Plant filter islands II: final report

2025

Socio-educational project: **Plant filter islands II**

Social mobilization for the cleaning of water reservoirs located in rural areas

Funding

GlobalGiving

Implementation

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Participants

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Szkoła Podstawowa im. Wandy Chotomskiej w Kiełczowie

Szkoła Podstawowa im. Marii Skłodowskiej - Curie w Wilczycach

Szkoła Podstawowa im. Jana Pawła II w Długołęce

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H2O SCITECH – WATER INSTITUTE

The H2O SCITECH foundation was established in 2019 in Wrocław. The aim of the Foundation is to independently and continuously conduct basic research, industrial research, and experimental development work, as well as to widely disseminate the results of such activities through teaching, publication, and knowledge transfer. The mission of the Foundation is education and the popularization of science among children, young people, and adults, with a focus on caring for the planet's water resources. The Foundation concentrates on scientific research and the development of new water filtration technologies.

Plant filter islands II

Plant-based filtration islands are a natural method of water purification. The island consists of carefully selected filtering plants, mounted on a buoyant raft. These filtration islands act as phytoremediators, "extracting" pollutants from the water, which become trapped in the plant tissues. In rural areas, on rivers and water reservoirs surrounded by farmland, they can provide an excellent way to monitor and clean water from agricultural pollutants, including artificial fertilizers.

The aim of the project is to mobilize local communities, non-governmental organizations, and companies to engage in environmental protection, in particular to encourage residents of rural areas and small towns to take actions that improve the condition of water. The project is an example of a grassroots initiative that demonstrates integration and equality across communities and generations in addressing the problem of water pollution in the Lower Silesia region of Poland.

Plant filter islands II: final report

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Content

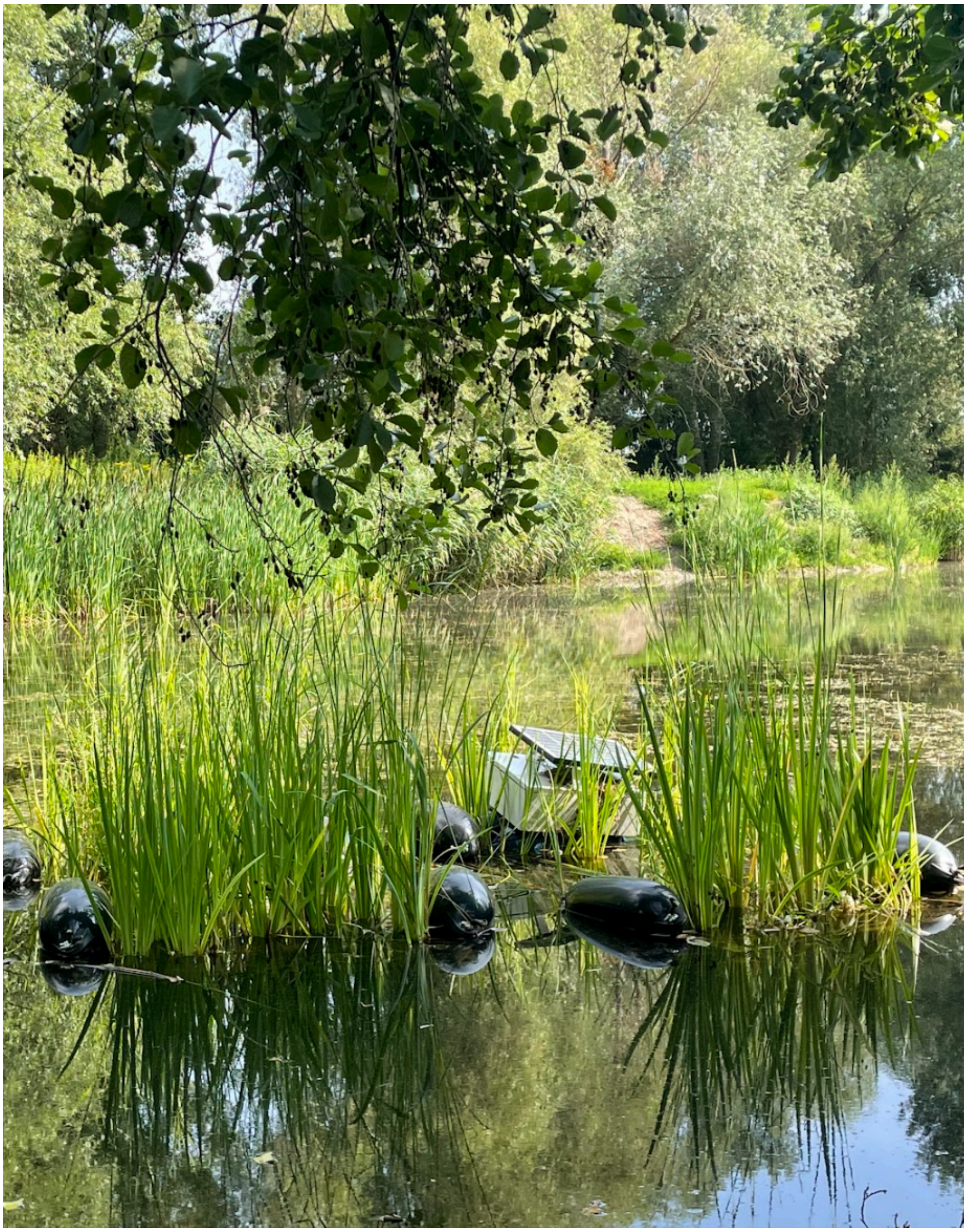
Fig. 1. Launched plant filter islands (source: H2O SCITECH)

In short

ASSUMPTIONS

Plant-based filtration islands are designed to purify water from excess nutrients and provide additional habitats for numerous aquatic and terrestrial organisms. The construction, launching, and monitoring of the islands can serve as an educational activity for primary and secondary school students, teaching them about water pollution in agricultural environments and selected methods of counteracting the phenomenon.

RESULTS

Workshop participants did not report difficulties in carrying out the planned tasks, and during subsequent meetings they demonstrated increasing knowledge of the issues discussed and the solutions being developed. The filtration islands maintained buoyancy throughout the entire growing season and supported the development of selected plant species. Plant growth was moderately intensive, due to the relatively low content of nutrients in the water and slight shading of the launch site. After harvesting, the islands could be relaunched in another location.

LESSONS

In phase II, previously developed designs and acquired experience were used to improve the island platforms and expand the scope of tasks carried out by project participants, while providing support and fostering feedback collection, ingenuity, and creativity. Inflatable buoys proved to be an effective reusable solution that prevented the islands from losing buoyancy. In cleaner water bodies, the islands became an element of the ecosystem, supporting balance and offering an additional habitat for aquatic organisms and birds. Combined with sensor equipment, the islands serve as a simple tool for monitoring and maintaining water quality.

Introduction

Water contamination issue

Watercourses and reservoirs located in the vicinity of agricultural areas are particularly vulnerable to pollution by biogenic substances, the excessive concentrations of which in water can trigger algal blooms – a phenomenon that threatens sensitive organisms and ecosystem balance[1].

Biogenic substances – compounds that cause the eutrophication of surface waters and contribute to the excessive growth of invasive organisms (including phytoplankton)[2].

The most problematic biogenic substances include nitrogen and phosphorus compounds. Nitrates and phosphates, as substances contributing to eutrophication, are listed in Annex VIII to the *Water Framework Directive*, which defines the most significant water pollutants[3].

It is estimated that while in developing countries water pollution results from improper management of domestic wastewater, in highly developed countries the majority of pollutants are leached from agricultural areas[4].

[1] E. Nachlik i in., *Zarządzanie wodą w sytuacjach kryzysowych*, Fundacja Gospodarki i Administracji Publicznej 2023, s. 10-11.

[2] E. Jachniak, *Związki biogenne, a proces eutrofizacji wód Goczałkowickiego Zbiornika Wodnego*, „Infrastruktura i Ekologia Terenów Wiejskich" nr 3(3)/2013, s. 33-34.

[3] *Dyrektywa 2000/60/WE Parlamentu Europejskiego i Rady z dnia 23 października 2000 r. ustanawiająca ramy wspólnotowego działania w dziedzinie polityki wodnej*, s. 342.

[4] *The United Nations world water development report 2024: water for prosperity and peace*, UNESCO 2024, s. 1.

The reduction of biogenic pollution involves, among other measures, capturing excess nitrates and phosphates that enter water from agricultural fields. Nature-based solutions, which use the capacity of natural elements to restore and maintain balance in the environment, are gaining increasing popularity. These include, among others, constructed wetlands and vegetative buffer strips[5].

Plant filter islands

A nature-based solution also includes plant-based filtration islands, most commonly referred to in English-language publications as *floating treatment wetlands*. In this case, the phytoremediation abilities of aquatic and wetland plants are utilized. These plants grow within the structure of a raft floating on the water surface. Their exposed roots are submerged in the water column, from which they directly absorb nutrients and pollutants, incorporating them into their biomass, which can later be easily removed from the reservoir or watercourse[6].

Phytoremediation – the use of plants, selected for their ability to absorb, degrade, or immobilize specific undesirable substances, to clean the environment[7].

Phytoremediants used to populate filtration islands can absorb from the water not only biogenic substances but also heavy

[5] A. Rizzo i in., *Nature-based solutions for nutrient pollution control in European agricultural regions: a literature review*, „Ecological Engineering" nr 186/2023, s. 1-2.

[6] H. Keizer-Vlek i in., *The contribution of plant uptake to nutrient removal by floating treatment wetlands*, „Ecological Engineering" nr 73/2014, s. 684-685. No

[7] M. Siwek, *Biologiczne metody oczyszczania środowiska – fitoremediacja*, „Wiadomości Botaniczne" nr 52(1/2)/2008, s. 23-26.

metals[8], which pose an equally significant problem, especially in rivers with long stretches running through industrial and urbanized areas[9].

The advantages of plant-based filtration islands include their applicability in locations with fluctuating water levels, as well as the low labor requirements for construction and maintenance. The islands also provide additional benefits by enhancing biodiversity and increasing the number of habitats in anthropogenic ecosystems[10].

The ease of construction combined with clear effectiveness makes plant-based filtration islands the core of projects with varying purposes and scales. Islands placed in wastewater reservoirs can significantly improve water quality and allow for its reuse in agriculture. Meanwhile, small structures made from recycled materials find applications in gardens and individual households[11].

In the project presented in this report, plant-based filtration islands – along with the very process of their construction, monitoring, and analysis of their potential – were used to promote knowledge about natural ecological engineering solutions among the local community.

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[8] R. Sharma i in., *Application of floating treatment wetlands for stormwater runoff: a critical review of the recent developments with emphasis on heavy metals and nutrient removal*, „Science of the Total Environment" nr 777/2021, s. 8-10.

[9] D. Ciszewski, *Wpływ regulacji koryta Odry na akumulację osadów zanieczyszczonych metalami ciężkimi: zróżnicowanie, zmiany w czasie, zagrożenie środowiskowe*, „Studia Naturae" nr 52/2006, s. 5.

[10] H. Keizer-Vlek i in., *op cit.*, s. 684.

[11] A. Kietla i in., *Pływające wyspy*, Łódź Art Center, s. 1-35.

The need for education in ecology

As research and reports indicate, environmental education is still very much needed, as the ecological awareness of Poles remains low, and the importance and impact of knowledge and community activity on the environment are often underestimated**.**

83% consider climate change to be an important issue (−8 pp compared to 2022); the most frequently cited environmental problems in Poland are: air pollution (57%), noise (43%), and water pollution (43%); "climate change" is indicated by 18% (−8 pp). The main sources of information identified by respondents are the internet and television, while the factors shaping attitudes are individual actions (41%) and schools (38%)[12].

Unfortunately, mobilization for environmental activities is decreasing – only 5% declare readiness for active involvement (down from 13% previously), and support for systemic climate restrictions has dropped to 46% (−7 pp compared to 2022)[13].

Similar conclusions appeared in a 2021 study entitled *The Greatest Challenges for Poland and Environmental Issues*. Respondents, when asked to indicate three areas in which our country faces the most problems to be solved, most often pointed to environmental protection – chosen by 52% of Poland's inhabitants. According to the respondents, the most serious environmental problems are air pollution (59%), waste management (50%), and water pollution/water-related issues (34%). The most frequently cited reason for protecting the environment is concern for future generations. Nearly three-quarters of those surveyed (73%) chose this reason, making

[12] *Raport rządowy: badanie świadomości i zachowań ekologicznych mieszkańców Polski,* Ministerstwo Klimatu i Środowiska/Indicator 2024.

[13] *Ziemianie atakują*, Lata Dwudzieste i Kantar 2024, <https://ziemianieatakuja.pl/> (Dostęp: 26.09.2025).

it the highest score across all editions of the study. The second most common reason, with 63%, was care for human health. Nature as a value in itself was selected by almost half of respondents (49%). One in ten respondents pointed to savings and economic considerations. In the opinion of those surveyed, the state of the environment depends primarily on the activity of each of us (69%). The most popular sources of information about the natural environment are the internet (72%), television (65%), and the press (27%)[14].

Differences in the approach to environmental protection and in perceiving nature as an integral part of society result from various conditions. Here, a division can be made into two groups: well-educated, affluent residents of large cities who show sensitivity and interest in ecological issues, and another group comprising older and poorer people, residents of rural areas, who are much less represented among pro-environmental supporters. The socio-professional structure of rural inhabitants is highly diverse. Therefore, a strong correlation can be expected between the direction and level of education, age, as well as sources and amount of income, and people's attitudes and behaviors toward nature. Currently, fewer and fewer rural residents are engaged in agricultural production, and this activity – thanks to the achievements of science and technology – can, in the absence of knowledge and professional ethics, cause much more environmental damage than in the past[15].

"Awareness of the material value of a farm is today decidedly not enough. It is also important to recognize other qualities that

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[14] A. Wojnarowicz*, Badania świadomości i zachowań ekologicznych mieszkańców Polski*, EKOMAIKA Ekologiczna Agencja Informacyjna 2021, <https://ekomaika.pl/raport-2020-badania-swiadomosci-i-zachowan-ekologicznych-mieszkancow-polski/> (Dostęp: 26.09.2025).

[15] B. Perepeczko, *Postawy i oczekiwania proekologiczne mieszkańców wsi obszarów chronionych*, „Wieś i rolnictwo" nr 1(146)/2010, s.157-158.

cannot be directly measured in monetary terms, such as the beauty of the landscape and the diversity of its elements, cleanliness and ecological safety, and finally the scent of the soil and the plants cultivated upon it. (…) Agriculture is a sector of the economy that is entirely dependent on the natural environment and at the same time significantly transforms it. Constant efforts are being made to find ways to reduce the degrading impact of this branch of the economy on nature. Pro-ecological directions of rural development are also supported by the European Union. The Rural Development Plan emphasizes the dissemination of the principles of Good Agricultural Practice. This means compliance with standards relating to the rational management of fertilizers, the protection of waters, soils, valuable habitats and species present in agricultural areas. It highlights the need to protect the landscape as well as to maintain cleanliness and order on the farm. The minimum requirements set out in the plan differ among EU countries, depending on the degree to which their agriculture is adapted to environmental protection requirements and on the level of ecological awareness among rural inhabitants. (…) Environmental education of rural residents is carried out by landscape parks, which, in their own publications or on their websites, can provide information and articles shaping general ecological awareness. It is worth recalling that landscape parks are one of the three forms provided for in Polish nature conservation law that implement protection under production conditions, guided by the constitutional principle of sustainable development"[16].

However, this is far from sufficient, because as shown by the educational activities of the Institute of Water carried out in rural

[16] R. Stoczkowska i in., *Kształtowanie świadomości ekologicznej mieszkańców wsi poprzez działalność informacyjną lokalnych władz i instytucji*, „Studia Ecologiae et Bioethicae" nr 5/2027, s. 1-6.

areas, the ecological knowledge and awareness of rural residents – both those from farming families and newcomers from cities – remain inadequate. In theory, they know about the impact of pollution on the environment and health, yet they lack sufficient understanding of the interrelations and effects of agricultural activity on nature. They are unfamiliar with the principles of daily life in close proximity to the natural environment and of living in harmony with nature. The "tidying up" of natural vegetation, altering region-specific ecosystems, and the extensive use of plant protection agents, insecticides, and fertilizers degrade rural areas and adversely transform the existing ecosystem. This is why continuous and consistent environmental education campaigns and programs are so urgently needed, conducted by non-governmental organizations in cooperation with local municipal and village authorities and local communities, to expand knowledge and indicate practical directions for development for the benefit of residents and their surrounding environment.

Concept

Plant-based filtration islands consist of several main elements that determine their properties and effectiveness:

- raft – a platform floating on the water surface, creating space for plant growth;
- plants – aquatic or wetland species well adapted to the conditions of the selected reservoir or watercourse and characterized by the ability to accumulate pollutants;
- substrate – a small amount of organic material that allows plants to take root;
- fastening elements – enabling safe anchoring of the islands in a chosen location and their modular connection.

When designing the islands, it was assumed that the raft should be made to the greatest possible extent from biodegradable materials, while maintaining buoyancy with the help of a minimal number of additional floats. Its dimensions should allow for easy manual transport. The materials used must be durable enough to prevent the island from disintegrating before the end of the growing season.

The main part of the raft was made of willow fascine, which has a low density when dry. The structure was joined using alder beams, a species known for its high durability when fully submerged in water.

It was decided to use more than one plant species for planting in order to maintain diversity and enhance the visual attractiveness of the installation. Plant species were selected based on the experience gained in the previous edition of the project. The most effective for water purification include:

- Yellow iris (*Iris pseudacorus*),
- Narrowleaf cattail (*Typha angustifolia*),
- Sweet flag (*Acorus calamus*),
- Common reed (*Phragmites australis*).

For planting, coconut fiber substrate was chosen, as it does not contain mineral fertilizers and at the same time represents a more sustainable alternative to deacidified peat.

To prevent the rafts from sinking after the fascine absorbed water, elongated inflatable boat fenders were used. One fender was placed along each of two opposite edges of every raft, as shown in the photo below:

Fig. 2. Finished raft construction with two buoys (source: H2O SCITECH)

Implementation

Highlighting the problem

MARCH/APRIL

Before the actual construction of the filtration islands, a series of workshops was conducted under the title *The Lake is Not a Garden; Why are Algal Blooms Dangerous?*. The aim of the workshops was to familiarize participants—through simple laboratory experiments—with the causes of water pollution by biogenic substances that trigger algal blooms. Understanding the processes leading to the problem is essential for grasping the principles behind the proposed solution. The workshops were held in 5 primary schools and 1 secondary school in rural municipalities, with the participation of local community teachers.

Fig. 3. Participants learning the experiments (source: H2O SCITECH)

Building the rafts

BEGINNING OF APRIL

Twelve rafts were built during three workshop sessions held on April 9–11 in a workshop space provided by 3M.

The workshop participants, equipped with the necessary materials and tools, constructed the rafts according to the instructions and guidance of the facilitators.

Fig. 4. Preparation of willow fascine (source: H2O SCITECH)

Although the teams were mostly composed of early primary school students, completing the tasks and building the proposed structures did not pose significant difficulties.

Fig. 5. Rafts built during the workshops (source: H2O SCITECH)

One of the rafts was equipped with a device powered by a battery charged via a photovoltaic panel, fitted with probes for continuous measurement of water temperature, pH, and electrical conductivity.

After the workshop series was completed, the finished rafts were transported to the vicinity of their designated launch site (indicated in fig. 1 and 2) – a large pond belonging to the Zielona Oliwka restaurant in Kiełczów.

Fig. 6. The place of launching of plant filter islands (source: H2O SCITECH)

Fig. 7. Location of the islands in the pond (opracowanie: H2O SCITECH)

Planting and launching

APRIL, 12

The free spaces within the bundles of willow fascine forming the rafts were planted with aquatic vegetation (using the four plant species listed in the “Concept” section). Planting consisted of placing a seedling into a nonwoven fabric pouch filled with a small amount of coconut fiber substrate. The pouches were tied with jute string to form small plant sachets, which were then pressed into the fascine bundles. Each raft was planted with between 20 and 30 plants.

Fig. 8. Rafts ready to be planted (source: H2O SCITECH)

After inflating the fenders, the rafts with plants were placed on the water; individual islands were connected into two parallel rows (six islands each), thus creating a large modular installation. Due to the presence of buoyancy elements on each island, no additional mooring buoys were used, and the islands were stabilized only by attaching them to three evenly spaced weights, each weighing 15 kg.

Fig. 9. Participants planting the seedlings (source: H2O SCITECH)

Fig. 10. Process of launching and connecting the islands (source: H2O SCITECH)

Fig. 11. Twelve launched plant filter islands (source: H2O SCITECH)

Monitoring

APRIL – JULY

The monitoring of the islands was carried out between their launch and harvest. It involved visual observation of the rafts' stability and plant development, physicochemical analysis of water samples, measurement of physicochemical parameters using a sensor, as well as the use of a mobile boat.

Laboratory tests were performed on water samples collected at the time of launching. To determine the content of nitrites, nitrates, ammonium ions, and phosphate ions, methods specified in the following standards were applied: PN-EN ISO 13395:2001, PN-EN ISO 117325:2007, PN-EN ISO 6878:2006.

The concentrations of all tested compounds were below the detection level, indicating high water quality in early spring. Changes in the content of dissolved substances in the water were observed later in the season, reflected in variations in electrical conductivity values measured with the described sensor.

Fig. 12. Plant filter islands in May (source: H2O SCITECH)

Plant growth during the vegetation season was slower compared to the growth observed on the islands launched on the Oder River in the previous edition of the project, which was due to the lower availability of nutrients as well as partial shading of the launch site. Nevertheless, gradual development of all planted species was observed, along with a uniform increase of healthy biomass on individual islands, dependent only on planting density.

Fig. 13. Plant filter islands in June (source: H2O SCITECH)

In addition, a remote-controlled boat equipped with probes for measuring pH, temperature, and dissolved oxygen was used for water quality monitoring. The boat makes it possible to quickly carry out measurements of these parameters at any point in the reservoir, and even to map the locations of the measurement points.

To study water quality, in addition to laboratory analyses, indirect methods were used – measurement of pH, EC, and oxygen content. The measurements were made possible through the use of a sensor system installed on one of the islands and a remote-controlled boat equipped with a set of probes.

Harvest and re-launch

JULY, 15 / END OF JULY

According to the previously developed plan, in mid-July the plant-based filtration islands were removed from the water surface and the green biomass was cut using pruning shears. All plant species were collected into a single pool.

Fig. 14. Collected plant filter islands after the harvest (source: H2O SCITECH)

The total fresh mass of the collected plants was weighed, and the dry matter content was determined using a moisture analyzer. A representative biomass sample was then taken, dried, and submitted for analysis of average nitrogen and phosphorus content. Nitrogen analyses were carried out using the Kjeldahl method in the Water Institute's laboratory, while phosphorus content was determined in an external laboratory in accordance with standard PN-EN 17851:2024-01. At the same time, the results of water parameter measurements performed by the sensor system were recorded.

The islands were stored in a shaded location, where they were regularly sprinkled with water until the end of July, when they were relaunched in a pond located within the green areas of the Agricultural School Complex in Krzyżowice. It was assumed that after cutting, the perennial plants would sprout new shoots from rhizomes and root clumps left within the island structure. In their new location, the islands are still intended to fulfill their filtration, ecological, and social role thanks to the cooperation between the Institute of Water and the school, whose educational program is related to the natural and technical sciences.

Fig. 15. After the re-launch (source: H2O SCITECH)

Results and conclusions

Observations of the islands during the vegetation season confirmed the stability of the structures and their potential for water filtration through plants. The selected species adapted to the conditions and began to grow. The water at the launch site turned out to be relatively clean, and the islands contributed additionally to improving its quality and enhancing the biodiversity of the site.

Water analysis

As mentioned earlier, laboratory analyses of water samples did not show elevated concentrations of biogenic substances, which was most likely due to the early sampling date and the relatively good condition of the water reservoir.

At a later stage, as part of the monitoring, measurements of the water's electrical conductivity were carried out at the site where the filtration islands were launched.

Electrical conductivity (EC) [mS/cm or μS/cm] – a measure of water's ability to conduct electric current, determined mainly by the presence of dissolved ions (e.g., $NH4^{+}$, $PO4^{3-}$). The more ions present in the solution, the higher the conductivity.

The results presented in the chart (Fig. 16) show a downward trend in the electrical conductivity of the water during the vegetation season. The decrease in EC over the following months is partly related to the increase in water temperature (values not compensated), but it may also result from the development of vegetation (not only on the islands but also directly in the pond and along its banks), which gradually absorbs biogenic ions from the water.

Fig. 16. Changes in electrical conductivity of the water (source: Luna Scientific)

Throughout the entire water quality monitoring period, **the EC value did not exceed 0.55 mS/cm,** which is one of the indicators of the ecological balance of the ecosystem, of which the plant-based filtration islands formed a part. For comparison, the electrical conductivity of the Oder River (Odra-Łany) for most of the time between March and July 2025 exceeded 1.00 mS/cm (maximum reading: 2.01 mS/cm) – a relatively high value indicating eutrophication of the watercourse, which may trigger algal blooms[17].

[17] *Wyniki badań rzeki Odry*, GIOS 2025, <https://badania.gios.gov.pl/odra/> (Dostęp: 13.08.2025).

Parallel measurements of water pH showed that values generally ranged between 8.0 and 9.5. This is a slightly elevated level (the pH standard for Class I inland water quality is 6.5–8.0)[18], which may result from the intensive growth of submerged vegetation that consumes dissolved carbon dioxide from the water. The decrease in pH visible in the chart (Fig. 4) in July may be linked to the decomposition of dying organic matter accumulated during the season (microbiological processes usually lower pH in the surrounding environment). Short-term, pronounced fluctuations in pH values are most likely the result of transformations of organic matter accumulated near the measurement probe.

Fig. 17. Changes in pH of the water (source: Luna Scientific)

[18] *Rozporządzenie Rady Ministrów z dnia 9 czerwca 1970 r. w sprawie norm dopuszczalnych zanieczyszczeń wód i warunków wprowadzania ścieków do wody i do ziemi.*

Measurements using the boat were carried out on May 16. Selected results were then marked on the orthophotomap below.

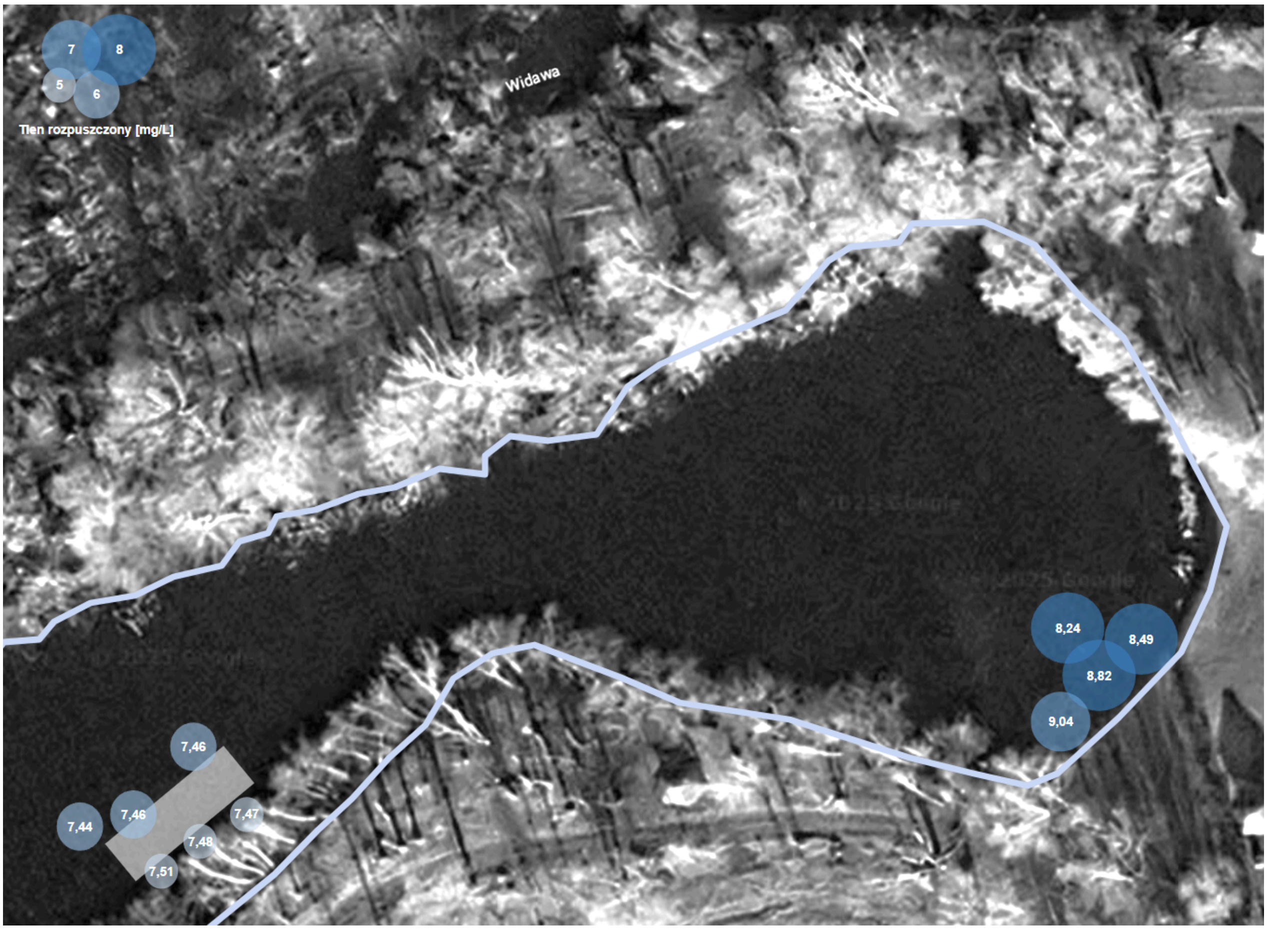

Fig. 18. Map with selected water measurements (source: H2O SCITECH)

As can be observed, the water in the part of the reservoir adjacent to the beach was characterized by high oxygenation (above 7 mg/L) and slightly elevated pH. The water near the launch site of the islands contained about 6 mg O_2/L, and its pH was close to neutral. The lower oxygenation of the water in the deeper part of the reservoir was most likely due to the accumulation of organic matter and ongoing biological processes. An oxygenation level of 5 mg/L is often considered the lower threshold suitable for the proper functioning of aquatic fauna.

Biomass and biogenic substances

Over the 94 days during which the islands remained on the water, the plants produced a total of 13 kg of fresh mass, which amounts to an average of 1.1 kg of biomass per raft.

The average dry matter content in the plants was 21%, so from 13 kg of fresh mass approximately 2.73 kg of dry matter was obtained.

Chemical analyses showed that the nitrogen and phosphorus content in the plant material amounted to 2.78 mg/g (d.m.) and 2.25 mg/g (d.m.), respectively.

This means that the total dry plant mass contained about 7.6 g of nitrogen and 6.1 g of phosphorus, which, when converted into nitrates and phosphate ions – the main forms of these elements in water – equals 33.6 g NO_3^- and 18.7 g PO_4^{3-}.

NITRATES	PHOSPHATES
total absorbed 33,6 g	total absorbed 18,7 g

At the end of the previous edition of the project, the total uptake of nitrates and phosphates was estimated at 8.8 g and 0.7 g, respectively[19]. The higher results achieved in the current activity are primarily due to the greater number of islands (5 → 12), but also to their improved efficiency (a higher value per island), which was related, among other factors, to maintained buoyancy (no disruptions in plant growth).

[19] Raport z projektu ukończonego w 2024 roku, <https://h2o-scitech.eu/wp-content/uploads/2024/11/Roslinne-wyspy-filtracyjne-GG-Raport-koncowy-PL-11.2024-pub.pdf>.

Islands as a habitat

In addition to purifying water, plant-based filtration islands also serve an important role as additional habitats within the ecosystem, positively contributing to the preservation of biodiversity. The raft structures – made mostly of natural materials with numerous spaces – together with multi-species vegetation, create excellent and safe living conditions for animals.

During monitoring, it was observed that birds often sought shelter on the surface of the islands, and even built a nest on the casing of the measuring device.

Fig. 19. Crayfish retrieved from the structure of islands (source: H2O SCITECH)

After the islands were harvested, numerous small crayfish were observed in the spaces between the willow fascine bundles, which were then returned to the water.

The plant-based filtration islands also served as a habitat for many species of aquatic insects.

A qualitative and quantitative analysis of the fauna inhabiting the floating islands could help expand knowledge about the additional ecological functions of this solution. Another topic worth exploring is the diversity and abundance of microorganisms developing on the surface of the fascine rafts, especially in the rhizosphere of the planted vegetation.

Bibliography

Afzal M. i in., *Floating treatment wetlands as a suitable option for large-scale wastewater treatment*, „Nature Sustainability" nr 2/2019.

Ciszewski D., *Wpływ regulacji koryta Odry na akumulację osadów zanieczyszczonych metalami ciężkimi: zróżnicowanie, zmiany w czasie, zagrożenie środowiskowe*, „Studia Naturae" nr 52/2006.

Dyrektywa 2000/60/WE Parlamentu Europejskiego i Rady z dnia 23 października 2000 r. ustanawiająca ramy wspólnotowego działania w dziedzinie polityki wodnej.

Jachniak E., *Związki biogenne, a proces eutrofizacji wód Goczałkowickiego Zbiornika Wodnego*, „Infrastruktura i Ekologia Terenów Wiejskich" nr 3(3)/2013.

Keizer-Vlek H. i in., *The contribution of plant uptake to nutrient removal by floating treatment wetlands*, „Ecological Engineering" nr 73/2014.

Kietla A. i in., *Pływające wyspy*, Łódź Art Center.

Nachlik E. i in., *Zarządzanie wodą w sytuacjach kryzysowych*, Fundacja Gospodarki i Administracji Publicznej 2023.

Perepeczko B., *Postawy i oczekiwania proekologiczne mieszkańców wsi obszarów chronionych*, „Wieś i rolnictwo" nr 1(146)/2010, s.157-158.

Raport rządowy: badanie świadomości i zachowań ekologicznych mieszkańców Polski, Ministerstwo Klimatu i Środowiska/Indicator 2024.

Raport z badania świadomości i zachowań ekologicznych mieszkańców Polski 2022, *Streszczenie zarządcze*, Ministerstwo Klimatu i Środowiska 2022.

Rizzo A. i in., *Nature-based solutions for nutrient pollution control in European agricultural regions: a literature review*, „Ecological Engineering" nr 186/2023.

Rozporządzenie Rady Ministrów z dnia 9 czerwca 1970 r. w sprawie norm dopuszczalnych zanieczyszczeń wód i warunków wprowadzania ścieków do wody i do ziemi.

Sharma R. i in., *Application of floating treatment wetlands for stormwater runoff: a critical review of the recent developments with emphasis on heavy metals and nutrient removal*, „Science of the Total Environment" nr 777/2021.

Siwek M., *Biologiczne metody oczyszczania środowiska – fitoremediacja*, „Wiadomości Botaniczne" nr 52(1/2)/2008.

Stoczkowska i in., *Kształtowanie świadomości ekologicznej mieszkańców wsi poprzez działalność informacyjną lokalnych władz i instytucji*, „Studia Ecologiae et Bioethicae" nr 5/2027.

Świadomość ekologiczna Polaków, „Komunikat z badań CBOS" nr 163/2020.

The United Nations world water development report 2024: water for prosperity and peace, UNESCO 2024.

Wojnarowicz A., *Badania świadomości i zachowań ekologicznych mieszkańców Polski*, EKOMAIKA Ekologiczna Agencja Informacyjna 2021, <https://ekomaika.pl/

raport-2020-badania-swiadomosci-i-zachowan-ekologicznych-mieszkancow-polski/>.

Wyniki badań rzeki Odry, GIOS 2025, <https://badania.gios.gov.pl/odra/>.

Ziemianie atakują, Lata Dwudzieste i Kantar 2024, <https://ziemianieatakuja.pl/>.

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