal energy will partially replace the coal-fired boilers used to date to produce heat. In addition, it is also expected to have the effect of stabilizing heating prices and attracting new system heat customers.


*pic. Municipal Office in Koło*

## The development of geothermal in the country allows for the implementation of Poland's Energy Policy until 2040.

The opening of the geothermal heating plant in Kole is not only a local event, but also an affirmation of the nationwide shift toward a sustainable energy future. The Ministry of Climate and Environment confirms that between 40 and 55 percent of the area. The country has geothermal reservoirs with water temperatures ranging from 20 to 100◙. There are 491 heating plants in their range that could extract geothermal energy for their purposes. Harnessing this potential by investing in geothermal development will certainly enable Poland to move away from coal combustion more quickly.

Geothermal projects are being implemented consistently and in accordance with the 2022 published. by the Ministry of Climate and Environment
*The multi-year program for the development of the use of geothermal resources in Poland*
. This program has identified paths for development geothermal in our country by 2040, with an outlook to 2050, and includes nine key areas. One of them is Deep Borehole Heat Exchanger technologies. However, investments of this type are not possible without the cooperation of the government, local governments and financial institutions. Increasing the budget of the NFOŚiGW-implemented priority program called *Making thermal waters available in Poland* from 300 to 480 million zlotys is an expression of support for projects that change the country's energy picture.

## The geothermal heat plant in Kole is not the last geothermal investment in Poland

The geothermal heat plant in Kole not only reduces the carbon footprint of the city's district heating system, but also provides a model for future investments. From the perspective of the amount of cost, environmental performance and energy efficiency, geothermal is setting new standards. It is currently the eighth such facility being built in our country. In addition to Kolo, geothermal heat plants also operate in Bańska Niżna (Małopolskie Voivodeship), Pyrzyce (West Pomeranian Voivodeship), Mszczonów (Mazowieckie Voivodeship), Uniejów (Lodz Voivodeship), Stargard (West Pomeranian Voivodeship), Poddębice (Lodz Voivodeship) and Toruń (Kujawsko-Pomorskie Voivodeship).

A geothermal heating plant in Sieradz (Lodz voivodeship) and Konin (Wielkopolska voivodeship) will soon be put into operation. Work on their launch is still underway. Also at the implementation stage is an investment in Szaflary (Małopolskie Voivodeship), where the deepest geothermal well in the world is being constructed. It will reach a depth of 7 km.

Test boreholes are also being drilled across the country to assess the potential for using thermal water for energy purposes. Their implementation in many cases is entirely financed by the National Fund for Environmental Protection and Water Management. The boreholes, along with studies to determine the thermal water resources in the area, have already been completed in seven localities: Sieradz, Kole, Sochaczew, Tomaszow Mazowiecki, Ladek Zdroj, Debica and Sękowa. Another 16 are in the implementation stage. So everything points to the fact that in the coming years geothermal heat plant will no longer be a rarity, but a standard.

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*Main photo: City Hall in Kole. Opening of geothermal heating plant in Kolo*

# FIRST EVER GREEN OLYMPIC GAMES. IS PARIS LIKELY TO BECOME A FORERUNNER?

*Posted on 10 March 2024 by Iwona Szyprowska-Głodzik*

The clock is ticking down to the inauguration of the Olympic and Paralympic Games in Paris, and with it, the city's efforts to fulfill its promise of an ecological revolution are intensifying. The whole world is watching with interest as the French capital pursues an ambitious goal: to hold the first ever green Olympics. The implementation of the International Olympic Committee's (IOC) 2020 sustainability strategy is becoming a test of sorts for Paris. The city will be judged not only on logistics and organization, but also has a chance to win on environmental issues. Will these aspirations change the face of global sporting events forever?

**Categories:** Issue 5/2024, News, Onet
**Tags:** CO2, ecology, Olympics, Paris

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## How is the Paris Olympics likely to become a revolution?

The organizers have taken extensive measures to show that the Olympic Games are not only a unique sporting event, but also a testament to the country's commitment to the environment. One innovative concept was to design medals containing fragments of the original Eiffel Tower. The iron used in the production of the 5084 medals came from recycling fragments of the original 1889 structure, which had been lying uselessly in storage for years. As part of the organizational effort, work has also been initiated to clean up the Seine River, and many other measures to reduce the environmental nuisance of sports struggles.

### Reducing the carbon footprint

Paris, as envisioned, uses modern technology and environmentally friendly materials to minimize its negative impact on the climate. The city has set an ambitious goal of cutting its carbon emissions in half compared to the Games held in London and Rio De Janeiro. Much of this reduction is due to the shift to renewable energy, mainly solar and wind. The projected carbon footprint means emissions of approx. 1.58 million tons of $_{CO_2}$ equivalent (3.4 million tons in 2012 and 3.6 million tons in 2016).

In addition, Paris has pledged to reduce$_{CO_2}$ emissions$_{by}$ promoting public transportation and electric vehicles to carry athletes and visitors. Toyota, a major sponsor of the Games, will provide a fleet of green vehicles in support of sustainable mobility. It will allocate a total of 2764 electrified vehicles and 700 other electric mobility solutions.

### A green vision for construction

Extremely important for lower$_{CO_2}$ emissions is the fact that as much as 95 percent. facilities used during the Games already exist or are temporary constructions. The newly-constructed buildings, including the Olympic village, have been designed to the highest environmental standards and are being constructed using low-carbon materials and environmentally friendly technologies. The buildings will be equipped with furniture made from biodegradable and recycled materials.

After the Games, the Olympic village will be converted into housing for Parisians. Preparing the main sports facilities was also guided by ecological values. As many as 11,000. The seats were made from recycled plastic. Le Pave, the company leading the initiative, has produced ergonomic seating for the Adidas Arena and aquatic center, which will host various Olympic events, from 100 tons of plastic.

### Education and community involvement

The organizers also focus on education and community involvement in the idea of sustainability. They are planning a number of initiatives to raise environmental awareness, including workshops and public campaigns. With this approach, they want not only to reduce the environmental impact of the Games, but also to initiate changes in society on a larger scale. Among other things, it was prepared. tool called

*Climate Coach*

, which allows sports event initiators to calculate their environmental impact and reduce it. It has already been used in the organization of 130 events - an average reduction in carbon footprint of 20 percent has been achieved.

## Sports for nature

The Olympic Organizing Committee, together with the International Olympic Committee and more than two dozen other sports institutions, has joined the UN initiative

*Sport for Nature*

. This means a commitment to protecting key species and their habitats, repairing damaged ecosystems, promoting sustainable production methods, and motivating the sports community to take an active role in conservation. The initiative underscores the important role the sports world can play in protecting our planet. All that is needed is for athletes to encourage activities that will help preserve biodiversity and promote sustainable development.

# Will Paris make history as the host of the first Green Games?

Despite the ambitious plans, Paris still faces challenges in putting its goals into practice. Critics point to the need for close monitoring of $_{CO_2}$ emissions and waste management to ensure that environmental promises are met.

Will Paris make history as the host of the first Green Games? We will know the answer to this question soon, but one thing is certain: such initiatives show that the direction of change is the right one, and that sports can go hand in hand with protecting our planet.

# THE WORLD'S LARGEST CARBON DIOXIDE REMOVAL AND HYDROGEN PRODUCTION FACILITY HAS BEEN BUILT IN SINGAPORE

*Posted on 9 March 2024 by Magdalena Skrzypek*

Singapore is preparing to build a revolutionary ocean facility that will not only remove carbon dioxide from the atmosphere, but also produce negative-emission hydrogen. The future of combating climate change is taking shape, thanks to a collaboration between the University of California's Institute of Carbon Management (ICM UCLA) and Equatic. The value of this world's largest oceanic investment is $20 million. It is expected that the system will be able to remove 3,650 tons of carbon dioxide from the atmosphere annually, and that it will produce 105 tons of hydrogen during this time. This endeavor sets new standards in clean technology and offers hope for reducing human impact on the environment.

**Categories:** Issue 5/2024, News, Onet
**Tags:** carbon dioxide, CO2, hydrogen, Singapore

Researchers at the University of California's Institute of Carbon Management, along with technology start-up Equatic, are likely to revolutionize the fight against climate change by building the world's largest system, an oceanic carbon dioxide removal and hydrogen production plant. This is a $20 million venture. has great potential to realize the hopes placed in it.

## Carbon dioxide removal and hydrogen production plant - the only such system in the world

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## Plans and preparations for construction of a system for carbon dioxide removal and hydrogen production - Equatic-1 plant

After successful pilot projects in Los Angeles and Singapore, UCLA and Equatic are proceeding to the next stage - the construction of a full-scale demonstration power plant, dubbed Equatic-1. Backed by Singapore's national water utility (PUB), the National Research Foundation (NRF) and UCLA's Institute of Carbon Management (ICM), they want to create a plant that will significantly reduce carbon emissions.

The existing plant in Singapore has so far removed 100 kg of carbon dioxide per day. Which is a significant advance over past achievements. The new Equatic-1 power plant will be built in two phases. The first phase of work began in March, and by the end of 2025. Nine additional modules are planned to be opened. Equatic-1 will be able to remove 10 metric tons of carbon dioxide per day from seawater and the atmosphere and store this harmful greenhouse gas.

Electricity, using electrolysis, is to flow through seawater brought in from neighboring desalination plants. This process will initiate a series of chemical reactions that will decompose water into hydrogen and oxygen components, while safely storing for at least 10,000. years of both dissolved and atmospheric carbon dioxide in the form of solid calcium and magnesium-based materials.

The system will also use selective anodes, a new invention developed with the support of the Advanced Research Projects Agency for the Environment. The U.S. Department of Energy (ARPA-E) is also working with the Energy Department. They will produce oxygen by electrolysis of seawater, while eliminating the by-product chlorine. This opens the way for a new way to remove carbon dioxide on a massive scale and with the co-production of hydrogen, a clean fuel needed for decarbonization in various sectors of the economy.

## Innovative technology for the world

Equatic-1 not only has an impact on Singapore's environment, but also represents a potential global solution. The system, with its ability to capture and remove carbon dioxide from the atmosphere and produce hydrogen with negative$_{CO_2}$ emissions, is becoming a pioneering model that can be adapted and implemented in different regions of the world. Proper scaling of this technology has the potential to significantly reduce global greenhouse gas emissions and promote sustainable development around the world.

## Design appreciated around the world

The first, pilot-scale installations of Equatic were unveiled at ports in Los Angeles and Singapore in April 2023, less than two years after lab-scale prototypes were created at the University of California. The technology was named one of the best inventions of last year by TIME magazine and made it to Popular Science magazine's list of top inventions: 50 Greatest Innovations of 2023. The project also won the 2021 Liveability Challenge, a global competition supported by the non-profit Temasek Foundation.

The construction in Singapore of the world's largest $_{CO_2}$ removal and hydrogen production facility represents a major step forward in the fight against climate change. This partnership between scientists and the public and private sectors is setting new standards in clean technology and demonstrating that innovation can make a significant contribution to protecting our planet.

# WATER FOR WOMEN'S DAY - MORE IMPORTANT THAN FLOWERS!

*Posted on 8 March 2024 by Agata Pavlinec*

On March 8, we celebrate Women's Day around the world. On this occasion in Poland there will be a sprinkling of tulips, chocolates, wishes. However, there are regions where the best gift would be... access to water. UNICEF estimates that women and girls spend up to 200 million hours every day carrying water to households. This is hard, arduous and dangerous work, the cost of which burdens entire societies. The global Women for Water initiative aims to change the current state of affairs.

**Categories:** Issue 5/2024, News, Onet

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## Struggle for access to water - hurtful gender inequality

From a report published by the UN in 2023. shows that 2 billion people worldwide lack access to clean and safe drinking water. This dramatic situation hits women in a special way. Not only do they have greater hygienic needs related to physiology, but they are also burdened with the responsibility of obtaining water for their families. In areas affected by prolonged drought, this is a huge challenge and a source of social injustice.

In 70 percent of households without access to water, it is women who have to carry the heavy dishes and canisters. They carry as much as 18-36 kg at a time, covering the same route even several times a day. The average distance is about 6 kilometers, but in the Horn of Africa the trek for water can exceed 17 kilometers. Carrying is done not only by adult women, but also by young girls up to 15 years old, who have to drop out of school for this reason.

## Women for Water, or Women for Water

The international coalition Global Water Challenge (GWC), which has set its sights on Sustainable Development Goal 6 (footnote: Clean water and sanitation), has launched the Women for Water platform to fight for the betterment of women. It was based on the important Ripple Effect Study, conducted by the WADA and Ipsos organizations, which examines the role of water as a catalyst for important social and economic change.

A holistic approach to the subject is key. Access to water, sanitation and hygiene facilities translates into a marked reduction in the risk of disease in families, improved fertility and reduced levels of gender-based violence. At the same time, women who don't have to waste time carrying buckets can engage in education and join the workforce. The hours saved also translate into more family and social engagement and essential rest for health.

## Women's Day in the perspective of development programs

The Women for Water platform has a series of ambitious programs in the Americas, Africa and Asia. The Coca-Cola Foundation, in cooperation with GWC's NewWorld program, for example, has already implemented more than 100 projects in 28 countries around the world. They have provided access to water and sanitation to more than 700,000. people and supported the professional activity of 120,000. women.

Popular actress Zendaya, in coalition with the smartwater brand and GWC, has initiated a grant system for local NGOs fighting for water access and cleanliness, while empowering women economically. The program is being rolled out in many regions of the world, including the United States, where, paradoxically, 2.2 million people have no source of water at home.

In Kenya and Tanzania, countries suffering from chronic water scarcity, GWA has developed partnerships with the Starbucks Foundation and Amref Health Africa. Its goal is to improve access to water, sanitation and hygiene supplies, and to promote the economic role of women in coffee and tea-producing communities. By 2030. The program is expected to reach 1 million women, offering new water connections, water

kiosks and business training. Other similar projects involve private brands such as Ford and Hilton, as well as international humanitarian organizations.

We can celebrate this year's Women's Day in a less traditional but more meaningful way. Every donation to initiatives such as Women for Water or similar helps support programs that make a scenario a reality, where girls and women will be able to study and work instead of risking their lives and health while trekking for water.

# VICTORIA FALLS IN ZAMBIA AND ZIMBABWE DISAPPEAR DUE TO DROUGHT

*Posted on 7 March 2024 by Zuzanna Olender*

Victoria Falls, like the entire region, is currently being impacted by the most severe drought in decades. El Niño, which brought a lot of rainfall to Europe, is causing drought in southern Africa. Despite the duration of the rainy season, water is scarce in the Zambezi River and throughout Zambia and Zimbabwe. This generates problems with food and electricity production. The scarcity of water in the largest waterfalls on Earth, ranked among the seven natural wonders of the world, is shocking. What are the implications of this?

**Categories:** Issue 5/2024, News, Onet

**Tags:** Drought, Victoria Falls, Zambia, Zimbabwe

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## Victoria Falls - the mist that thunders

Victoria Falls is located on the Zambezi River, on the border of Zimbabwe and Zambia. As tectonic fractures have formed along the flow path, water pours into them, creating spectacular cascades. Before the arrival of the colonizers, the local Kololo tribe called it *Mosi-oa-Tunya*, which means *fog that thunders*. Victoria Falls is located within Victoria Falls National Park. They have been a UNESCO World Heritage Site since 1989 and attract millions of tourists each year. Unfortunately, they will not currently see the spectacular natural wonder for which they came here.

## Largest drought on record

The weeks-long drought has meant that a massive curtain of water no longer flows from the rock walls, but only a fine stream. The waterfalls, which usually thunder and create fountains of mist, are now quiet and much less impressive. The water flow is now at its lowest level ever. During the rainy season, more than 9,000 meters usually sweep through the waterfall.$^{3}$ water per second. In 2019. recorded a drop in this value to 252$^{m3}$, and this was the lowest water flow in 25 years. Due to increasingly prolonged periods of drought, the Victoria Falls are disappearing.

The rainy season is currently underway, yet it is dry and hot throughout Zambia. Temperatures here reach as high as 40°C. As a result, the Zambezi is again short of water. The famous wonder of the world does not please the eyes of tourists with its power. However, Victoria Falls is not just a tourist attraction. It's also a way to generate electricity for the local population.

*pic. depositphotos/NadaK2*

## Impact of drought in South Africa

Zambia and Zimbabwe are supplied with electricity by a power plant on the artificial Lake Kariba. The water level in this reservoir depends on the Zambezi River that feeds it. It usually begins to rise from mid-February, but this year the water continues to decline. This makes the drying up of Victoria Falls and the river flowing below the lake the cause of power supply problems. More than 80 percent. Zambia's electricity production is the result of water work. The drought is expected to lead to a power deficit of 430 MW. In this case, limits may be imposed on its consumption for all customers.

Residents will be looking for alternatives, and since the most popular and cheapest source of energy in these regions is charcoal, Zambia's forests are at risk of large-scale logging. Coal is used by private individuals, as well as small industrial plants, which significantly worsens air quality. Drought is also, and perhaps most importantly, a problem for food production. Local agriculture is based mainly on the cultivation of corn. It is largely used to make cornmeal, which is used to prepare the popular dish n'shima. This dish is a staple in the daily diet of Zambians. They are facing starvation after the drought destroyed crops over an area of 1 million hectares. Animals are also suffering from the lack of water. In Zimbabwe's Hwange National Park alone, it fell approx. 200 elephants.

## State of emergency in Zambia

Zambian President Hakainde Hichilema has declared a state of emergency in the country due to the enormity of the damage the natural disaster has caused so far. He made sure to increase food imports and asked the world for support. His call was answered by, among others. United Nations, which is helping the Zambian government develop a drought response plan.

UN Resident Coordinator in Zambia, Beatrice Mutali, says the organization is preparing to help Zambia deal with challenges being, among others. effect of El Niño and climate change, as well as an unprecedented cholera epidemic.

# DROUGHT AID STILL NEEDED. LAST DAYS TO SUBMIT APPLICATIONS!

*Posted on 6 March 2024 by Karol Kucharski*

The call for applications for funds aimed at drought assistance for agricultural producers affected by the 2023 event is underway. Drought and other adverse weather events. Recruitment is in high demand. According to information published by the Agency for Restructuring and Modernization of Agriculture, more than 40,000 are already applying for support. farmers. Documents can be submitted until March 15. Interested parties still have a few days to deliver the forms.

**Categories:** Issue 5/2024, News, Onet

**Tags:** agriculture, call for proposals, Drought, drought aid, farmers

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## Drought aid - 2024 call

The current call for applications began on February 29, 2024. and will last until March 15, 2024. Drought aid can be applied for by agricultural producers whose farms suffered crop damage caused by the occurrence of adverse weather events last year. Attrition must be at least 30 percent. average annual crop production. Causes of damage may include the occurrence of drought, hail, driving rain, negative effects of overwintering, spring frost, flood, hurricane, lightning, landslide or avalanche as defined in the regulations on insurance of agricultural crops and livestock.

The current call for drought aid applications is another such initiative launched recently. The previous one took place in November/October in 2023. and was of great interest to agricultural producers. At that time, the application deadline was extended twice, as we wrote about in a previous article in *Water Matters*: Drought - we are still counting losses, 251,000 have been filed. applications for support.

According to information received from the Ministry of Agriculture and Rural Development, to date, applications for the assessment of drought damage have been submitted by approx. 290 thousand. agricultural producers. The data comes from the administrator of the *Report Agricultural Damage* application.

## Current aid rates

According to the current call for drought aid applications, four support rates apply:

1. PLN 1,000 per hectare of crop area with damage caused by 2023. drought, hail, driving rain, adverse winter effects, spring frost, flood, hurricane, lightning, landslide or avalanche caused a loss of at least 70 percent. yield, including perennial grasslands, where the stocking density of cattle, sheep, goats, horses or geese is at least 0.3 head of a large conversion unit per hectare of such land;

2. 500 zlotys per hectare of crop area with damage resulting from 2023. drought, hail, driving rain, adverse winter effects, spring frost, flood, hurricane, lightning, landslide or avalanche caused a loss of at least 30 but less than 70 percent. yield, including perennial grasslands, where the stocking density of cattle, sheep, goats, horses or geese is at least 0.3 head of a large conversion unit per hectare of such land;

3. PLN 500 per 1 hectare of perennial grassland, on which the damage occurred in 2023. drought, hail, driving rain, adverse winter effects, spring frost, flood, hurricane, lightning, landslide or avalanche caused a loss of at least 70 percent. yield and on which the stocking density of cattle, sheep, goats, horses or geese is less than 0.3 head of large livestock unit per hectare of such land;

4. 250 zlotys per hectare of perennial grassland, on which the damage occurred in 2023. drought, hail, driving rain, negative effects of overwintering, spring frost, flood, hurricane, lightning, landslide or avalanche caused a loss of between 30 and 70 percent. yield and on which the stocking density of cattle, sheep, goats, horses or geese is less than 0.3 head of large livestock unit per hectare of such land.

It is worth mentioning that the amount of aid for agricultural producers who do not have a policy insuring at least half of the agricultural area, excluding perennial grassland, will be subject to a 50 percent reduction.

Detailed information on drought aid rates in the current call can be found on the website of the Agency for the Restructuring and Modernization of Agriculture.

## How to apply for drought aid?

Applications for drought aid are accepted by district offices of the Agency for the Restructuring and Modernization of Agriculture. Documents can be submitted until March 15, 2024. in person or by an authorized person at an ARMA facility, by mail, through the ePUAP platform or using the mObywatel service. According to information received from the Ministry of Agriculture and Rural Development, disaster aid payments are scheduled to begin in the first quarter of 2024.

# GUZIANKA I LOCK IS READY! POLISH WATERS INVESTS IN MASURIA

*Posted on 5 March 2024 by Agata Pavlinec*

In early March this year. Another important investment completed in recent years on the Great Masurian Lakes Route was put into operation. Guzianka I sluice is a hydrotechnical monument and an important part of the region's water infrastructure. Its operation will increase the safety of boaters and have a positive impact on the development of tourism in Mazury. The project was subsidized by the European Regional Development Fund.

**Categories:** Issue 5/2024, News, Onet
**Tags:** lock, Masuria, upgrade, Wody Polskie

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## Guzianka I sluice - comprehensive modernization

Built in 1879. Guzianka lock is located on the trail leading from Lake Mikołajskie to Lake Nidzkie and directly connects Lakes Beldany and Guzianka Mała, leveling the two-meter difference in level. The renovation included replacing gates and communication gangways and mechanisms, as well as upgrading slopes and sealing the ground. The surrounding buildings have also been renovated. The entire investment cost about PLN 16 million, and was carried out with the support of the Regional Operational Program of the Warmian-Masurian Voivodeship for 2014-2020. The beneficiary of the project was the Great Mazurian Lakes Association 2020, and the work was carried out in partnership with the State Water Company Wody Polskie.

For the duration of the closure of the overhauled facility, sailing traffic on the route was handled by the Guzianka II lock, built with EU funding three years earlier on the initiative of the Polish Waters. It is capable of accommodating 10 large or 12 smaller yachts arranged in two rows. After the opening of Guzianka I, water traffic was split so that the renovated facility handles large vessels, while the modern Guzianka II lock handles smaller vessels.

*pic. Wody Polskie*

## Other Masurian investments by Polish Waters

The construction of Guzianka II was the first stage in a series of investments planned by Wody Polskie in the area of the Great Mazurian Lakes. Its total cost was nearly PLN 160 million, and the work was completed in 2023. Another will be canal repairs on the route from Mikolajki to Gizycko. The first to begin renovation was built in the 18th century. Luczanski Canal, formerly known as Gizycki Canal. The work included the construction of bank reinforcements and new outlets for rainwater, as well as the installation of bumpers, polders, ladders and

steps. The implementation, which cost more than PLN 69 million, was completed in early December 2023.

Last year, the Great Mazurian Lakes 2020 Association, in cooperation with Polish Waters, also repaired the Szymon Canal over its full length of 2.5 kilometers, the Węgorzewo Canal and the fortifications on the Węgorapa River. These investments cost a total of more than PLN 80 million. Previously, the Grunwald Canal, the Kaltec Canal, the Beautiful Mountain Canal and the Miodun Canal were also modernized. In early 2024. Wody Polskie has also announced the commissioning of a sluice and weir in Karwik. Dating back to the 19th century. The facilities perform an important function in Mazurian shipping, connecting Pisz with the Great Lakes system, while creating a water stage of retention and flood significance. The cost of this important investment amounted to PLN 13 million.

The comprehensive renovation of the Great Masurian Lakes Trail also included the reconstruction of dilapidated lake shorelines, including. Mikołajski, Nidzki and Niegocin. The modernization of the Pisa waterfront is also underway, which has unfortunately encountered bureaucratic problems. As early as 2024. Water sports enthusiasts will be able to use the newly opened locks and canals.

## The Great Mazurian Lakes and the development of regional tourism

The Guzianka I and II sluices and other investments by Polish Waters aim to increase the tourist attractiveness of one of Poland's most beautiful regions. The measures taken improve the safety of sailors, increase the comfort of sailing, and the profits generated are allocated to the socio-economic development of the Warmian-Masurian province.

Wody Polskie is planning further investments to help increase the tourist potential of Mazury. In 2025. The preparation of documentation for the restoration of the waterway from Warsaw to the Great Masurian Lakes will be completed. There is also talk of building tunnels that would connect Tyrklo and Buvellno lakes, giving boaters the opportunity to circumnavigate the Great Lakes Route all the way around. The Mazurian Loop - as the long-range plan is called - is expected to cost 400 million zlotys, with completion projected for 2029.

According to the Gizycko Tourist Promotion and Information Center, in 2023. The number of domestic and foreign tourists in Masuria increased by 7 and 8 percent, respectively, compared to the previous year. It remains to be hoped that new investments will boost the momentum of this favorable trend.

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Photo source. main: Wody Polskie

# MEXICO - ONE OF THE WORLD'S LARGEST AGGLOMERATIONS FACING WATER CRISIS

*Posted on 4 March 2024 by Alicja Bar*

**Categories:** News, Issue 5/2024, Onet
**Tags:** crisis, lack of water, Mexico, Water crisis

In recent weeks, residents of many neighborhoods in the Mexican capital have been facing a lack of running water. The situation is serious enough to require strong responses from the city government. Will this year be ground *zero day* for many millions of Mexicans?

## Mexico's water crisis

The population of Mexico City's urban agglomeration, which includes Mexico City and adjacent suburban areas, currently estimated at more than 22.5 million people, has faced a difficult water supply crisis. The problem is the result of a combination of factors, including. the region's peculiar geography, disorderly urban development and outdated water supply infrastructure, which is further compounded by the negative effects of climate change.

Over the past few years, Mexico has been experiencing significantly lower than usual rainfall, prolonged periods of drought, and rising temperatures, putting significant strain on an already inefficient system for supplying the water needed to meet the growing needs of the population. Because of this, the authorities were forced to impose severe restrictions on water intake from local sources.

In some parts of the city from December 2023. water is in short supply, and there are still several months until any rainfall can be expected. It is customary for the rainy season here to begin in May and last until September. Last year, much of the country was hit by heat waves that left at least 200 people dead. The researchers concluded that if it were not for progressive climate change, such waves would not have occurred.

Climate impacts have combined with other problems of a rapidly growing city. Experts say the centralized water supply system is not keeping up with population growth. Although politicians are ignoring the situation, some experts are warning that the city may soon experience a so-called "zero day.
*zero day, a moment when a significant part of the metropolis will run out of water in the taps*
.

## Mexico - difficult location doesn't help

The metropolis is built on land formerly occupied by lakes, is located in a zone of higher seismic risk and is particularly sensitive to climate change. The history of Mexico 's capital dates back to the 14th century, a time when the Aztecs decided to establish the city of Tenochtitlan here. Taking advantage of natural water resources, they built the city on islands and extended it outward through networks of canals and bridges.

However, the Spaniards arrived in the 16th century. demolished much of the city, drained the lake bed, filled in the canals and cleared the forests. The conversion of the land for the construction of Mexico led to the degradation of the natural aquatic environment, the effects of which we see today. Wetlands and rivers have been replaced by concrete and asphalt, resulting in flooding in the city during the rainy season and drought in the dry season.

Currently, about 60 percent. water for the city comes from underground layers whose exploitation is so intensive that it leads to the gradual collapse of the capital's land - a phenomenon occurring at an alarming rate of 50 cm per year! In addition, about 40 percent. water returns to the environment through leaks in the outdated infrastructure, while rainwater is unable to penetrate the city's concreted surface.

## Mexico must take radical action

Cutzamala's water system, a strategic source of water supply, is also suffering from the drought, which has caused its output to drop to critically low levels. This prompted the authorities to impose even more restrictions on supply. Residents of the capital's poorer neighborhoods in particular are suffering from an increasingly acute water shortage. Periodic water shortages have already occurred periodically in recent years, every dry season. The situation is such a complex problem that it requires urgent action both in terms of water resources management and adaptation to changing climatic conditions.

Experts point out that without significant rainfall, Mexico could soon find itself in a situation where access to water becomes even more limited and *zero day* becomes a reality. They stress that without radical changes in management and adaptation, the city could face even more serious crises.

The authorities reassure that such a scenario will not happen. Independent experts and environmental activists, however, are unrelenting in their calls for concrete preventive steps. They propose, among other things. more efficient treatment of wastewater, which would increase water availability, implementation of rainwater harvesting systems that could reduce dependence on the water supply system, and regeneration of rivers and wetlands. These measures could not only increase the availability of water, but also contribute to the greening and cooling of the city.

# WORLD WILDLIFE DAY. SEAS AND OCEANS

*Posted on 3 March 2024 by Zuzanna Olender*

Every year, World Wildlife Day is celebrated in early March. Announced in December 2013. by the UN is aimed at a more widespread appreciation of the unique role of wildlife in our lives. This year, March 3 will be held under the theme, Connecting People and Planet: Exploring Digital Innovation in Wildlife Conservation. And since 70 percent. of our planet's surface is occupied by seas and oceans, let's check how this issue looks in the context of water matters.

**Categories:** Issue 5/2024, News, Onet
**Tags:** nature, ocean, protection, sea

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## What is World Wildlife Day?

World Wildlife Day reminds people of their bond with nature. It should also inspire further learning and responsible action to protect plants and animals for the rest of the year. The day commemorates the signing of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1973.

The Washington CITES Convention has been signed by 183 countries and the European Union. It listed nearly 41,000. species of wild animals and plants whose usefulness for their needs, such as in agriculture or industry, has been discovered by people around the world. They serve us, for example, in the production of food, medicines, furniture, tourist souvenirs, cosmetics, clothing or accessories.

The goal of CITES is to ensure that international trade in listed species is sustainable, legal and traceable. It should also contribute to the livelihoods of communities living close to wildlife and support their countries' economies. The list of monitored species included. sharks such as the giant (Cetorhinus maximus) and whale sharks (Rhincodon typus), manta rays and stingrays of the subclass Elasmobranchii, or the snail Wingshark(*Strombus gigas*), a resident of the Caribbean Sea, or more precisely, its beautiful shell.

## Seas and oceans

This year's World Wildlife Day is an opportunity to highlight the importance of digital innovation in marine conservation. Martha Rojas Urrego, executive secretary of the International Whaling Commission, mentions that many whale species are found in remote, inaccessible regions. Extreme cold and rough seas make it difficult to conduct research there from a ship or plane. Thanks to developing technology, scientists can do this remotely, from behind their own desks. They conduct population assessments using satellites that literally count whales from space.

Meanwhile, drones can be used to obtain genetic information and perform body condition assessments on individual animals. In the event that the sea strikes a whale in a more desolate area, relevant response teams can share images and receive real-time advice from experts thousands of kilometers away.

Specialists also have mapping tools that track the presence of chemical pollutants in the oceans and identify hotspots of collisions, merging points of shipping lanes and whale populations. To avoid accidents, the apps alert ships to the presence of whales in specific regions. Units can also be equipped with thermal imaging cameras or acoustic monitors to detect individual animals. Acoustic transmitters, on the other hand, keep cetaceans away from fishing nets to reduce bycatch.

## Threats to wildlife in the seas

On the other hand, new technologies are unfortunately also available to fishing vessels that are thinning marine animal populations. Using precision electronic tools, they track, for example, entire schools to harvest huge quantities of fish. This leads to overfishing, which is the overexploitation of harvested species that brings their numbers below safe levels, thereby making it difficult, and sometimes impossible, for

populations to recover.

Bottom trawling also aggravates the situation. Large fishing vessels pull behind them laden nets that scrape animals from the seabed and destroy the flora in the path of their activities. Many marine animals are also killed or injured by bycatch. This is about species that accidentally get entangled in the network. Dolphins, turtles and birds often become such victims.

The world's largest mammals, whales, also face threats. In addition to whaling, climate change, overfishing or sonar noise are dangerous to them. Not to mention the pollution discharged into marine waters. One example is plastic, which gets broken down in the sea. Because animals mistake it for food, it becomes the cause of death for many of them. World Wildlife Day reminds us of the importance of taking action to protect the world and that humans are the key factor.

# WARMEST FEBRUARY ON RECORD

*Posted on 2 March 2024 by Agata Pavlinec*

Second month of 2024. brought record high temperatures to many parts of the country. There is a shortage of snow in the mountains, ski resorts shine with emptiness, in parks and forests nature prematurely awakens to life. So far, it is difficult to fully assess the consequences of the warmest February yet, but scientists warn that we can expect similar anomalies in future years, and not just in winter.

**Categories:** Onet, Issue 5/2024, News

**Tags:** climate change, El Niño, February, high temperatures, hottest

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## Heat records in southern Poland

The Institute of Meteorology and Water Management - National Research Institute (IMGW-PIB) in a message issued on social media on February 28 this year. reported that in Tarnow, thermometers showed 19.1°C! A day earlier, 17.3°C was recorded in Katowice, Rzeszow and Czestochowa. Evaluating the weather from the perspective of the entire month and historical measurements over the past 30 years, the average air temperature anomaly was as high as +6°C. Thus, the 1990 record for monthly average temperature was broken. Moreover, on February 27, thermometer readings at IMGW-PIB stations showed a daily anomaly of +12.1°C. On Kasprowy Wierch, the snow cover decreased by 12 cm in one day alone.

The warmest February was felt primarily by residents of southeastern Poland. The mercury column reached record levels, among others. In Lublin, Zamosc, Kozienice and Wieluń. Temperatures above 10°C were recorded at 29 stations across the country. Considering multi-year weather data, the shortest month of 2024 ranked above the 95 percent quantile. maximum daily temperatures. According to forecasts by IMGW-PIB, high temperatures may continue until March 4. After that, meteorologists expect a moderate cooling.

## Not the first and not the last such February?

Weather anomalies have been occurring with increasing frequency in recent years. On February 25, 2021. Maków Podhalański recorded 22.1°C - the highest daily temperature for February in 30 years. The previous record of 21.4°C was set in 1990. For the sake of argument, let's add that between 1991 and 2020, the area average air temperature in Poland in February was-0.1°C. However, in 2021 it was already 1.6°C, the next year 3.2°C, and the year after that 1.5°C. This year's warmest February in three decades seems to clearly confirm the fact of global warming.

Dr. Jerzy Kozyra of the Department of Bioeconomy and System Analysis at the Institute of Fertilization and Soil Science in Puławy, in an interview on Radio Lublin, noted that we are already dealing with a disruption in the order of the seasons. Increasingly, warm air from the south is coming over Poland, bringing unprecedentedly high temperatures, both in winter - that's where the warmest February comes from - and in summer, when heat waves hit us. Dr. Miroslawa Malinowska, a climatologist at the University of Gdansk, even suggests that Poland's climate will evolve toward two seasons typical of the subtropical zone: warm and dry and cool and wet.

## Warmest February in other regions of the world as well

According to the Copernicus Climate Change Service (C3S), as early as January 2024. was the warmest recorded first month of the year worldwide in the history of meteorology. The global area average air temperature was 13.14°C, 0.7°C higher than the average for the 1991-2020 period. It was also the eighth consecutive month of global heat records. February is the ninth.

Maximiliano Herrera, a climatologist who has been tracking and reporting on extreme global temperatures for years, reports that 140

countries around the world set heat records in the first half of February alone. Heat waves swept through, among others. Through South Africa, Chad, Morocco, Australia, Sri Lanka, Thailand, Maldives, Mexico and Paraguay. It was unusually warm in six states in the central US - in Missouri the mercury column exceeded 32°C. More than 20°C was registered in Romania and Hungary, and above 18°C thermometers showed in the Czech Republic and Slovakia. The warmest February on record was also recorded in the Netherlands and Belgium.

According to the World Meteorological Organization (WMO), not only climate change but also the impact of El Niño is responsible for the current records. The warm weather phenomenon from the Pacific is beginning to wane, to say the least, but the warmest February on record is undoubtedly to its credit. Between April and June, El Niño is expected to end its nagging activity, raising hopes that the rise in temperatures will be limited in the coming months.

# OPERATION CLEAN RIVER LAUNCHES TODAY

*Posted on 1 March 2024 by Zespół redakcyjny*

Spring is under the belt, so traditionally Operation Clean River mobilizes the community to clean up in nature. Garbage is a problem that affects each of us. We should know how to manage them at home, but we also can't be indifferent to the waste that lingers in our environment. By engaging in community cleanup, we have a real impact on preserving nature in the best possible condition for future generations. All you have to do is choose a place to clean up or sign up as a participant. Registration begins on March 1, and the first cleanup of the year could be organized, if only to mark International Day of Action for Rivers or World Water Day.

**Categories:** Issue 5/2024, News
**Tags:** contaminants, garbage, river, river pollution, rivers

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The largest coordinated action of social cleaning of rivers and green spaces in Poland, Operation Clean River, has its origins in 2019, when more than 2,000 volunteers collected almost 55 tons of garbage. Each year there were more and more involved in cleaning up nature. In total, during all editions, more than 36 thousand volunteers cleaned up more than 875 t of trash.

## Do a survey of your neighborhood in the spring

Operation Clean River is taking place nationwide. The campaigns kick off in spring, when nature slowly awakens to life after winter, and it is easiest to spot trash in the still-green bushes, along paths, in the forest or in areas adjacent to the riverbed.

For the sixth time, we stand ready to fight litter in the wild. Thanks to our regular activity, we know that we can count on willing cleaners. We are grateful to everyone who makes the effort to organize the action as chief of staff, as well as to everyone who participates in the social cleanup of the river or their neighborhood. Unfortunately, there is no shortage of places requiring our intervention, so once again we encourage all environmentally sensitive people to mobilize," says Daniel Parol, one of the originators and organizers of Operation Clean River.

## Register a staff or sign up for action

Staff registration begins March 1 via the campaign website. Among other things, there will be a Chief of Staff Guide, a hotline 22 290 20 40 open Monday through Friday at. 8-20. Inquiries or concerns will also be able to be directed to the following email address: rzeka@operacjarzeka.pl.

Anyone can become a participant in the campaign, except that teenagers (13-18 years old) need written permission from their guardian, and younger children can collect garbage under the supervision of a parent or other adult. There will also be an opportunity for school action in this edition. All that is needed is for the caregiver to register the staff and sign up the participants.


*pic. 6 Operation Clean River*

## Ecological calendar

Staff registration begins on March 1, and outdoor cleanup campaigns can begin as early as March and last until May 25. They can be planned around calendar occasions, of which there is no shortage.

The International Day of Action for Rivers, which falls on March 14, is a good date to plan an outdoor cleanup campaign. World Water Day (March 22) will also be an important day, reminding us that water is one of the most precious resources we have. Another motivation for activity is Earth Day (April 22), which every year mobilizes the largest number of participants to organize local actions. On this day alone, 176 actions took place last year.

For the past five years, the General Staff has also organized a major campaign on this occasion. A year ago in the capital it was a major cleanup of the Vistula River with the participation of more than 400 people. In this edition, such an action is planned in Kazimierz Dolny. To keep up to date with the events of Operation Clean River 2024, it is worth following the initiative's communication channels.

## Operation Clean River

This is the first-ever coordinated public cleanup of rivers along their entire length, including tributaries, as well as banks and the surrounding area. It aims to engage local communities, local governments, NGOs and tourists to clean up the rivers and surrounding areas, and to keep them clean throughout the year. It is also an educational and social action premised on influencing the behavior and attitudes of citizens in the long term. Initially, it was to concern only the Bug River, but it soon became clear that there were those willing to promote the idea throughout Poland. As a result, in 3 editions more than 8 thousand. Volunteers collected approx. 280 t of garbage nationwide.

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*Source: press release 6 Operation Clean River*

*Photo. MAIN: 6 Operation Clean River*

# MADAGASCAR - DROUGHT IN THE LEMUR KINGDOM

*Posted on 29 February 2024 by Agnieszka Hobot*

Madagascar, an island nation off the coast of Africa, impresses with postcard-perfect views and "playful" lemurs. At the same time, it is the world's fourth most vulnerable country to climate change, regularly hit by cyclones and droughts. Nearly 70 percent. The population here lives in extreme poverty. But the biggest problem is the lack of water, without it Madagascar, like any other place in such a situation, dies. The most dramatic situation is in the south of the island, which is why Polish Humanitarian Action has focused its efforts on these regions. I spoke with Margaret Klein about how PHA supports the indigenous people of Madagascar.

**Categories:** In this issue, Issue 5/2024, Issue topic, Onet
**Tags:** crisis, Madagascar, PAH, sand dams, Water crisis

Madagascar, an island nation off the coast of Africa, impresses with postcard-perfect views and "playful" lemurs. At the same time, it is the world's fourth most vulnerable country to climate change, regularly hit by cyclones and droughts. Nearly 70 percent. The population here lives in extreme poverty. But the biggest problem is the lack of water, without it Madagascar, like any other place in such a situation, dies. The most dramatic situation is in the south of the island, which is why Polish Humanitarian Action has focused its efforts on these regions. I spoke with Margaret Klein about how PHA supports the indigenous people of Madagascar.

**Agnieszka Hobot:** Why have water problems in Madagascar increased in recent years?

**Margaret Klein:** Polish Humanitarian Action's presence in Madagascar is linked to the crisis in the south of the island. Temporariness is usually associated with the word crisis. Here it is a protracted situation that is additionally little discussed in the media. The earthquake or flood we often see in the news is sudden and dramatic. The crisis in Madagascar is not sudden, but dramatic, stretched over time, and those affected have no voice. Where we work now there are very few state structures and NGOs or international organizations. PAH is opening up its strategies to French-speaking African countries such as Madagascar.

Madagascar has historically suffered from high water stress. It particularly affects the Androy and Atsimo-Atsinanana regions, where the rainy season can fail to appear for up to six years in good measure. From the dry season, during which it does not rain at all, we are entering the rainy season, which all farmers are waiting for. More than 90 percent. Communities here make a living from family farming or ranching. When the rain doesn't come or there is too little of it for the crops to be sufficient, people are unable to cultivate the land. It is necessary to deliver food to the needy, and this in many cases is an impossible mission. The problem, for example, is the lack of roads, and the food that is brought is not only inadequate, but also very expensive and often of poor quality.

This is the situation in southern Madagascar in a nutshell. I will only add that in recent years droughts have also intensified due to demographic pressures. The island's population has tripled over the past 25 years. These are very dynamic changes that involve water shortages and deforestation. The population, in order to prepare even the most modest meal, is usually condemned to lighting a campfire. Other energy sources are usually not available to them. More residents need more wood, so it is cutting down the dry forests of southern Madagascar, threatening its resurgence. This is one cause of deforestation. The other is a way of cultivating the land called *slash-and-burn*, or burning and clearing the land for farmland.

Logging and population pressures, combined with intensifying global climate change, are making rainy seasons increasingly unpredictable and less abundant, making it difficult for populations that depend on cultivating the land to survive.

*pic. PAH*

**A.H.:** The difficult situation is due to the accumulation of several factors that the islanders are trying to cope with in some way. What, then, is the government's attitude? Are roads or water intakes being built? Is this population really left to fend for themselves and can only rely on NGOs?

**M.K.:** The government of Madagascar, which is one of the 15 poorest countries in the world, is already subsidized half by international organizations at the basic budget level, not including the response to natural disasters. So in terms of state support, the investment potential is very low, not to say non-existent.

Drought in southern Madagascar now occurs every decade. These are prolonged, multi-year periods without rain or with little, insufficient rainfall. For that, cyclones occur on the other side of the island, causing floods and destroying homes and farmland. As you can see, the intensity of natural disasters in Madagascar is significant, and resources for responding to them are scarce. These are costs that even for OECD countries would be unaffordable, especially if disasters recur in each successive decade.

In summary, the state's response depends not on the country's GDP, but on external support. Domestic policymakers only indicate the region whose problems they will respond to.

As for the presence of government institutions or structures in southern Madagascar, it is, compared to other regions, low. There is no school network there, and the number of clinics is insufficient. In addition, their quality leaves a lot to be desired. There is not even a main road cutting through the area that is maintained. It is replaced by a comma between cacti - you can see which way to go, as cars go there frequently.

The European Union is currently working with the government to build a road from the coast to the capital of the Androy region, the one most affected by the drought, Ambovombe. This alone causes me to cover the 170 kilometers to our field office in 6 hours, not 8. Of course, if I don't get stuck somewhere and nothing breaks. The fact is, however, that in the hinterland of this drought- and famine-stricken region, the road will not be there for a very long time to come.

**A.H.:** I wanted to ask about something that even intrigued me. In developed countries, the response to impoverishment and natural disasters is usually a drop in the birth rate, and in Madagascar there has been a huge increase. What factors are responsible for this? This is rarely

discussed.

**M.K.:** Actually, this topic is not often raised. The birth rate in the world's poorest countries is significant, while in those with high prosperity it is low. In many European countries, the ratio is being raised by immigrants, protecting them from the consequences that accompany aging populations.

In both highly developed countries and poorer ones, society is guided by logic. In our European context, we will be reducing the number of births due to the fact that we are not able to support a family, so in simple terms. That is, I have a small apartment - I need to have fewer children, because I can't accommodate them, I need to have fewer children to be able to give them quality education. And in countries where I will always have a small house anyway and can never afford to educate my offspring because either there is no school at all or it costs too much, this fertility rate is driven by other factors. First, unfortunately, is the fact that a great many children die before the age of 5, and second, the lack of birth control.

It is colloquially said that children are Africa's wealth. This is a rather idyllic take on the matter. This is largely due to cultural considerations. A woman often can't get an education, can't take gainful employment in a very narrow market, so her position is judged by whether and how many children she has. This is very difficult to understand for people who have developed a completely different view of the world, who grew up in completely different cultural conditions, in prosperity.

Having children is a great joy for these people, their life achievement. This is a completely different optic of looking at fertility, but also an economic argument. When someone is sick and one has to help in the fields or go far to fetch water or wood, work a great deal to have to get food for the day, then every pair of hands is needed.

**A.H.:** I wanted to go back to the question about water. What activities does PAH carry out to facilitate access for the people of Madagascar? I've heard about sand dams - it's something we don't know in Poland.

**M.K.:** In terms of water activities, PAH is working in southern Madagascar in two, soon three ways.

We are talking about an area where there are no flowing rivers as we understand them. On an annual basis, these are dry riverbeds where the water has accumulated in the carried sand. People enter such a trough and dig small holes to collect the water they need for drinking, for pets, and to wash themselves. We operate in an area with villages of 200 to 700 residents. To provide them with better quality water, where possible we dig surface wells, that is, wells up to 20 meters deep.

PAH has been dealing with this for the past two years. This is the simplest solution, supporting local activities, that is, local people themselves start digging for water, but they don't have the know-how, they don't have the resources to buy a hand or foot pump, and then the organization partners, providing support.

PAH is not involved in drilling (deep water intakes) at this point, which in this particular region is not the easiest solution. This is handled by UNICEF and UNDP, for example. These organizations are looking for a way to keep it sustainable in this particular area.

The next way to collect and replenish water is to collect rainwater. PAH will participate in the construction of domestic tanks. We will train local residents to be able to work independently and build such a domestic tank on their own in 4 days. With rainfall as low as it is in the region, they will not collect water all year round. Their task will only be to supplement household resources.

The crown project that PHA is implementing in the region is the sand dam. The organization has been working with Kenyans in the driest regions of their country for many years, and as a result, the technology is proven, efficient and promotes a good model of cooperation with local communities. As the first implementations took place 20 years ago, it is already known that they work for a long time, serve, do not

deteriorate and are a solution that is viable for really poor communities. That is, where there are no funds for infrastructure repair, dams perform admirably.

*pic. PAH*

**A.H.:** What does the construction of such a dam involve? What does it look like technologically?

**M.K.:** The technology of sand dams is that specialists in locating investments look for a place with good ground - impermeable rock. If it meets other, less crucial criteria, then a dam can be built there. There are many such places in southern Madagascar. Local people are involved in the work. It involves the collection of stones and rocks. To build a medium-sized dam you need about. 500 t, so it's a huge job that will later provide them with a source of water, even in times of drought. Once the material is collected, a Kenyan expert arrives to help us organize the work and who passes on the know-how.

First we build the foundation. We dig into the impermeable rock and fill the resulting space with accumulated stones, gravel and cement. The local community is also learning the basics of construction in this way. Such regions are not about innovation in the sense of developed countries that already base their economies on the service sector. Here, the innovation is a solution that is able to perform its function, that is, to provide the best possible filtered water during periods of drought to the world's poorest communities, i.e. those that are unable to allocate surplus income to water harvesting.

**A.H.:** Can such dams be built in a cascade, several on one river? Do you already have experience with such investments? For example, in Kenya.

**M.K.:** Any such investment should be analyzed in detail in the geographical and social context. General assumptions are not authoritative and it is difficult to make predictions based on them. An environmental analysis is needed. We try to approach our interference in a region as responsibly as possible, and even if the administration does not make exorbitant demands on us, we impose them on ourselves. We shape them in consultation with her. With the experience we have gained, we know that environmental impact analysis is necessary.

**A.H.:** Please give some more tips for readers who ask themselves: how can I help?

**M.K.:** I invite you to visit our website. Tangible support includes donations to a specific cause or region, such as projects in Madagascar.

# EC TO INVEST €2.2 MILLION TO MODERNIZE FISHING VESSELS

*Posted on 29 February 2024 by Iwona Szyprowska-Głodzik*

On February 20, the European Commission issued a call for proposals for the development of a prototype fishing vessel project with modern propulsion technologies and innovative energy solutions. The European Union has allocated €2.2 million for this purpose. This experimental project seeks to modernize fishing vessels through the use of alternative energy sources, and thus is expected to help reduce greenhouse gas emissions and underwater noise, and increase the economic efficiency of the fishing industry. The initiative opens up new prospects for the future of European fisheries, striving for a balance between environmental protection and economic development.

**Categories:** From the European Commission, Issue 5/2024, Onet
**Tags:** decarbonization, EU, fishing, KE, upgrade

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## Project implementation

A pilot project, it aims to develop and test a prototype ship using alternative energy sources. The initiative is a step toward decarbonizing the maritime industry and increasing its economic resilience. It also aims to confirm the feasibility of new technologies and highlight the pluses of reducing the use of fossil fuels.

The project will be implemented through an open call for proposals initiative, managed by the European Agency for Safety and Health at Work. Climate, Infrastructure and Environment. The competition is open to all interested parties and will run until June 11, 2024. This is a unique opportunity for potential applicants, including representatives of the fishing industry, NGOs, scientists and other interested parties, to present their innovative ideas and projects that can contribute to the sustainable development of the sector. In order to support potential applicants in the application process, the EACEA has been working on the application process. The Climate, Infrastructure and Environment Council will hold an information session on March 18, 2024. The purpose of this event is to provide participants with detailed information on the initiative, including project selection criteria, application procedures and expected results.

The information session will be a unique opportunity to get clear explanations of competition requirements, which is crucial for preparing effective and formally correct applications. Participants will also have the opportunity to receive expert advice from the EACEA. The Climate, Infrastructure and Environment Councils can significantly increase the chances of success for their projects. In addition, the event provides an excellent platform for building partnerships and exchanging experiences among various stakeholders interested in supporting the sustainable development of the fisheries sector.

Funding for the call for proposals is made possible by EU Pilot project funds. To participate in the competition, applicants are required to submit documents through an electronic system, which is located on the Funding & Tenders platform. The system provides an efficient and transparent application process, allowing all interested parties easy access to the necessary information and tools needed to apply. The results will be announced at the end of the third quarter of 2024.

## Modernizing fishing vessels: why is it important?

The increase in fuel prices in 2021 and 2022 has had a significant impact on the European fishing fleet, posing serious economic challenges. High operating costs, due in large part to dependence on fossil fuels, are not only straining the finances of fishing companies, but also increasing their carbon footprint, contrary to global and European environmental goals. The European fishing fleet, generating some 4.3 million tons of $_{CO2}$ equivalent annually, is at the center of the need to transform to more sustainable practices. This change is necessary not only to protect the environment, but also to ensure the long-term viability and stability of the fishing industry.

The European Union, aiming to achieve climate neutrality by 2050, has pledged to promote sustainability in all economic sectors, including fisheries. Supporting this process is therefore an important part of the EU's strategy. Investments in new technologies, such as alternative fuel vessels, energy efficiency systems and innovative fishing methods, are aimed at reducing dependence on fossil fuels, lowering $CO_2$ and improving the economic efficiency of the fleet.

The transition to sustainable energy sources in the fisheries sector also means increasing Europe's strategic autonomy by reducing dependence on volatile fossil fuel markets and foreign energy suppliers. In the face of global challenges such as climate change and geopolitical tensions affecting energy prices, such measures are essential to ensure energy security and economic stability for the fishing industry.

In addition, these investments are part of the Union's broader goals of promoting a pollution-free economy and increasing the sustainable use of natural resources. By fostering innovation and sustainable practices, the EU aims to create a more resilient and greener fishing industry that can meet future challenges and contribute to global environmental goals. In this context, supporting the transition to sustainable energy sources is not only a response to current economic and environmental challenges, but also an investment in the future of the fisheries sector.

# LIFE PROGRAM WILL SUPPORT 12 STRATEGIC EUROPEAN PROJECTS: 223 MILLION EUROS IN FUNDING

*Posted on 29 February 2024 by Agata Pavlinec*

**Categories:** From the European Commission, Issue 5/2024, Onet
**Tags:** environment, EU, funding, KE, klimat, LIFE

On February 22 this year. The European Commission has decided to invest 223 million euros in new strategic environmental and climate projects. The initiative is being implemented in line with the ambitious Green Deal policy and will support 12 projects in ten member states, including one in Poland. The LIFE program will cover part of the implementation costs, and additional funds are expected to flow down, among other things. from structural, national and regional funds.

## LIFE program in a nutshell

Launched in 1992, the LIFE program is the only EU financial instrument focusing exclusively on subsidizing environmental and climate projects. Over three decades, funds from this program have been allocated to more than 5,500. initiatives, including in countries outside the EU. The European Executive Agency for Competitiveness and Innovation is responsible for the management of LIFE. Climate, Infrastructure and Environment (CINEA).

In the period 2021-2027, the LIFE program is expected to provide funds totaling €5.4 billion. Funding will be distributed in two areas: *Environment* and *Climate Action*. The former will include projects on nature, biodiversity and the circular economy and quality of life. The second area includes subprograms for climate change mitigation and adaptation and transition to clean energy (starting in 2021).

## Projects supporting the environment

Support under the new co-funding pool was awarded to three strategic projects seeking to improve the environment. More than 14 million euros will be awarded to beneficiaries of the Polish LIFE Podkarpackie project to implement an air quality improvement plan. It aims to reduce PM10 and PM2.5 dust concentrations in the region. The project provides for the development and implementation of good practices and the mobilization of public and private funds.

The LIFE program will also support an Irish initiative to expand Marine Protected Areas (MPAs) and a Lithuanian project to improve the quality of marine and surface waters through the implementation of a national plan for the water sector.

## LIFE program for ecosystems

As many as six strategic projects will be implemented under the nature and biodiversity subprogram. Nearly €30 million will go to a Finnish initiative to develop regional biodiversity plans and build know-how in the area. Applicants will focus more on managing the regeneration of entire ecosystems rather than protecting individual habitats and species.

Funding was also provided for projects related to the implementation of Natura 2000. The Lombardy region will receive nearly €28 million to develop an integrated management system for Natura 2000 sites, strengthen ecological corridors, and support ecosystems crucial to climate change mitigation. Activities will be implemented in four regions of northern Italy. In turn, an Irish consortium of public authorities can count on more than €20 million to build an integrated Natura 2000 data platform across the country and improve financial mechanisms for raising further funds. The project envisions, among other things. Regeneration of forested peatlands and coastal habitats.

In Austria, 1,400 are planned for renewal. hectares of peatlands, home to 37 protected species. The project includes, among other things. Synchronization of legal regulations and the development of expertise in this area. In the Czech Republic, support was given to a project to implement species-specific action plans and create algorithms to facilitate their evaluation. The applicants expect to reverse the negative population trend in at least 25 species.

A more general, sectoral approach is represented by the French LIFE BIODIVFr project, which aims to start a dialogue among stakeholders and improve the implementation of the National Biodiversity Strategy.

## LIFE climate initiatives

The LIFE program will also include co-financing for three climate change projects. The €12 million in aid will go to Finland to support efforts to achieve carbon neutrality in 2035. Activities uniting the government, scientific, civil society and private sectors will include. Developing value chains in swamp agriculture and reducing emissions in industrial transportation.

In Bulgaria, a project to implement Sustainable Urban Mobility Plans (SUMPs) in an area inhabited by 30 percent of the country's population will receive €9 million in support. country's population. In France, meanwhile, funding will be provided for the development of a transboundary climate strategy affecting six regions within the Pyrenees. This is one of the first such initiatives in Europe, and could become a catalyst for climate change adaptation in other mountain areas as well.

# HYDROGEN ECONOMY IN THE EU - EUROPEAN COMMISSION TO ALLOCATE €6.9 BILLION FOR IPCEI HY2INFRA PROJECT

*Posted on 29 February 2024 by Karol Kucharski*

The REPowerEU plan lays out a series of measures aimed at smoothly reducing the EU's dependence on Russian fossil fuels by accelerating the transition to clean energy. One such measure is faster implementation of ways to use hydrogen. Target adopted by 2030. assumes the production of 10 million tons of renewable hydrogen in the EU. With the stated goal in mind, the European Commission will allocate nearly €7 billion to seven member states to support the development of an innovative and sustainable European hydrogen industry.

**Categories:** From the European Commission, Issue 5/2024, Onet
**Tags:** EU, hydrogen, hydrogen management, IPCEI Hy2Infra, KE

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## Hydrogen management in the EU - IPCEI Hy2Infra project

The project, called IPCEI Hy2Infra, was prepared and submitted by several member states: France, the Netherlands, Germany, Poland, Portugal, Slovakia and Italy. It is intended to help increase the supply of renewable hydrogen, thereby reducing dependence on natural gas and helping achieve the goals of the European Green Deal and the REPowerEU plan. Some member states (France, Germany, Poland and Portugal) have included participation in IPCEI's Hy2Infra project in their reconstruction and resilience plans, allowing them to partially finance certain projects through the Reconstruction and Resilience Facility.

Member states will provide up to €6.9 billion in public funding for the project. It is also expected to free up an additional €5.4 billion in private investment. The 33 projects will involve 32 companies operating in more than one member state, including small and medium-sized companies. They will work closely with each other, as well as with external partners such as transmission system operators, potential customers, universities, research organizations and equipment suppliers from across Europe.

IPCEI's Hy2Infra project will cover a wide range of the hydrogen economy value chain, with support going to:

- Launching electrolyzers with a capacity of up to 3.2 GW, producing renewable hydrogen;
- Commissioning of new and adapted hydrogen transmission and distribution pipelines with a length of about 2,700. km;
- Launching large-scale hydrogen storage facilities (with a potential of at least 370 GWh);
- Construction of terminals and related port infrastructure for handling liquid organic hydrogen carriers (LOHCs), allowing the turnover of 6,000. t of hydrogen per year.

As part of the project, participants will work together on interoperability and common standards, which will eliminate barriers and facilitate market integration in the future. It will also support the gradual process of creating a hydrogen infrastructure that will cover the entire EU and be based on regional groups.

## European Commission evaluation of IPCEI Hy2Infra project

The European Commission has assessed the proposed project on the basis of EU state aid rules and, in particular, the Communication on important projects of common European interest.

According to the assessment:

- IPCEI's Hy2Infra project contributes to a common goal by supporting the deployment of hydrogen infrastructure, important for achieving the goals of key EU policy initiatives such as the European Green Deal, the REPowerEU Plan and the EU Hydrogen Strategy;

- All 33 projects that make up IPCEI are very ambitious and aim to create infrastructure beyond what the market currently offers. They will lay the foundations for an integrated and open hydrogen network, available on a non-discriminatory basis, and allow for an increased share of renewable hydrogen supply in Europe. This, in turn, will facilitate the decarbonization of economic sectors that need to rely on hydrogen to reduce carbon emissions;

- The IPCEI project involves significant financial risks. Therefore, public support is needed to encourage companies planning to invest;

- aid to individual enterprises is limited to what is necessary and proportionate and which does not unduly distort competition;

- Technical knowledge and experience gained during the start-up period and during the first years of project operation will be shared by participating companies through publications, conferences and joint recommendations; operational rules and technical standards will be developed.

## Development of the hydrogen economy in the EU

The green hydrogen economy is currently one of the European Commission's priorities. Numerous initiatives and activities are being undertaken as part of development and promotion. One of them is the Hydrogen Bank, which we have already written about in *Water Matters*. According to the announcements, a number of programs will be implemented in the future for various high-powered electrolyzers, which would become operational between 2026 and 2028, as well as hydrogen pipelines, which in turn would become operational between 2027 and 2029 - depending on the geographic region.

# WHAT WILL BE THE EU'S CLIMATE TARGET FOR 2040?

*Posted on 29 February 2024 by Karol Kucharski*

According to the European Climate Law, which came into force in July 2021, the EU should achieve climate neutrality by 2050 and reduce net greenhouse gas emissions by at least 55 percent compared to 1990 levels by 2030. The climate law also requires the European Commission to propose a climate target for 2040. According to the latest impact assessment on possible ways to achieve climate neutrality, the European Commission recommends net greenhouse gas emission reductions of 90 percent by 2040.

**Categories:** From the European Commission, Issue 5/2024, Onet
**Tags:** climate neutrality, CO2 emissions, greenhouse gas emissions, klimat

According to the European climate law, which took effect in July 2021, requires the EU to achieve climate neutrality by 2050 and reduce net greenhouse gas emissions by at least 55 percent compared to 1990 levels by 2030. The climate law also requires the European Commission to propose a climate target for 2040. According to the latest impact assessment on possible ways to achieve climate neutrality, the European Commission recommends net greenhouse gas emission reductions of 90 percent by 2040.

Climate change is causing more frequent and severe extreme weather events that lead to significant economic damage. Setting a climate target for the next few years is expected to bring not only economic benefits from lower risk of extreme weather events and associated losses, but also a range of co-benefits, including improved air quality and health, reduced dependence on imported fossil fuels, and support for biodiversity.

## Climate target for 2040 and its importance for the development of the economy

Setting a climate target for 2040. will help European industry, investors, citizens and governments make decisions that will allow the EU to reach its 2050 climate neutrality goal. This will provide important signals indicating how to effectively invest and plan for the long term. Through foresight, it is possible to shape a prosperous, competitive and equitable society, decarbonize the EU's industry and energy systems, and make Europe a major investment destination and a stable workplace fit for the challenges ahead.

Setting a target will also increase Europe's resilience to future crises and, in particular, strengthen the Union's energy independence from fossil fuel imports, which have been consuming more than 4 percent of the world's energy supply. GDP in 2022. Climate-related economic losses in Europe over the past five years are estimated at 170 billion euros. The European Commission's impact assessment shows that, even by conservative estimates, global warming as an effect of inaction could reduce EU GDP by about 7 percent. By the end of the century.

## How will the EU's 2040 climate target be achieved?

Achieve a net reduction in greenhouse gas emissions of 90 percent. By 2040. Compared to 1990 levels. will require a number of conditions, such as the implementation of regulations aimed at reducing emissions by at least 55 percent. By 2030. One of the key elements on the way to this goal is updating the National Energy and Climate Plans, which we wrote about in a previous article: National Energy and Climate Plans.

Another important element here is European Green Deal, which must become an agreement to decarbonize the industry and base it on wind power, hydropower and electrolyzers, and to increase domestic production capacity in emerging sectors such as batteries, electric vehicles, heat pumps, photovoltaic power, CCU/CCS, biogas and biomethane, and the closed-loop economy. According to the European Commission, setting greenhouse gas emission fees and access to financing are crucial for European industry to achieve its reduction targets, so a special task force will be set up with the role of developing a global approach to setting greenhouse gas emission fees and carbon release markets.

One of the most important elements of making a clean transition is open dialogue with all stakeholders. The European Commission has already engaged in talks with industry and agriculture representatives. Ongoing outreach efforts will help present legislative proposals for a post-2030 policy framework. and which will contribute to achieving the 2040 target. In a fair and cost-effective manner. The pace of decarbonization will depend on the availability of technologies that deliver zero-carbon solutions, as well as the efficient use of resources in a circular economy.

## Climate target - how to reduce$_{CO2}$ emissions

Achieving the recommended goal of 90 percent. will require emission reductions and$_{CO2}$ removal. To achieve it, the focus should be on implementing carbon capture and storage technologies, as well as its use in industry. EU industrial emissions management strategy aims to support the development of$_{CO2}$ supply chains and the required transportation infrastructure. $_{CO2}$ capture should target sectors where emissions are difficult to reduce and where alternatives are less economically viable. Carbon dioxide removal will also be needed to generate negative emissions after 2050.

## Industrial alliance for small modular reactors

The energy sector is expected to achieve full decarbonization after 2040. based on zero- and low-carbon energy solutions, including renewable energy sources, nuclear power, energy efficiency, storage, CCS, CCU, carbon dioxide removal, geothermal and hydroelectric power plants. In support of the stated goal, the Small Modular Reactor Industrial Alliance has been established, which will seek to increase the competitiveness of the industry and ensure a strong supply chain and skilled workforce in the EU.

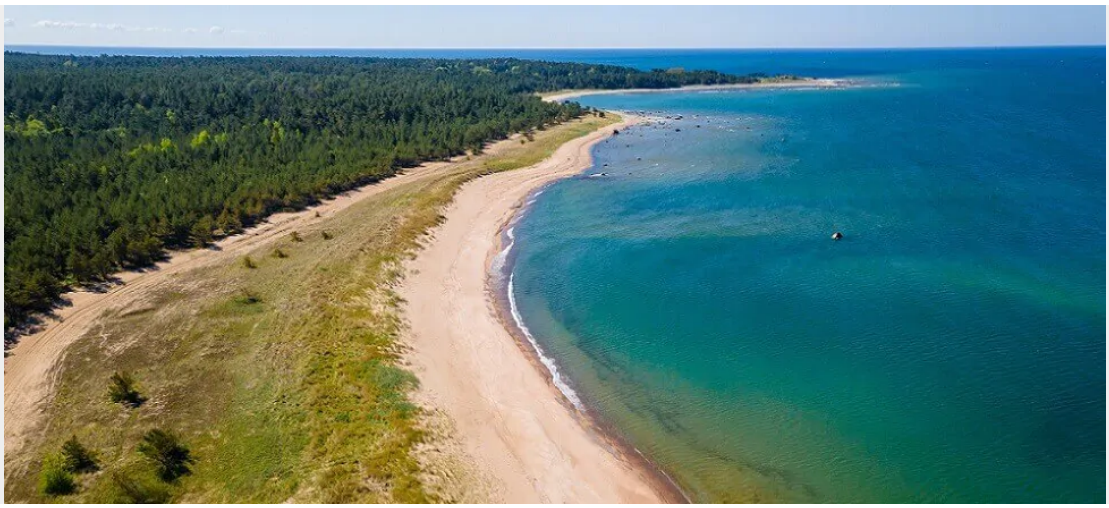
## When will the 2040 climate target be adopted?

The legislative proposal, as envisioned, will be presented by the next European Commission after the elections, and then agreed with the European Parliament and member states - as required by EU climate law.

Recommending a net 90 percent reduction in greenhouse gas emissions. By 2040. is in line with the opinion of the European Scientific Advisory Committee on Health and Safety at Work. Climate Change (ESABCC) and with the EU's obligations under the Paris Agreement.

# SEAWATER DESALINATION. DOES IT MAKE SENSE IN POLAND?

*Posted on 29 February 2024 by Zuzanna Olender*



Poland, like many other countries, is increasingly facing water shortages. Due to insufficient retention, abundant precipitation flows down rivers to the sea and becomes unfit for our needs due to salinity. Many places around the world are implementing solutions to treat salt water. Is desalination a good way to ensure water security in our country? Under what conditions does such an investment work best?

**Categories:** Business and economics, Issue 5/2024, Onet

**Tags:** desalination, desalination of water, water desalination process

Poland, like many other countries, is increasingly facing water shortages. Due to insufficient retention, abundant precipitation flows down rivers to the sea and becomes unfit for our needs due to salinity. Many places around the world are implementing solutions to treat salt water. Is desalination a good way to ensure water security in our country? Under what conditions does such an investment work best?

## Largest installations in the world

The largest seawater treatment plant in the world is located in Ras Al-Khair, Saudi Arabia. The facility produces 1 million[cubic meters of] water per day. The plant uses multistage projective distillation technology combined with reverse osmosis . The energy for this process is generated by the 2,400 MW power plant next door. As many as 3,500 are needed to operate the entire complex. Employees. The Kingdom of Saudi Arabia desalinates 20 percent. of water extracted in this way and is a market leader. This position is due to large local needs, but also to the ability to use its own fossil fuels to produce energy for water treatment.

## Desalination of seawater in Europe

European countries are also using similar technologies. Installations have already been set up in the UK and France, mainly on islands and in coastal regions where freshwater resources are limited and do not meet high demand. Several also operate in Corsica, for example. They provide drinking water for about 100,000. residents. However, the largest number of installations can be found in Spain. These are not as large desalination plants as in the Middle East, but there are already some. 800. In one day, they produce 5 million liters of drinking water. This is the result of more than 50 years of work on developing water policy and seawater desalination technology.

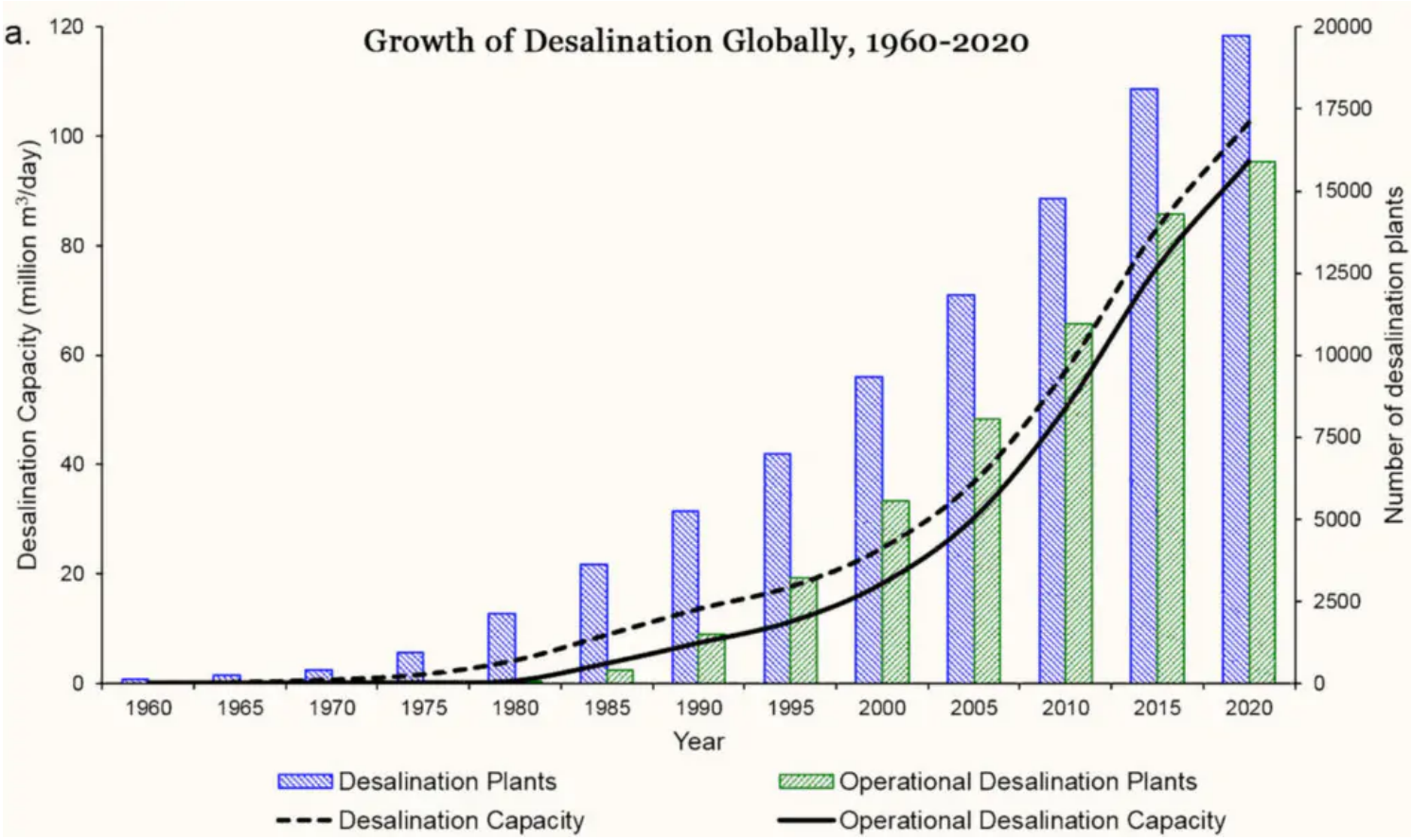
In recent years, the occurrence of long periods of drought has forced Spaniards to make fuller use of existing facilities, such as the Llobregat in Barcelona. It has a capacity of up to 200 million liters per day. By 2021. Desalination of water in this city satisfied only 3 percent of the city's water supply. demand, and now it is already 33 percent. The impact of climate change is clearly seen in the increasing share of freshwater from a variety of previously little-used sources.

## Israel - desalination technology tycoon

Seawater desalination is an industry in which Israel is a leader. Why? Because it has already been allocating funds to develop this method for years. Israelis are aware that they need to invest in obtaining fresh water, as it is a scarce good in their country. Now there are several hundred desalination technology companies there, with a total value of $2 billion.

From desalination plants comes 80 percent of the water available in Israel. However, this is not an economical solution. Desalination price of $1^{m3}$ of water is about 70 cents, but the consumer pays three times as much - $2.22 (as of 2022), still one of the lowest rates in the world for drinking water sourced from the sea. The largest plant is Sorek, located 15 kilometers from Tel Aviv, which produces more than 600,000 $m.^3$ drinking water per day in a reverse osmosis system. Its construction cost $500 million.

## Desalination process over the years




*pic. Data index of global growth in capacity and number of desalination plants from 1960 to 2020 source: https://e360.yale.edu/*

The first large desalination plants were built in the 1960s, but the energy intensity and high cost of the process meant that they were not used on a large scale. Over time, as populations grew in water-scarce places such as China, India, South Africa and the United States, desalination became a necessity. Also, climate change is contributing to the occurrence of drought in previously water-abundant regions.

Developments in technology are making seawater desalination cheaper relative to the cost of the process in its early years. Over the past three decades, the value has more than halved and the number of installations has tripled. More than 16,000 are currently in operation. desalination plants in 177 countries around the world.

The controversy is that the production of desalinated water consumes a lot of energy. It most often comes from burning fossil fuels. Admittedly, investments are already being made that combine desalination with renewable energy sources, such as solar panels or wind farms, but at this point these are exceptional situations. Experts view the rise of the plant with concern: desalination of water as a way to deal with climate change-induced drought emits more greenhouse gases, contributing to worsening global warming.

The dumping of the byproduct of the whole process, the brine, into the sea also remains problematic. In high concentrations, it can negatively affect ecosystems. Besides, along with seawater, fish and other organisms are sucked into the plant, becoming victims of the production process. Therefore, considering the economic and environmental costs of this technology, seawater desalination is used only where other sources of fresh water are really hard to come by.

## Desalination of seawater in Poland

Poland has not yet developed a seawater desalination plant for municipal purposes, but we already have a track record in such technologies. Startup Nanoseen has developed a process for instant, low-cost and emission-free seawater treatment that uses nanomembranes and

gravity. Filtration takes from 2 to 5 minutes. The carbon nanomembranes can be regenerated up to 10 times, and are biodegradable after use. They can absorb all sorts of contaminants and can be used in both small mobile devices and industrial-scale applications. The technology is still in the development stage, but investors are already coming to the startup.

Our country operates a desalination plant for industrial use. Azoty Police Group in 2019. has begun construction of such a plant for its own facility. When the water level in the Oder River decreases, salted water from the Baltic flows into its mouth. In order to ensure that the water captured by the plant from the river, whose salinity is therefore increasing, does not cause technological problems and does not require the use of a large amount of chemicals, a water treatment plant was built.

## Desalination of seawater for nuclear power plant

Seawater desalination will be the solution used for Poland's first nuclear power plant. It is to be built in Pomerania, and the cooling system will be supplied with water from the Baltic Sea.

The environmental impact assessment report states that water demand during the power plant's operational phases depends on the type of cooling system used. Seawater will be desalinated or used directly, depending on the chosen solution. Currently, the construction of the power plant is in the design phase, so we still have to wait for binding information.

## Should we source water from the Baltic Sea?

After analyzing the above information, one can conclude that desalination of Baltic water is not the best solution to Poland's fresh water shortage problems at the moment. It is true that we suffer from periodic deficits, but the situation is not yet as critical as in the Gulf countries or Spain. High costs, high energy consumption and the production of toxic brine make desalination of seawater not a viable form of securing supplies for our country's residents.

It is worth noting, however, that the use of such technology in industry may enable some plants to use seawater instead of fresh water. The presence of salt hinders technological processes and causes corrosion of metal machine components, and desalination will enable its use in production processes. Therefore, it's possible that more coastal industrial plants will soon follow in the footsteps of the Police pioneer and invest in seawater desalination.

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Reverse osmosis is a process that uses an osmotic membrane to remove impurities and organic matter from water, leaving it pure and crystalline.

# WATER MONITORING INDICATORS FOR THE *FIELD-TO-TABLE* STRATEGY

*Posted on 29 February 2024 by Monika Zabrzeńska-Chaterera*

The COVID-19 pandemic and the two-year-long war in Ukraine have demonstrated the great importance of a safe and crisis-proof food system, one that functions under all circumstances and allows citizens to have access to food in sufficient quantity and quality, and at affordable prices.

**Categories:** Business and economics, Issue 5/2024, Onet
**Tags:** CAP, From field to table, Water indicators

The COVID-19 pandemic and the two-year-long war in Ukraine have demonstrated the great importance of a safe and crisis-proof food system, one that functions under all circumstances and allows citizens to have access to food in sufficient quantity and quality, and at affordable prices.

The *Farm-to-Table* Strategy for a Fair, Healthy and Environmentally Friendly Food System (see COM/2020/381) points to the need to create such a solution and to monitor the transition toward sustainable food systems that reduce the current environmental and climate footprint.

## *Field to table* strategy

Published May 20, 2020. message titled Strategy
*From field to table*
for a fair, healthy and environmentally sound food system (COM/2020/381) is a comprehensive approach that addresses the challenges of sustainable food systems, improving lifestyles, health and enhancing the environment. It was prepared by the Commission for the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.

In addition, the increasing occurrence of extreme events such as water shortages, droughts, flooding, floods, forest fires or the emergence of new agrophages means that the food system may be at risk, and thus should become more sustainable and resilient to various risks and crises as soon as possible.

## Field to Table Strategy Objective

As pointed out in the *Farm to Table* strategy, food systems remain one of the main drivers of climate change and environmental degradation. Therefore, it stresses the need to urgently reduce dependence on pesticides and antimicrobials, reduce over-fertilization, strengthen organic farming, improve animal welfare, and reverse the loss of biodiversity.

Among other things, the adoption of the Commission's proposed guidelines will force the introduction of ambitious and far-reaching measures, including new legislation to reduce water, air and soil pollution, as well as the natural environment. It is also pointed out that our consumer habits and our diet are not insignificant for the need to achieve the aforementioned goals.

## EU food systems

According to estimates by the Commission for the Promotion and Protection of the Environment. Business and Sustainability Council of 2017. food and agricultural systems linked to the Sustainable Development Goals at the global level could provide wholesome and affordable food for the world's growing population, help restore key ecosystems and create new economic value of more than 1.8 trillion euros by 2030.

In addition, as the *Field to Table* strategy indicates, EU agriculture is one of the most important food systems in the world and has reduced greenhouse gas emissions by 20 percent since 1990, i.e. from 543.25 million gigatons of carbon dioxide equivalent in 1990 to 438.99 million gigatons in 2017. However, it is still pointed out that food production, processing, retailing, packaging and transportation are major contributors to water, air and soil pollution and greenhouse gas emissions.

# Monitoring the implementation of the objectives of the strategy *From the field to the table*

The *Field-to-Table* strategy assumes that the European Commission will regularly collect data to comprehensively assess the cumulative impact of all *Field-to-Table* activities on competitiveness, the environment and health. The food system sustainability model consists of:

- 3 thematic areas: environmental, social (which includes health) and economic;
- 13 topics;
- 40 domains that are linked to one or more of the objectives of the *Field to Table* strategy.

For monitoring the sustainable management of resources and their use for the *Farm-to-Table* strategy, such indicators relating to water are proposed, among others:

- agricultural water use - Water Exploitation Index Plus (WEI+);
- Water quality - nitrates in groundwater (within the pollution domain);
- Agricultural water use (within the water use domain);
- irrigated area (within the domain of water consumption);
- reuse of treated wastewater for irrigation (water re-use) (within the water use domain);
- Water-induced soil erosion (within the soil and land domain);
- Gross nutrient balance - nitrogen (within the soil and land domain);
- Gross nutrient balance - phosphorus (within the soil and soil domain).

In addition, within the consumption footprint domain, the following indicators are proposed, among others:

- eutrophication;
- water consumption;
- freshwater ecotoxicity;
- climate change.

With this, the consumption footprint is assumed to be a set of 16 indicators based on life cycle assessment, which aim to quantify the environmental impact of food consumption, both at the level of the European Union and individual member states.

## *Farm-to-table* strategy vs. the Strategic Plan of the Common Agricultural Policy

The Common Agricultural Policy(CAP), as indicated by the European Commission, is intended to be a key tool for the transformation toward a sustainable food system. That's why the recent CAP reform focused on the sustainability of agriculture. It links CAP support to environmental, climate and food security regulations. The need to achieve the goals and monitor the results of the *Farm to Table* strategy is also addressed in the proposal for a regulation on CAP strategic plans.

The European Commission, under the CAP, has planned areas of intervention relating directly to water primarily in terms of the Nutrients objective and has provided for the following indicators:

- Indicator 1 (W1): the percentage of groundwater monitoring stations where nitrate concentrations exceed 50 mg/L (relative to the average of the reference period, i.e., 2012-2015);
- Indicator 2 (W2): gross nitrogen balance in kg/ha of utilized farmland (relative to data from the reference period, i.e., 2012-2014). This indicator is also proposed as part of the monitoring of the *Farm-to-Table* strategy within the soil and land domain.
- Indicator 3 (W3): gross phosphorus balance in kg/ha of used farmland (relative to data from the reference period, i.e., 2012-2014). This indicator is also proposed as part of the monitoring of the *Farm-to-Table* strategy within the soil and land domain.

In the case of Poland, the figures for the reference periods are respectively: W1: 5.6 percent, W2: 48, W3: 2. However, the targets adopted for Poland with regard to the above-mentioned indicators can be found in the national CAP Strategic Plan.

# WATER MAINTENANCE PLAN - NEED OR NECESSITY?

*Posted on 29 February 2024 by Katarzyna Biegun*

A long, long time ago... I remember when the first (and so far the last) water maintenance plan (PUW) was created. It was treated as a legal invention. Or even as a necessary evil and bending to the ideology of environmental organizations. Some said: we give a finger - they will take the whole hand and we can't do anything. For others - the long-awaited standardization of conducting work in riverbeds. Prior to the implementation of the PUW, an environmental impact assessment, in accordance with the October 3, 2008 law, was not mandatory when conducting maintenance work. On sharing information about the environment and its protection, public participation in environmental protection and environmental impact assessments.

**Categories:** Feedback, Issue 5/2024, Onet
**Tags:** PUW, Water maintenance plan, WZMiUW

A long, long time ago... I remember when the first (and so far the last) water maintenance plan (PUW) was created. It was treated as a legal invention. Or even as a necessary evil and bending to the ideology of environmental organizations. Some said: we give a finger - they will take the whole hand and we can't do anything. For others - the long-awaited standardization of conducting work in riverbeds. Prior to the implementation of the PUW, an environmental impact assessment, in accordance with the October 3, 2008 law, was not mandatory when conducting maintenance work. *On sharing information about the environment and its protection, public participation in environmental protection and environmental impact assessments.*

## Water maintenance plan - the eye of the NGO

The blame for maintaining waters without meeting habitat and species protection standards has usually been placed on the provincial Water Reclamation and Management Boards (WZMiUW). But it was sarcastically pointed out that if the Regional Water Management Boards (RZGW) had as much money for maintenance as the WZMiUW, their operations would be no better.

WWF in the document *Summary and interpretation of the results of the report Inventory and evaluation of the natural effects interfering with the hydromorphology of rivers of 'maintenance' works carried out on the watercourses of the provinces of Łódź, Podkarpacie, Podlasie, Małopolska, Mazovia, Opolskie, Świętokrzyskie, Warmińsko-Mazurskie, Wielkopolskie, Zachodniopomorskie in 2010-2012 - a study based on tender announcements posted on WZMiUW websites and the results of questionnaires sent to these institutions, and supplementing this report with data from 2013* indicated the need to develop maintenance work plans for rivers as a matter of urgency. The NGO also stressed the need to *close the legal loophole of the imprecise definition of maintenance work* and to *develop a catalog of maintenance work as a matter of urgency.*

## Water maintenance plan - with a practitioner's eye

In 2014, an amendment to the Water Law (OJ. 2014 pos. 850 Law of May 30, 2014. On Amendments to the Water Law and Certain Other Acts) introduced the need for a water maintenance plan. It was to be in effect for six years, and its adoption should be preceded by an environmental impact forecast. The first work on the plan began in 2015. The atmosphere was heated even among the administrators - Regional Water Boards and Water Reclamation Boards. There were two, three or more WZMiUWs per RA. Each institution operated on annual maintenance plans, the vast majority of which depended on funds allocated annually for necessary work.

There were a number of uncertainties around the creation of the plans. How to plan activities 6 years ahead - in the absence of financial perspectives and clearly defined rules for financing tasks in subsequent years. The basic question raised was whether the maintenance plan is a maintenance needs plan or perhaps a financial capability plan. Added to this was the difficulty of interpreting the legislature's intent in defining what is a maintenance activity and what is not. The 2014 law defines it as work involving:

- Mowing plants from the bottom and banks of inland surface waters;
- Removal of floating and rooting plants in the bottom of inland surface waters;
- Removal of trees and shrubs overgrowing the bottom and banks of inland surface waters;
- Removing natural and man-made obstacles from inland surface waters;

- Backfilling of breach in the banks and bottoms of inland surface waters and their biological development;

- to make inland surface waters passable by removing blockages that impede the free flow of water and removing silt and debris;

- repair or maintenance owned by the water owner:
    - Regulatory structures and insurance within these structures,

    - water facilities;

- Demolition or modification of beaver dams and backfilling of beaver burrows in the banks of inland surface waters.

Interpretive difficulties included. The definition of a shoreline or regulatory structure. Because can the removal of trees and shrubs from the spit be counted as shoreline maintenance activities? And is the removal of beaver burrows on the embankments also a maintenance activity that should follow from the plan? Can the removal of blockages that impede the free flow of water be done along the entire cross-section of the watercourse - how free is the flow to be? Interpreting the filling of potholes in the banks and bottoms of inland surface waters was also quite a challenge - because isn't pouring a truckload of stone into the water completely unreasonable, and maybe it's better to somehow stack and wedge the stone so it doesn't flow with the nearest larger water?

A series of discussions and concerns resulted in the various water administrators agreeing on the final version of the draft plans. Impact projections were prepared for the first PUWs, and the documents were subjected to consultation. The forecasts were met with a backlash from environmental organizations. The comments often included negative voices from NGOs. They concerned the accumulation of maintenance activities in places where they are not necessary. The interpretation of the concepts of maintenance activities was also subject to criticism.

The Naturalists' Club pointed out, among other things, that *in the case of building up potholes with stone, we are not dealing with "filling in potholes," but rather with the construction of an aquatic device - a stone bank band, and this already goes beyond the scope of water maintenance.* There was also a different interpretation regarding the removal of trees and shrubs from the spit. To quote the Naturalists Club, *The removal of trees from flood-prone areas does not fall within the catalog of maintenance work specified in Art. 22 para. 1b of the Water Law (covering the removal of trees from the bottom and banks of waters, but not from floodplains) and cannot be the subject of a water maintenance plan at all.*

Critical comments were numerous, and the first PUW was subject to changes and clarifications according to the suggestions that resulted from the document's consultation. There have even been further versions of plans and further forecasts for some regions. The first documents were approved by ordinances of the individual Regional Water Management Board directors. The PUWs were to be in effect for six years. In the meantime, the Water Law has been amended, which indicated, among other things. The need to adopt new water maintenance plans by December 21, 2021. This did not happen because the Water Authority did not submit the projects to the governors for approval.

## Water maintenance plan - liberalization of records?

The law made modifications to the definition of maintenance of public waters and added a point to the old statutory wording regarding the possibility of carrying out maintenance activities also those not resulting from the plan, if they do not have a significant impact on the achievement of the environmental objectives referred to in Art. 56, Art. 57, Art. 59 and in Art. 61. The provision seems expedient in terms of the possibility of carrying out off-plan activities, because, after all, not everything can be predicted 6 years ahead. But note, for any such task,

it must be proven that it does not have a significant impact on the achievement of environmental goals.

In the current law, the provisions on the scopes for developing maintenance plans have remained almost unchanged from the first plans. According to Art. 227 of the Water Law, maintenance of surface water and maintenance activities, are carried out for a specific purpose, as indicated by the legislature. Thus, their conduct should be justified, preceded by a thorough analysis of needs, and then evaluated in terms of impact on the state and natural resources. The legislature only removed from the scope of the plan the action on repairing water facilities and replaced it with a provision on repairing or maintaining insurance within water facilities. This change will mean that the new plan will not include renovation activities dedicated to water facilities. It seems that the change is correct, since the renovation of the device to more specific to the construction law, not water law.

## Water maintenance plan - here and now

The tender sites of the Polish Water Authority have announced and awarded the tender for the construction of the PUW. The subject of the order is the development of drafts of eleven planning documents for the areas of operation of the Regional Water Management Boards, together with a strategic environmental impact assessment. The water maintenance plan was announced as a unified document for all regions - this is positive news. Negatively perceived is the short timeframe for the task, which may not be sufficient to produce 11 extensive documents with impact projections.

Environmental organizations are already looking at the new order. On the page of one of them you can read: *In our opinion, a naturalist who wants to know the threats to a river of interest should look at these lists as soon as possible and protest the intentions of harmful activities as soon as possible....*

# TALES - WATER AS ARCHE

*Posted on 29 February 2024 by Adam Kapler*

Sage Thales, when once a spectator of the agon, Thou, O Zeus-Helios, didst snatch from the stadium. That you took him closer, it must be appreciated, For in old age he could no longer see the stars from the ground (Diogenes Laertios).

**Categories:** Feedback, Issue 5/2024, Onet
**Tags:** evolution, Tales, water

*The sage Thales, when once a spectator of the agon,*
*Thou, O Zeus-Helios, didst snatch him from the stadium.*
*That Thou didst take him nearer, it must be appreciated,*
*For in old age he could no longer see the stars from the earth* (Diogenes Laertios).

The history of European philosophy and mathematics can be traced back to either Thales or Pythagoras . More important for readers of *Water Matters* will be Tales of Miletus (7th/VI century BC) as a thinker who sees water as a creative force and the pratfactor of the whole world.

## First Naturalist. Sage or philosopher?

The theory of evolution says that all living organisms are descended from one common ancestor. This rule applies not only to nature, but also to naturalists themselves. Modern astronomers, physicists, meteorologists or biologists are the intellectual heirs of Thales, who was the only one to figure in lists of both sages and philosophers. For the ancient Greeks, the terms were not synonymous. Both used reason, but only the former effectively solved the problems of their communities. Sages were called skillful politicians or miracle-workers, such as. Solon and Pittakos. Philosophers, on the other hand, selflessly pursued the truth, maintaining an admirable indifference to worldly matters, even the death of their own or their native children .

## From Thales to Voltaire

According to Farrington (1954), Tales initiated the materialist and atheist currents. His successors were not only the following *physiologists* from Miletus, but also:

- physicians of the Hippocratic school, who were the first to explain life and death by natural factors rather than by the intervention of spirits;
- Tukidides, who was the first historian to reject the direct intervention of supernatural forces in history, was critical of sources and reconstructed the past based on its material remains;
- Sophists teaching that states and laws are works of men, not gods, and are subject to criticism, and that breaking laws is not tarnishment.

Farrington saw Tales as a bourgeois philosopher, the ancient Greek equivalent of Voltaire and la Mettrie. The originality of the hypotheses was supposedly due to his experience as a merchant and traveler, well acquainted with the daily toil of sailors, artisans and farmers, and despised by Egyptian and Babylonian priests and the Greek landed aristocracy .

## From Thales to Muhammad

Witwicki, in his preface to Plato's *Feast* , noted Ionian's criticism. He has undermined not only faith in tradition-honored ancestral myths and rituals, but also in the testimony of the senses and the common sense of the average person. Thanks to this, atheistic and pantheistic doctrines found fertile ground for development, but also religions of a new type, mystery cults of the kind of Orphism, early Christianity, then Islam.

Tales was a deeply religious thinker. Cicero (1960) argued in his dialogue *On the Nature of the Gods* that Milesius asserts that *water is the principle of all things and that God is the Mind that formed and created all things from water*. According to 19th century commentators. the only original philosophical, rather than mythographic, contribution of Thales was to be his attempt to prove reasonably or empirically that water evaporates and solidifies, and without it everything languishes .

Closer to our time, Molinari (2022) claimed that Thales remained a worshipper of Achelojos, a deity of fresh, swift-flowing water, especially worshipped in Miletus. In myths and art, he was depicted as an immortal and shape-shifting being, able to become anything and anywhere. The rivers in the lands, worshipped as separate nymphs, were said to be *the tendons of Achelojos*. It is this omnipresence of supernatural forces that *is* reflected in Thales' cry that *everything is full of gods!* .

## Tales: forerunner of the open society

Popper (1999) considered Tales' most outstanding and groundbreaking achievement to be his creation of a new liberal school of thought, educating an open society. Thales was to be the first founder of a school raising independently thinking students, not blind followers like the priests of Babylon and Egypt. He was also to encourage them to critically dissect his theses, to find their own solutions, even if fundamentally contradictory to the master's words. Most of the sages of the Middle East took pride in their fidelity to the doctrine, meanwhile, successive generations of Ionians held views different from the master's on the primordium of being (arche).

Thales' disciple Anaximander (610-546 BC) considered the arche to be the infinite (apeiron). His disciples, in turn, assigned this role to air (Anaximenes). Other Ionians pointed to fire (Heraclitus), earth (Xenophanes), all four elements combined (Empedocles) and, finally, infinite germs (homojomerie; Anaxagoras). From there, it's only a step to the atomism of Leucippus and Democritus. Although Plato and Aristotle accepted the existence of five types of atoms (fire, air, water, earth and ether), for Plato the proper arche was the eternal, immaterial ideas, while for Stagyrates it was form and matter .

## Water as arche: creator and creature

The choice of water as the material of the world, rather than fire or earth, has been justified very differently. Most historians of philosophy today repeat the arguments of Aristotle and Theophrastus as those of Thales himself. In their opinion, he chose water because it brings life to everything. It also changes focus states easily. Some commentators are drawing lessons from their travels in Egypt. There Thales was able to observe the flooding of the Nile and the construction of the delta .

Water played a key role in many Middle Eastern theogonies, which are also its cosmologies. According to the Babylonians and Hebrews, the earth emerged from water chaos, and the creators of mankind had to fight Tiamat, a female sea monster. References to this vision of creation can be found in the Psalms, the books of Job or Isaiah, not to mention the apocrypha of Rev. Henoch. The recognition of water deities as creators of the rest of the world is also found in ancient Hellenistic religion. Jaeger (2001) in *Paideia* argued that there is no clear difference between the well-known myth of Okeanos from the *Iliad* and the teaching of Thales.

Nietzsche (1993) in his *Philosophy in the Tragic Age of the Greeks* defended Ionian natural philosophy against charges of infantilism and absurdity. Thales' idea was important for at least three reasons. First of all, he was the first to say something about the original origin of all things. Second, he did so in language devoid of fairy-tale imagery. And finally, it contained the germ of monistic thought: *everything around us, including ourselves, is a unity*.

## Tales still unknown

Although we learn about Tales in elementary school, we actually know very little about it. We are not even sure which claims are due to him. In continental Europe, the theorem called by his name is: *If the arms of a plane angle are intersected by two parallel lines, the segments determined by these lines on one arm of the angle are proportional to the corresponding segments on the other arm of the angle*, while in Anglo-Saxon countries it refers to the circle and its diameter: *the angle inscribed in the circle and based on its diameter is a right angle* .

Already the ancient Greeks had a strongly vague idea about the founder of one of the philosophies. They argued, for example, about his father's nationality. Tales almost certainly did not write down his own teachings. Everything we know about him comes from commentators and biographers several generations later . The short aphorisms of the Ionian *physiologists* were quoted by Aristotle in his *Metaphysics* and *Physics* , and later by his student Theophrastus in his *History of Philosophy*. Medieval Europe, on the other hand, learned about Thales from St. Augustine's *Rejection of All Heresies*. Hippolyte .

Both Stagirite and the Church Fathers were critical of the Ionian *physicists*. They did not strictly refer to their positions, but justified their own, carefully selecting quotations. Earlier generations of Greeks valued him more highly. Later cultures were also proud of him. For example, in the late 19th and early 20th centuries, he was seen as the first researcher of electricity, the lay patron of electricians and railroad workers.

A huge number of fragments of works attributed to the oldest thinkers, including the Ionian *physicists*, were collected by Diels and Kranz in their *Fragments of the Presocratics*. However, these remnants of scattered puzzles do not give us a picture of the whole. Therefore, one can still argue to what extent the Ionians and later the Hippocratics and Sophists explained nature to the Greeks. Have the basic elements - earth, water, air, fire, cosmic ether - become dead material for them? Did they remain in some sense alive and conscious, as their common name, the elements, suggests? For how many generations were they still gods, self-aware and indestructible, but also incalculable? Only their struggle would create harmony, the ancestor of the Stoics' cosmos and our ecological balance sung by Hesiod .

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# LAKE ROŻNOWSKIE - NO MAN'S WASTE

*Posted on 29 February 2024 by Ewa Gondek*

The beautiful Rożnowskie Lake, located in the Małopolska province, is starting to become popular again. Not only tourists, but also local residents would like to spend time pleasantly on its banks or doing water sports. The problem arises after heavy rains. The sight of garbage lying everywhere is not conducive to relaxation. For the benefit of all, it is necessary to remove them quickly. Just who should do it? And who should pay for it?

**Categories:** Feedback, Issue 5/2024, Onet

**Tags:** contaminants, Lake Rożnowskie, river pollution, waste

The beautiful Rożnowskie Lake, located in the Małopolska province, is starting to become popular again. Not only tourists, but also local residents would like to spend time pleasantly on its banks or doing water sports. The problem arises after heavy rains. The sight of garbage lying everywhere is not conducive to relaxation. For the benefit of all, it is necessary to remove them quickly. Just who should do it? And who should pay for it?

## Rożnowskie Lake - historical outline and location

*The central part of the Association of Municipalities of Lake Rożnowskie is a reservoir, flooded back during World War II. The immediate cause of the dam's construction was the numerous floods, especially the one in 1934. The construction of the reservoir was carried out as part of the Central Industrial District. The dam was erected between Ostra Gora and Laziska in Rożnovo. Construction began by the Poles in 1935, and was completed by the Germans in 1941. Complete filling took place two years later. The creation of the artificial lake has irreversibly affected the entire region.*

*The combination of the lagoon with its hilly surroundings, numerous forests and meadows, as well as the Dunajec Valley, stretching between the dams in Czchów and Rożnow, has given the area, a unique, tourist character. Lake Rożnowskie resembles the letter "S" in its shape. Walking along the right bank from the dam, we pass the villages of the Gródek nad Dunajcem municipality: Rożnów, Bartkowa-Posadowa, Gródek nad Dunajcem, Lipie, Sienna, Zbyszyce. The lake then borders Kurow (Chełmiec municipality). Here there is a bridge over the Dunajec River flowing from Nowy Sącz. The left bank of the lake is the villages of the Łososina Dolna municipality, in turn: Białawoda, Tęgoborze, Bilsko, Łososina Dolna, Rąbkowa, Znamirowice, Tabaszowa. At the height of Gródek nad Dunajcem on the lake there is a natural island called Grodzisko.* - Development Plan for the Rożnov reservoir for 2016-2020.

*pic. Catherine Biegun*

## Garbage troubles at Lake Roznowskie

Anyone who has come to Lake Rożnowskie at least once after heavy rainfall in the Dunajec catchment area, hoping to admire the sights and have a pleasant time, has seen a striking sight: in addition to the brown color of the agitated lake, a mass of waste of various types and origins floats or lingers on the shores, in coves and on the surface of the water. This demonstrates the consumer wealth and image poverty of users

of the Dunajec River and surrounding areas. Littering is anonymous, but indiscriminate. Currently, volunteers are dealing with the problem, but their efforts are insufficient. Top-down decisions are needed on who should collect and manage the waste, as well as finance the work.

## Legal division of responsibility for garbage in the municipality

Waste management is regulated by the provisions of the Law of September 13, 1996. On maintaining cleanliness and order in municipalities (i.e. OJ. of 2023. pos. 1469, 1852). According to Art. 3 paragraph. 1 of the aforementioned law, the municipality's own tasks include maintaining cleanliness and order in its territory. In addition, Art. 6r para. 2b of that law stipulates that from the fees collected for the management of municipal waste, the municipality may cover the costs of removing municipal waste from places not intended for its storage and disposal within the meaning of the Law of December 14, 2012. On waste (i.e., Journal of Laws 2023, item 1587).

For the time being, state authorities have no plans to introduce financial subsidies or create special funds for the removal of waste accumulated by natural forces from municipalities. It is up to the municipality, within its resources, to cover the cost of the cleanup, including the garbage that flows into it in a broad stream with the flow of water.

The Ministry of Environment and Climate, in its current legal state, does not have the capacity to provide systemic support to municipalities in cleaning up Lake Rozhnovskie. Guided by regulations, managers of administrative units must find a solution on their own. And it doesn't seem easy, since the problem is complex and affects more than one municipality.

Cleaning up what's backlogged is one thing, but it's also important to consider how to reduce the waste carried by the forces of nature. Virtually everyone bears the cost of the "garbage tax." The municipality provides waste collection and PSZOK (Selective Municipal Waste Collection Point), so logistically everything is organized as it should be. Nevertheless, Lake Rożnovskie experiences from time to time that some citizens are outside the waste management system and feed the waters and shores with garbage along with the tide. The problem is not only with this reservoir, but because this object is extremely close to me, I have trouble accepting that after heavy rains it presents an apocalyptic picture from the gospel of St. John.

## Local initiatives on litter at Lake Rożnovo

Every year, landowners, tenants, the municipality and volunteers set out to clean the lake and shores so as not to deter visitors, tourists and local residents. There are additional human and financial costs. For years, the topic of waste, some of which comes from the forces of nature (branches, sticks, leaves, roots, sometimes trees), has come up in deliberations, debates and even petitions. And just as I can understand to some extent the presence of natural garbage around the lake, I qualify plastic bottles, plastic bags or cans as a pathology of attitudes in the area of personal culture and environmental protection.

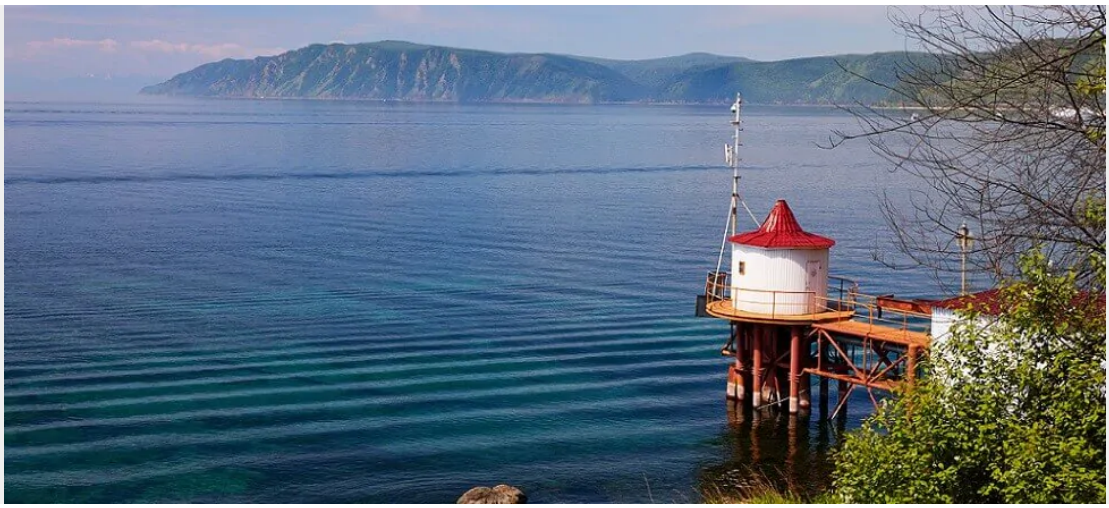
*First of all, you need to take care of order. Trash not only deters tourists, but also causes the residents themselves to have a bad opinion of the lake. What's needed is a thoughtful design that not only removes the waste that is currently piled up, but also allows for ongoing control of the problem. It is necessary to clearly define which legal entities are responsible for which areas - trash on shores, trash in the water, trash in forests and along roads. Once the lake is "cleaned up," you can get down to improving the broader tourist, recreational, leisure infrastructure.* - Development Plan for the Rożnov reservoir for 2016-2020.

In anticipation of a systemic solution for direct funding or the creation of a targeted fund for "no man's waste" I will rant a little - let the practice become the promotion of environmental awareness, and its determinant is respect for nature, adherence to the rules and prevention of threats. And as Lake Rożnowskie experiences a renaissance in popularity, let's give it a respite from direct contact with plastic, plastic bags, cans and bottles.

*Photo. main: Catherine Biegun*

# THE DEEPEST LAKES IN THE WORLD

*Posted on 29 February 2024 by Aneta Błędowska*



Among the extraordinary works of nature are the deepest lakes, which stand out for their exceptional diversity of flora and fauna. These lakes are habitats for many specific species, including endemic ones. They are also places attractive to tourists and conducive to recreation, beautiful and unique, and in an era of climate change there is a growing need to protect them. In this article we present the deepest lakes in the world along with some interesting facts about them.

**Categories:** From the world, Issue 5/2024, Onet
**Tags:** climate change, contaminants, deepest, lakes

Among the extraordinary works of nature are the deepest lakes, which stand out for their exceptional diversity of flora and fauna. These lakes are habitats for many specific species, including endemic ones. They are also places attractive to tourists and conducive to recreation, beautiful and unique, and in an era of climate change there is a growing need to protect them. In this article we present the deepest lakes in the world along with some interesting facts about them.

## 1. Lake Baikal, Russia (depth: 1,642 m)

Baikal is the deepest and oldest freshwater lake in the world, some 25 million years old. It is also the largest freshwater reservoir by volume. It is located in the mountainous region of Siberia. In 1996. It was inscribed on the UNESCO World Heritage List. The symbol of Baikal is the endemic nerpa, or Baikal seal. The lake is home to unique and special aquatic organisms, 70 percent of which are in the area. is not found anywhere else in the world.

pic. *Envato Elements/Viktelminova*

## 2. Lake Tanganyika, Africa (depth: 1,471 m)

It is the second deepest and longest freshwater lake in the world. It is part of the African Great Lakes complex and stores 15 percent of the Earth's freshwater resources. It is known as a place to source aquarium fish for export. Tanganyika is one of the richest freshwater ecosystems in the world, home to some 2,000. species of fish, plants, crustaceans and birds. About 500 species are found nowhere else, and 50 percent. Of these are fish of the*cichlid (Cichlidae*) clade.

## 3. the Caspian Sea, Russia, Kazakhstan, Turkmenistan, Iran and Azerbaijan (max. depth: 1,025 m)

The Caspian Sea, despite its name, is not a sea. Its huge surface area, depth and high salinity qualify it for this category, but due to its completely closed basin it falls into the category of lakes. It is located between Europe and Asia and is home to endemic species such as the

Caspian tern, Caspian turtle and Caspian seal. Currently, many species living in its area are threatened with extinction due to habitat destruction, pollution, overexploitation of water, or shrinking of the lake under climate change.

## 4. Lake Vostok, Antarctica (depth: 914 m)

Vostok is one of the subglacial lakes (subglacial lakes) of Antarctica. They were discovered in 1996. The ice layer covering it is 4 kilometers thick. According to some estimates, the cover has cut them off and isolated them from the outside world for 25 million years. This, in turn, meant that the gene pool of the microorganisms living there has not changed since the days when Antarctica was still covered with forest.

## 5. Lake O'Higgins-San Martin, Argentina, Chile (depth: 836 m)

Lake O'Higgins-San Martin is located on the territory of two countries: Argentina and Chile. It owes its distinctive blue-milky color to the surrounding mountains, from which the rock (stone) meal comes. It enters its waters with the melting glacier. The lake has a peculiar shape - eight arms spread out along the valleys, having national borders for nothing.

*pic. betoscopio/Wikipedia*

## 6. Lake Malawi, Africa (depth: 706 m)

Also known as Niassa and Nyasa, it is the second of Africa's Great Lakes. Malawi plays an important economic role - there are fishing villages along its shores, and its waters are home to the largest number of lake fish species in the world (90 percent. of these species are *cichlids Cichlidae*, including a cichlid with a unique appearance, called by natives as Mbuna). The lake is a popular place for kayaking, sailing or scuba diving. Malawi has been identified by the Living Lakes Network as endangered in 2022.

## 7. Lake Issyk-Kul, Kyrgyzstan (depth: 668 m)

Although its name literally translated from Kyrgyz means "warm lake," in January 2023. The air temperature over the water dropped to -30°C, causing the first-ever Issyk-Kul freeze. It is called the Pearl of Kyrgyzstan and is an IBA (Important Bird Area - areas recognized by Bird Life International as important for the conservation of bird populations). Issyk-Kul is the largest tourist resort in Central Asia - there are many resorts and sanatoriums around the lake.

## 8th Great Slave Lake, Canada (depth: 614 m)

The name of the lake refers to the tribe of "Slavey" Indians living in the area. Due to the low temperatures in the area, for about eight months of the year the lake is partially frozen, while in winter the ice layer is extremely thick - trucks with trailers can drive on it. However, climate change has led to earlier melting of the ice caps, making conditions for drivers dangerous and unpredictable. Great Slave Lake is also a stopover and habitat for many water birds.

## 9th Crater Lake, USA (depth: 592 m)

Crater Lake is located in the national park of the same name and is a popular destination for tourists. Its unique blue color comes directly from snow and rainfall - because the lake has no inlets or outlets, so no pollution carried by the current of rivers enters it. This translates into the exceptional purity of its waters and the associated high transparency.

*pic. Camerong1980~commonswiki/Wikipedia*

## World's deepest lakes threatened by climate change and more

The world's deepest lakes play a vital role in understanding the Earth's complex ecosystems and the evolution of life - their unique characteristics make them capable of serving as natural laboratories. Lakes are susceptible to worsening climate change, and this phenomenon is not bypassing the world's deepest ones either. Their fragile, mostly endemic ecosystems are threatened not only by the

changing climate, but also by encroaching alien and invasive species that can spread at an alarming rate.

The lakes are also threatened by pollution and excessive human use of their waters and shoreline areas, resulting in overfishing, deforestation and degradation of important habitats. Many of these lakes are covered by special programs and conservation initiatives, but in poorer countries the ability to implement them depends on external subsidies.

# AI TO GUARD MANATEES. REVOLUTION IN THE PROTECTION OF MARINE GIANTS

*Posted on 29 February 2024 by Iwona Szyprowska-Głodzik*

Manatees, once a common sight in waters around the globe, have become rare animals. Only four species of these herbivores have survived to this day, inhabiting mainly the warm waters of the tropics and subtropics. Their presence is noticeable in regions such as Florida, the Caribbean, the Amazon and the African coast. Natural conditions and the physical appearance of manatees make it difficult to monitor their populations. This is a challenge that researchers at Florida Atlantic University have taken on. They have developed a groundbreaking AI model that, using machine learning methods, is capable of identifying and counting individuals based on images obtained from CCTV cameras. This innovation offers new opportunities to protect these marine mammals through faster and more accurate population monitoring.

**Categories:** From the world, In this issue, Issue 5/2024, Onet
**Tags:** AI, climate change, endangered species, manatees, species protection

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## A few words about manatees

Manatees, also known as sea cows or, more jokingly, floating potatoes, are true masters of relaxation. These peaceful giants, floating lazily through warm tropical waters, attract attention with their unique appearance and gentle behavior. They can reach impressive sizes - the length of adult individuals often exceeds 3 meters, and the weight reaches up to 600 kg. This makes them one of the largest aquatic mammals.

Their diet consists mainly of aquatic plants, which makes them play a key role in maintaining the health of marine and river ecosystems. These aquatic mammals with impressive appetites feed mainly on seagrasses and can spend up to eight hours a day foraging for them. As natural *reapers*, they help control the growth of algae and other aquatic plants, ensuring the balance and health of the environments in which they live. Their presence helps keep the waters clean and clear.

Many dangers lurk for manatees. Collisions with boats, loss of natural habitat due to the development of human settlements and water pollution are the main reasons for the decline of these very important animals for ecosystems. Progressive climate change is increasing water temperatures, which could negatively affect the environments that are home to these gentle giants. As a result, manatees have been placed on the IUCN Red List as *vulnerable*. Their protection has become a priority for many organizations that seek to preserve their natural habitats and promote awareness of the threats that await them.

*pic. David Gross/Ocean Image Bank*

## Is counting necessary?

Counting manatees is essential to protect these marine mammals and the ecosystems in which they live. With data on their numbers, scientists can monitor the status of populations and implement effective conservation measures. To be able to accurately estimate the number of manatees, a team of researchers from the College of Engineering and Computer Science at Florida Atlantic University used innovative counting techniques. In the early stages of the project, the researchers tried to use images available on the Internet to train their model, but quickly realized that they needed more diverse data for greater effectiveness.

The ideal solution turned out to be the use of video footage from U.S. state parks, which provided images of manatees in a variety of situations - at different times of the year and from different perspectives. This allowed the model to be effectively trained to recognize dugongs in many environments and accurately count their populations, even from low-quality images.

This method also takes into account distortions due to the difference in perspective between the water environment and the image plane. Given that the shape of the manatee is more elliptical than circular, a method based on an anisotropic Gaussian kernel (AGK) was used to best represent the contour of the animal and estimate the population density in a given area. By approaching the counting of individuals as a machine learning task for density estimation using deep neural networks, it is possible to balance the data labeling effort with the efficiency of the process. In summary, this method offers a simple and effective solution for counting manatees that requires minimal data preparation effort.

## The future of manatee conservation with AI

Despite the promising results, the model still faces some limitations. The difficulty in distinguishing adults from juveniles or males from females is a challenge that the team plans to tackle in the next stages of the project. This gives the model a chance to become an even more effective tool.

An AI model for identifying manatees has the potential to make a significant contribution to the conservation of these endangered mammals. By enabling rapid and accurate estimates of manatee populations, it can support the planning of conservation efforts, the prevention of habitat loss, and the preparation of rules for boaters and divers. This minimizes the impact of our activities on these sensitive creatures, which is essential for their survival.

# AQUATIC PUBLICATION REVIEW (13)

*Posted on 29 February 2024 by Magdalena Skrzypek*

In the current review of aquatic literature from the past few days, we present the findings of a study on the impact of climate warming on fish habitat in Arctic lakes. We will also learn how climate change affects the distribution of antibiotic resistance genes in the river environment, and what a study of porpoises' responses to sound signals emitted by acoustic devices can say about environmental protection and public health. In turn, the results of studies by geologists from centers in Portugal and Germany prove that in a few tens of millions of years it will be possible for the Atlantic Ocean to close, preceded by the merging of the land masses of Europe and the Americas. Surprisingly, in the context of global warming and its generally adverse effects, one can find positives. They are ancient artifacts that appear as a result of melting glaciers, which are a valuable source of information about people who lived centuries ago. Finally, we will learn the results of an experiment conducted on inland silversides, which looked at the effects of pesticides on their behavior and reproduction. The surprising results of this study underscore the need to monitor chemicals in the environment to protect the health of populations not only of fish and aquatic organisms, but also of humans.

**Categories:** Issue 5/2024, Science
**Tags:** climate change, fish, global warming, lakes, literature review, review

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## 1. major changes in fish thermal habitat diversity in Canada's Arctic lakes due to climate change

Daniel P. Gillis, Charles K. Minns, Steven E. Campana, Brian J. Shuter. Major changes in fish thermal habitat diversity in Canada's Arctic lakes due to climate change. Communications Earth & Environ 5, 89 (2024).

A study by scientists from Canada and Iceland has shown that there have been significant recent changes in the thermal diversity of fish habitats in the former's Arctic lakes. The results of this study are important for understanding the impact of climate change on aquatic ecosystems and fish populations in the Arctic. Thermal changes in fish habitat can have far-reaching consequences for the entire lake ecosystem, underscoring the importance of further research on this issue.

The main conclusion from the results of the analysis is that the most significant factor disrupting the structure of fish communities is climate warming. The study used large-scale geospatial analysis of nearly 500,000. Canadian Arctic lakes of at least 10 hectares. Based on these, it can be concluded that the increase in maximum surface temperature, the extension of the ice-free period and the presence of thermal stratification have important consequences for the aquatic environment.

These changes may lead to the opening of lakes that were previously covered by deep winter ice, which will affect habitat diversity and the availability of warm and cool waters. The projected climate change requires adaptation of fishery management strategies to maintain the balance of aquatic ecosystems. Thermal changes in lakes can affect the distribution of fish species and other aquatic organisms, underscoring the need to monitor and protect the aquatic environment in the face of changing climatic conditions.

## 2. Contrary effects of increasing temperatures on the spread of antimicrobial resistance in river biofilms

Kenyum Bagra, David Kneis, Daniel Padfield, Edina Szekeres, Adela Teban-Man, Cristian Coman, Gargi Singh, Thomas U. Berendonk, Uli Klümper. Contrary effects of increasing temperatures on the spread of antimicrobial resistance in river biofilms. ASM Journals. mSphere (2024).

Riverine microbial communities serve an important function in counteracting the spread of antimicrobial resistance genes (ARGs) that enter environmental microbiomes through wastewater. Studies have shown that increasing temperature can affect the invasion dynamics of wastewater-transported resistance genes into river biofilms. Higher temperatures may promote an increase in naturally occurring resistance genes, while foreign ones may be lost under such conditions. Climate change, including, among other things. temperature increase, can therefore have a significant impact on the effectiveness of ARG invasion in the river environment.

Infections with antibiotic-resistant bacteria are a serious health problem, and the spread of ARGs is increasingly dangerous. Research suggests that climate change may be influencing this process by affecting river microbial communities. Higher temperatures may promote the spread of naturally occurring antimicrobial resistance genes, but at the same time may reduce the importance of foreign ARG invasion from wastewater. It is necessary to understand whether a river's ecosystem is more susceptible to naturally occurring ARGs or those from external sources. Further research on this issue is key to predicting the effects of climate change on public health and strategies to combat antibiotic resistance in bacteria.

## 3. Response of Harbor Porpoises to Pingers and Acoustic Harassment Devices

Julika Voß, Armin Rose, Vladislav Kosarev, Raúl Vílela. Ansgar Diederichs Response of Harbor Porpoises to Pingers and Acoustic Harassment Devices. In: Arthur N. Popper, Joseph Sisneros, Anthony D. Hawkins, Frank Thomsen. The Effects of Noise on Aquatic Life, Principles and Practical Considerations, p. 1-21, Springer, Cham (2023).

A study on the response of porpoises (Phocoena) to sound signals emitted by pingers and acoustic deterrent devices (AHDs) is important for understanding their effects on the behavior of these marine mammals. Porpoises are sensitive to sound, so the use of these devices in the environment can have a significant impact on their behavior and function. The results of such studies can help develop strategies to protect animals and minimize the negative effects of human activity.

Pingers and acoustic deterrent devices are used in various industries to protect marine mammals such as porpoises. Penguins emit acoustic signals with lower pressure levels and frequencies, which tends to make porpoises move closer to them. The selection of a suitable device should take into account not only cost and ease of installation, but also the desired range of acoustic signals and the minimization of areas exposed to sound. The selection of mitigation measures and regular monitoring should take into account animal habituation and the impact of signals on non-target species. Pingers and AHDs are effective tools for deterring porpoises from areas where they may be at risk of hearing damage or becoming entangled in fishing nets.

## 4. Atlantic Ocean Closing Soon: Formation of Atlantic Ring of Fire Draws Near as the Americas and Europe to Drift Back Together

João C. Duarte, Nicolas Riel, Filipe M. Rosas, Anton Popov, Christian Schuler, Boris J.P. Kaus. Gibraltar subduction zone is invading the Atlantic, Geology (2024).

Subduction initiation plays a key role in the Wilson cycle, which illustrates the consequences of tectonic processes leading to the formation, development and disappearance of the oceans. Subduction involves the overlap of one tectonic plate under another, leading to the recycling of oceanic (lithospheric) rock matter into the Earth's mantle. The formation of new subduction zones in the context of the Atlantic Ocean is challenging, as it requires external forces such as far-field compression and tectonic plate movements.

Although the only force that can initiate the formation of a subduction zone is another subduction zone (excluding meteorite impacts and supercrustal plumes), there are already two such sites in the Atlantic (in the Caribbean and the Scotia Arc near Antarctica) that have been pushed out of nearby Pacific subduction zones. Another point where the subduction zone from the Mediterranean Sea penetrates the Atlantic Ocean is the Arc of Gibraltar. Geodynamic studies suggest that subduction in this region may continue to be active and affect Earth's geological evolution by pulling the Atlantic oceanic plate underneath Africa and Europe, and this in turn will close the ocean.

However, before this happens, and before the land masses of the Americas and Europe reunite, *the Atlantic Ring of Fire*, also known as the Atlantic Subduction System, will form. This means that the surface where the Atlantic Ocean is located, as in the case of the *Pacific Ring of*

*Fire*, could become a region with active earthquakes and volcanic eruptions.

## 5. Archaeology on Ice, Featuring Dr. E. James Dixon, NOAA's Annual Greenhouse Gas Index (An Introduction)

Stephen A. Montzka. Archaeology on Ice, Featuring Dr. E. James Dixon, Tanana Chiefs Conference (2024). The NOAA Annual Greenhouse Gas Index (AGGI). NOAA Global Monitoring Laboratory Website (2022).

Climate change, which occurs due to heat trapping by greenhouse gases such as carbon dioxide, methane, ozone, nitrous oxide, can lead to an increase in the frequency and intensity of extreme events such as droughts, storms and heat waves. The aforementioned phenomena affect ecosystems, both terrestrial and aquatic. Global warming is causing glaciers to melt, sea levels to rise and oceans to acidify. While this has serious environmental consequences, there are positives to be found. Global warming, contributing to the rapid melting of glaciers, is resulting in, among other things. the emergence of artifacts that have been frozen for thousands of years.

Archaeological discoveries on glaciers and ice sheets in Europe, South America and Mongolia are becoming more common. In North America, important finds have been discovered, among others. In the Rocky Mountains, the Canadian Yukon and Alaska. Most of these artifacts are made of perishable materials such as wood, bark and leather, making them quickly decay once they are removed from the ice. Dating them not only provides information about the rate of ice melt, but also about the people who inhabited these areas thousands of years ago. Preserved artifacts, such as ancient arrows, hunting tools and clothing, provide a better understanding of the lives of people in glacial environments centuries ago. However, if they are not properly collected and preserved, they can be lost forever.

## 6. Multigenerational, Indirect Exposure to Pyrethroids Demonstrates Potential Compensatory Response and Reduced Toxicity at Higher Salinity in Estuarine Fish

Sara J. Hutton, Samreen Siddiqui, Emily I. Pedersen, Christopher Y. Markgraf, Amelie Segarra, Michelle L. Hladik, Richard E. Connon and Susanne M. Brander. Multigenerational, Indirect Exposure to Pyrethroids Demonstrates Potential Compensatory Response and Reduced Toxicity at Higher Salinity in Estuarine Fish, Environmental Science and Technology 58, 5, 2224-2235 (2024).

Estuarine environments play a key role for many fish species, often serving as breeding sites. Global climate change (GCC) is affecting sea level rise and precipitation characteristics, causing salinity levels in estuaries to fluctuate, which in turn affects the functioning of these ecosystems. In addition, increasing the intensity of insecticide use in agriculture may alter their toxicity to fish under different salinity conditions. This underscores the need to understand the impact of chemicals on aquatic ecosystems and to monitor the environment.

Researchers at Oregon State University conducted an experiment on inland silversides(*Menidia beryllina*) to study the effects of three pyrethroid pesticides on their behavior and reproduction. The study found that fish exposed to pesticides showed reduced behavioral activity at the larval stage, while the second generation, which was not affected by the chemicals, showed excessive arousal. The study suggests that exposure to pesticides in early life can affect fish over the long term, and similar effects may occur in humans. This is an important finding that underscores the need to regulate the use of chemicals in the environment to protect the health of fish populations and potentially humans.

# THE GLOBAL OCEAN GENOME. HOW MANY GENES ARE IN THE OCEAN?

*Posted on 29 February 2024 by Agnieszka Kolada*

Life originated in water, and this means that it has been evolving in the oceans for much longer than on land. This process has resulted in a huge variety of organisms, especially microorganisms such as bacteria and archaeons. Ocean microorganisms play key roles in the biochemical metabolism and energy processes that affect the state of the ocean and ultimately the Earth's climate. That's why learning about the diversity and understanding the functions of the organisms that populate the oceans is so crucial. Scientists used an advanced technique called metagenomics to examine the DNA of all organisms present in ocean water samples taken from different locations and depth zones of oceans around the world. On this basis, they created the so-called. The global ocean genome. It's a complete set of genes from all marine organisms - from bacteria and archaeons, to fungi and plants, to animals - along with the information those genes encode. It is the foundation of marine biodiversity, the functioning of these ecosystems and all biogeochemical processes in them.

**Categories:** In this issue, Issue 5/2024, Onet, Science
**Tags:** bacteria, DNA, genome, ocean

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## The long history of the evolution of life in the ocean

The ocean is the largest habitat in the world. It covers more than 70 percent. of the globe's surface and accumulates more than 1.3 billion $km^3$, or about 97 percent. Earth's total water resources. Also in the ocean the first forms of life on Earth originated and this took place about 3.9 billion years ago. The long evolutionary history of life in the oceans is illustrated by the fact that of the 34 known types of animals, only one (Onychophora claws), is found exclusively on land, while all the others have representatives also associated with the aquatic environment. Considering how long life has evolved in the ocean, it should come as no surprise that it is characterized by great biodiversity. Most of the organisms inhabiting it are still unexplored to us.

By far the most abundantly represented in the ocean are prokaryotes, that is, unicellular organisms without cell nuclei or specialized organelles, which include two groups: bacteria (bacteria proper, eubacteria) and archaeons. Although they have much in common, an important feature that distinguishes them is the presence of peptidoglycan (murein) in the cell wall of many bacteria, and its absence in archaeons. More than two million species of bacteria are estimated to live in the global ocean, but still little is known about them or other types of ocean microbes. These organisms are extremely difficult to study, and more than 99 percent of the of which have never been grown in a laboratory.

## The power of metagenomics, or the answer to the question of who lives in the ocean

One method of studying microorganisms is sequencing their DNA, which means reading the genomes (set of genes) of the organisms. For many years, the technique was an extremely time-consuming and error-prone process, with individual experiments only able to sequence short stretches of DNA chain. For example, it took 13 years (1990-2003) for scientists from 20 institutions around the world to sequence the human genome as part of the international Human Genome Project, and the work was not finally completed until 2021.

Amazing technical advances in DNA sequencing have not only made it faster, easier and cheaper to read the entire genome, but they have also enabled the rapid development of a field called metagenomics. This is a study of the collective genetic information of all organisms contained in a sample from the environment, such as water or soil. This information tells what types of organisms are present and what ecological functions they perform in the studied habitats.

The first ocean metagenomic survey was conducted in 2003-2004 as part of the Sorcerer II Global Ocean Sampling Expedition. The marine plankton community was then analyzed. Other expeditions have taken place over the past 10 years, including the TARA ocean expedition,

which, between 2009 and 2013, collected more than 200 samples from 68 sites, mostly in the upper, epipelagic, part of the ocean. Metagenomic analysis identified 33.3 million genes (for comparison, the human genome contains 30,000).

## The global ocean genome, or how many genes the ocean holds

If you can sequence the DNA of a piece of ocean, why not try to do it for the whole? The initiative to create a complete "catalog" of the global ocean genome, dubbed KMAP Global Ocean Gene Catalog 1.0, was undertaken by researchers at King Abdullah University of Science and Technology (KAUST) in Saudi Arabia, and they published their results in January of this year on *Frontiers in Science* .

Using the European Nucleotide Archive's(ENA) genetic data repository, they collected metagenomic data from more than 2,000. samples taken as part of earlier studies. Most of them came from the Pacific (41 percent) and Atlantic (28 percent), with others from the Indian Ocean, Mediterranean, Arctic and Southern Oceans. The vast majority of samples (78.5 percent) were taken from the upper zone of the ocean (depths up to 200 m), while the rest were taken from the mesopelagic zone (depths of 200-1000 m), the dark ocean (below 1000 m), and (about 4 percent) from the sediments of the benthic zone, or bottom. By sequencing the full DNA in each sample and identifying individual genes, the researchers identified more than 300 million gene clusters (groups of genes with similar function, encoding closely related proteins) present in the ocean's metagenomes.

The final step was to determine what the genes were responsible for and what organism they came from. This is done by comparing the identified gene sequences and the proteins they encode with existing databases (gene repositories). Researchers were able to identify 52 percent of. of them, which is a very good result, but still means that almost half are still unknown to science.

## The main inhabitants of the ocean are bacteria

If anyone thinks that the main inhabitants of the oceans are fish, they are mistaken. By analyzing those gene clusters that could be linked to a specific type of organism and for which functional information was available, the researchers found that more than 78 percent of the genes in all analyzed samples belonged to bacteria, 12 percent. to eukaryotes (organisms whose cells contain a cellular nucleus with chromosomes - animals, plants and fungi), and the remaining 10 percent. To archeons and viruses.

However, the genes of these four main types of oceanic organisms are not evenly distributed across all ocean depth zones, although bacteria were dominant in all (accounting for 77 to 88 percent). For example, genes of eukaryotic organisms and viruses were more often identified in the epipelagic zone (upper layers of the ocean) than in the deep, dark ocean, and the opposite was true for archaeons. This is not surprising, since conditions in different depth zones vary (especially in terms of temperature and access to light), creating ecological niches for different types of organisms.

Interestingly, in the mesopelagic zone, more than half of the identified eukaryote gene groups were fungi, suggesting that these organisms play a more important role in oceanic processes than previously thought.

## Microbial metabolism can affect Earth's climate

The researchers also looked in detail at genes related to microbial metabolism, which keeps the oceans healthy by controlling the flow of nutrients and energy. Some of these processes are essential for the cycling of elements such as carbon, nitrogen and sulfur, and thus can affect the Earth's climate. Half of all metabolism-related genes were involved in the processing of carbon compounds, viz. Carbon dioxide ($_{CO_2}$) or methane ($_{CH_4}$), as energy sources. Both gases are classified as greenhouse gases and contribute to global warming.

As in the case of taxonomic variability, a large variation was found between ocean depth zones. More than 40 percent. described clusters of genes found in samples from the bottom (benthic) zone were involved in metabolic processes, while in the pelagic zone such clusters were only 25 percent.

Some bacteria and algae use photosynthesis to convert$_{CO_2}$ into carbohydrates in the presence of sunlight, thus absorbing$_{CO_2}$ from the atmosphere. But photosynthesis is not the only pathway that ocean organisms use to metabolize carbon. In addition, methane metabolization pathways do not require light and can occur in ocean depths and bottom zones. The large proportion of gene clusters involved in methane metabolism in the bottom zone testifies to the great importance of this poorly understood area of the ocean for the carbon cycle in nature.

## Why do we need an ocean gene catalog?

The KMAP 1.0 ocean gene catalog consists of about 163 million annotated clusters, providing information on the types of organisms that live at different ocean depths and the functions they perform. The global ocean genome is much more than a simple catalog of the organisms living there and their functions. It also has important applications in various fields of research and industry.

The catalog contains information about protein-coding genes that can be useful in drug development, agriculture and other industries. It also contributes to a better understanding of ocean biodiversity, enhances knowledge of the locations of various microorganisms and their role in biogeochemical processes that shape the state of ecosystems and are relevant to climate change. It allows tracking the impact of human activities on marine life. It can serve as a reference for monitoring the effects of global warming, pollution and other anthropogenic changes in the marine environment. Finally, it can be used to set directions for future research, to formulate research theses on specific habitats, groups of organisms or other areas of marine biology.

## Next steps in building the global ocean genome

The authors of the cited studies point to several areas that require further work to more fully identify the global ocean genome. One of the priorities is to increase the number of samples from deep-sea zones and the ocean floor, which are highly diverse and poorly explored environments, and are likely to hide many yet undiscovered genes and functions. Another important task is to extend the analysis to viral RNA.

The authors also cite several technological challenges, including the need to increase the computing power needed to analyze metagenomes as new genes are added to existing repositories and to improve techniques for identifying them. This can help to classify 48 percent of. gene clusters that the authors failed to characterize, as well as in the metagenome sequence, where no genes were identified.

The global ocean genome, even after the sequencing work is completed, will require regular updates as the ocean is constantly changing. This means that ongoing scientific cooperation on a global scale is needed to fully understand, monitor and exploit the complexity of its biodiversity.

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In the article, I used, among others. From the works:

Laiolo E., Alam I., Uludag M., Jamil T., Agusti S., Gojobori T. et. al. al. (2024). Metagenomic probing toward an atlas of the taxonomic and metabolic foundations of the global ocean genome. *Front. Sci.* 1:1038696. doi: 10.3389/fsci.2023.1038696

Laiolo E., Alam I., Uludag M., Jamil T., Agusti S., Gojobori T. et al. (2024) The Global Ocean Genome: A "Catalog" of Ocean Life. *Front. Young Minds*. 12:1052361. doi: 10.3389/frym.2023.1052361

# THE BUTTERFLY EFFECT: OR WHY THE WEATHER FORECAST GOES WRONG

*Posted on 29 February 2024 by Katarzyna Stefaniuk*

Weather forecasts on popular websites are increasingly covering the next week or two. You can even find models predicting temperature, precipitation and cloud cover for months ahead. Every now and then, eye-catching headlines pop up in the newspapers about a sudden frost coming from the east, heavy snowfall for the holidays, a heat wave that will hit us as early as March or some other extreme weather that is expected to hit us in two weeks. Another time, we leave the house in the morning armed with an umbrella, because on the radio they were talking about fleeting rainfall, and throughout the day not a single drop fell on us. So what about the reliability of such predictions? And if they don't work, why?

**Categories:** Issue 5/2024, Onet, Science
**Tags:** butterfly, hurricane, weather, weather forecast

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## Why the weather forecast doesn't work

Forecasts with forecasts, and then (which we can no longer find information about in the media) it turns out that the world has not been covered with ice, snow in the mountains is still scarce, and nature has not exploded with greenery after the sudden arrival of spring. And even the inquisitive, reviewing later the numerical models cited by the authors of the weather sensations, look in vain for confirmation of their predictions. It turns out that a butterfly is the "culprit" of it all, which, with the flutter of its wings, introduces a tiny change into the dynamic system that is the Earth's atmosphere, and with it triggers a tornado on the other side of the world.

## How a butterfly triggers a hurricane

Of course, the butterfly story is figurative, but this colloquial comparison illustrates two things. The first says that introducing even a small initial change to the system can cause large discrepancies at the end. And the second is a reference to the shape of the butterfly wing-like graph that Edward Lorenz obtained when simulating a weather model. This prominent American mathematician and meteorologist, whose research created the first computer models of the weather, tried to forecast it several days ahead. He developed the following in the 1960s. In the 1970s. A set of more than a dozen nonlinear differential equations that describe the relationship between temperature, pressure or wind speed.

He believed, as did most scientists at the time, that accurate input data on the state of the atmosphere would yield accurate output data, i.e. a weather forecast. However, when he entered the two input numbers into the computer with different accuracy, he got results that were increasingly different as the simulated time went on, despite the small difference in the initial values. Such sensitivity of an equation or system of equations to a small perturbation of the initial parameters was called the butterfly effect by Lorenz in a scientific article. This phenomenon was later referred to as deterministic chaos.

In the context of weather forecasting, the butterfly effect is of great importance because the atmospheric system is a dynamic and complex system in which even the smallest changes affect the whole. Minor differences in temperature, humidity or wind speed at one end of the world can affect weather conditions elsewhere. These parameters theoretically combine to form a cause-and-effect relationship, but one so distant and complex that it remains impossible to predict and capture in weather models.

In addition, it is not possible to enter a dataset at the beginning of the simulation that will describe all the initial parameters of the atmospheric state in a sufficiently accurate way. There may also be unexpected changes not included in the global model (such as tree cutting, change in shading by skyscraper construction or aircraft overflight) that will lead locally to cloud development, temperature change and *de facto* different weather than forecast.

So, as you can see, the slightest deviation in the initial values results in a very rapidly increasing deviation in the final results - the long-term weather forecast. This is still the case, despite the fact that specialists in numerical forecasting have more and more accurate and complete data on the state of the atmosphere. Today, weather models assimilate data from satellite imagery, radar, lightning detection systems, and

even those collected on research vessels or passenger aircraft, in addition to data from ground measurements. However, the sensitivity of a system such as the atmosphere, the multitude of processes in it and the influence of the substrate on it result in the fact that an accurate weather forecast can only cover the next 2-4 days.

Accurate weather forecasting over the long term is unpredictable. In individual recalculations of the numerical model, based on new initial conditions every few hours, there may be results suggesting a weather collapse, which will certainly be picked up and described by numerous media outlets. However, this abrupt change may not be there in the next forecast. An additional factor contributing to the poor verifiability of the forecasts are local conditions that are not taken into account with sufficient accuracy, which can affect, for example, the variation in precipitation occurrence over a small area.

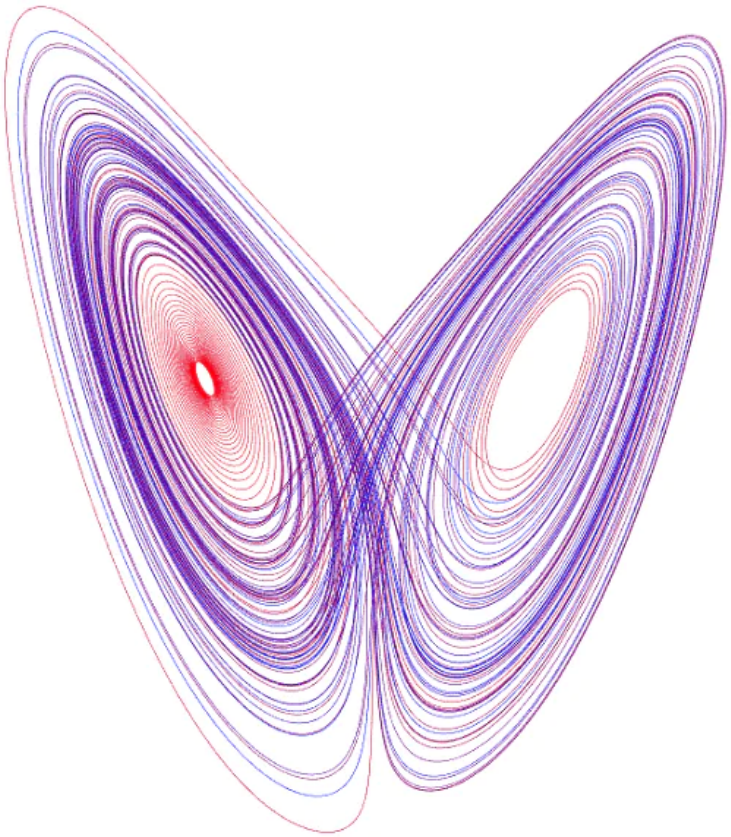

*fig. 1. Lorenza butterfly*

*Source: Dschwen /Wikimedia*

## What instead - probabilistic and synoptic forecasting

So can't we really determine, even if only in a simplified way, the weather over a time horizon of a few or several days or for an exact location taking into account local conditions? In part, we can. Today, an increasing number of global medium-term numerical weather models are based on a bundle forecast, which at one time generates dozens of forecasts with slightly altered initial conditions. The magnitude of the differences increases over time in the individual results of the beam let go. This allows you to determine the point up to which the forecasts in the bundle are consistent and reliable with each other. This extends the forecast accuracy period to 5-7 days. In this way, we can predict most of the meteorological parameters that are relevant to the standard viewer, such as temperature, cloud cover, precipitation, wind speed and pressure distribution.

If we need a forecast beyond the range of a few days, such as monthly or seasonal, it is worth turning to probabilistic models. They illustrate, usually in the form of maps for the country, whether a particular meteorological parameter will be below, even or above the multi-year norm.

They are generally developed for basic meteorological parameters such as temperature and precipitation on a decadal, monthly or seasonal basis. Long-term models, due to the complexity of the calculations and the continuous development phase, are generally created at meteorological and research institutes.

For consumers expecting a weather forecast for the here and now, covering a wide range of meteorological parameters, several hours or 1-2 days at most and taking into account local conditions, forecasts developed by synoptics or nowcasting models will be important. Synopticians, with a wide range of meteorological data, knowledge of the specifics of the covered area, and based on calculations and comparison of model results, can create forecasts with high verifiability and tailored to audiences concerned with ensuring the safety of the population, ships or aviation.

You can also turn to the nowcasting models available on some platforms, which forecast weather over a time horizon of up to 6 hours. They use precise calculations of the movement and evolution of meteorological phenomena and parameters that determine the current state of the atmosphere, making it possible, for example, to Tracking the movement and development of individual storm cells. They make it possible to determine the weather with great precision and taking into account local conditions.

As you can see, products created by synoptics or nowcasting models, due to the short horizon of forecasts and their constant updating, resist the butterfly effect. On the other hand, if we want to reach into the more distant future with a forecast, we have to expect less accuracy.

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In the article, I used, among others. From the works:


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