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Small Hydropower (SHP) in Czechia

Used and realistically usable potential, SHP development possibilities

The Association of Entrepreneurs for the Use of Energy Resources, a registered association (hereafter referred to as SPVEZ) has been continuously active since 1990 at connecting operators of small hydroelectric power plants and the defence of their interests. After two years of intensive study, in 2017, SPVEZ developed comprehensive materials with the goal of acquainting its readers with the use of hydropower and SHP in our country. It included historical contexts, current state and the possibilities of further realistic development of the use of hydropower potential. This year (2024), the material was significantly updated and extended for the second time. Drawing on previously unpublished data, this document highlights diverse perspectives on this fascinating energy sector, showcasing a rich, thousand-year history of hydropower use in our country and beyond. With the support of expert opinions, it indicates possible realistic directions for the further development of the SHP field. It is up to each reader of this material to form their own opinion on the usefulness or harm (public interest) of the further modern use of hydropower in our country.

Pavel Štípský, Chair of SPVEZ, z. s., June 2024

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INTRODUCTION

As of 31 December 2023, Czechia had 1361 small hydropower plants (SHPs) of various capacities in operation, with a total installed capacity of 353 MW. Together, this group of renewable energy sources generated 1.23 TWh of electricity in 2023.

While this represents a modest share of Czechia's total electricity production and consumption, electricity generation from small (and large) hydropower plants remains a crucial part of the national energy mix. The operation of the SHP network brings a whole range of important benefits, which have recently become especially important and which far outweigh any local negative impacts. In addition to the benefit and need of producing ecologically clean electricity, other important benefits of SHP's operation are increasingly coming to the fore. Common examples include the removal of floating debris and waste from waterways, maintenance of riverbeds adjacent to the SHP and their riparian vegetation, improved water management in the landscape (including its accumulation, retention, and slowing down of the runoff), and the stabilisation of optimal groundwater level in adjacent floodplains.

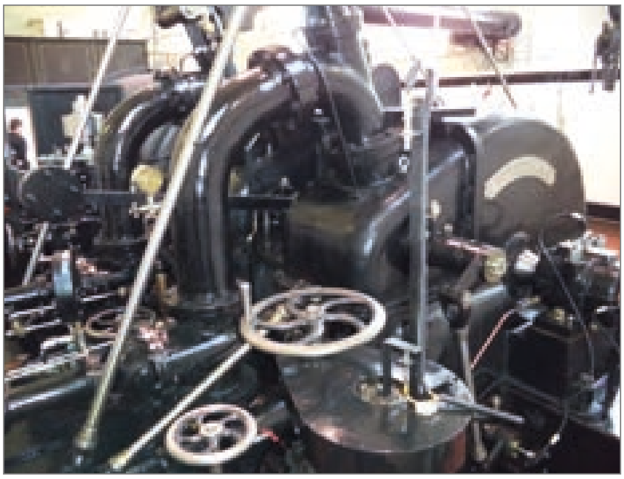
Water mills have been an inseparable part of our landscape for centuries

SHPs, along with their associated water features and infrastructure, have also become important regional and landscape landmarks. In built-up areas, they serve as distinctive urban elements with historical and architectural value as industrial heritage sites. Many have been integral to local communities for centuries, enhancing the character of their surroundings and contributing to the "genius loci" of these spaces with their water features, aesthetic appeal, and unique atmosphere.

HISTORICAL CONTEXT OF THE USE OF HYDROPOWER

In our country and across Europe, the use of water power has a history spanning over a thousand years. This history is particularly significant because, for almost the entirety of this period (during the feudal era), up until the dawn of the 19th century—the "age of steam"—the water wheel was the only widely used and **universally known mechanical power source** in human society (Annex 1).

While wind power was also utilised at that time as another available form of mechanical energy, it was always a supplementary option in our natural conditions due to its



Some unique object from the beginnings of electrification serve us to this day inconsistency. Its use was largely limited to the use of milling grain and pumping water. Therefore, throughout this period, no other type of **universal mechanical power** existed except water power. For nearly the entire second millennium, the use of water power for mechanical purposes uniquely and indispensably supported human progress and the advancement of civilisation. It played a crucial role in driving technological and agricultural development and significantly contributed to landscape cultivation and environmental enhancement.

Many extinct water works still fascinate with their precision

Centuries old technology still reliably works

The history of the development of the textile industry inherently includes the use of water power

A still underappreciated factor in the widespread adoption of water power and its associated technical innovations in the early centuries of the second millennium throughout Europe was the activity of the Catholic Church. The spread of Christianity and the growth of monastic orders in Europe were instrumental in enabling this pivotal development, which laid the foundation for further technical progress in our Christian civilisation (Annex 2).

Throughout this period, our country consistently stood at the forefront of technical innovation in Europe. Water power was effectively utilised until the late 19th century across various fields, including metallurgy, mining, ore processing, metalworking, engineering, glassmaking, textile and leather production, agriculture, and food industries. It was also widely employed to power sawmills and pump water. By the end of the 19th century, a "hot" innovation—electricity generation from water—was gradually introduced across these sectors. Initially, it served as a valuable supplement, and in grain mills, it became an important safety feature for lighting. Over time, it evolved into a universal energy source, supporting all facets of human activity and everyday life (Annex 3).

NEW SHP DEVELOPMENT

SHPs still serve as interesting landscape elements today

By 1930, approximately 15,500 establishments in the entire Czechoslovakia (including Slovakia and Subcarpathian Ruthenia) were recorded as utilising water power, operating a total of 16,932 water engines. Of these, 71% (nearly 12,000) were water wheels, with an average installed mechanical power of just 4.6 kW.

Grain mills had the largest numerical representation among all the industries effectively using cheap water power, followed by sawmills and then other technologies for mechanical drive of various equipment, including generators and dynamos for electricity generation. Under the electrification law of the time, there were plans to convert surplus and outdated water-powered grain mill installations into supplementary electricity generators. This initiative aimed to improve the economic viability of these small, mostly outdated operations during the economic crisis, supporting their survival, boosting employment, and increasing state revenue (as water power was taxed) (Annex 4).

During the 1930s, however, advancements in technology and the expansion of nationwide electrification, driven by large, well-capitalised power companies, left these small establishments unable to compete economically or technologically.

After 1948, following political changes in the country, larger hydropower plants were nationalised. Smaller establishments, particularly grain mills still largely reliant on mechanical power, were initially left with their original owners due to their low production efficiency. Eventually, some were transferred to local agricultural cooperatives (JZDs) or municipal enterprises, but the vast majority were forced to cease operations and were shut down. A distinct category was formed by SHPs associated

Many SHPs conceal historical technical uniqueness

with nationalised factories. Some of these survived, mainly thanks to the dedication and diligence of their operators, until the 1970s, when attitudes towards the usefulness of such facilities began to shift. Larger facilities and power plants were incorporated into the Central Administration of Czechoslovak Energy Enterprises.
In this way, the revival of SHPs during the socialist era occurred in the 1970s, spurred by the global energy crisis and the so-called oil shock. This led to the adoption of a strategic plan for the utilisation of watercourses and decisions to construct and restore SHPs (Annex 5). At the same time, the argument for "clean energy" and environmental protection, particularly the need to address severe air pollution, began to take hold in the country. This period marked the emergence of the Czech phenomenon of the modern SHP.

CURRENT ECONOMIC STATE AND SHP OPERATING CONDITIONS

At present, our hydroelectric potential is utilised exclusively for electricity generation. Every SHP operator, whether an individual or a legal entity, except for the smallest plants with an installed power of up to 50 kW (previously up to 10 kW), generates electricity under a licence issued in accordance with the Energy Act and the Act on Supported Energy Sources. From a water management perspective, each plant must hold a valid water permit—formerly known as "water rights"—to use water legally.

The Kaplan turbine now produces electricity even in the smallest SHPs

Pelton wheels work on higher gradients

Water engines have also undergone incredible developments over the last 150 years

In Czechia, the upper power limit for SHPs is set by legislation at 10 MW. In practice, this means that operators of multi-kilowatt SHPs, e.g. in former mills, are subject to the same rules and legislation as operators of large SHPs up to and including 10 MW (Annex 6).

In our country, SHPs are operated by a variety of business entities, including individuals and legal entities.
Importantly, around one-third of "small water" operations remain under state management. These are operated through the semi-state-owned ČEZ Group (a total of 27 SHPs with an installed power of 66.32 MW) and the state enterprises group Povodí, s.p. In the case of Povodí, income from SHP operations represents a significant portion of their total revenue—approximately 10% (in 2022, their 106 SHPs, with a combined installed power of 56 MW, generated total revenues of CZK 0.62 billion). It is undoubtedly in the public interest of citizens and taxpayers to support the further sustainable development and construction of SHPs under these state enterprises, contributing to their long-term financial stability.
Another notable group of SHP operators consists of water supply and wastewater treatment companies. The operation of SHPs significantly enhances the economic performance of these enterprises by reducing operational costs. This, in turn, helps stabilise socially acceptable water and wastewater tariffs for their end customers.
In this segment, too, the prevailing public interest is unquestionably the continued sustainable development and operation of SHPs (Annex 7).

SUPPORTED ENERGY SOURCES, LEGAL FRAMEWORK OF SUPPORT FOR SHP

Under current legislation, supported energy sources in our country primarily include renewable energy sources (RES), and thus also SHPs. Given that SHPs (along with other supported energy sources) are not yet fully economically competitive under present market conditions, investments in this sector would otherwise become economically unviable. To address this, a model of operational and investment support has been established to ensure a reasonable return on investment for these sources, thereby providing economic viability and incentivising further development.

SHPs currently account for 10.86% of electricity generated from renewable energy sources, with hydropower as a whole contributing 20.2%. In terms of total gross electricity production in Czechia, hydropower makes up 2.49%, with SHPs alone accounting for 1.34% (ERÚ statistics, 2022). Due to drought conditions, SHP electricity production in 2022 declined by approximately 13% compared to 2021. Over the past decade (2014–2023), the average annual electricity production from SHPs has been 1.124 TWh.

Operational support for SHPs has also enabled the restoration of historically significant machinery, which had been condemned to obsolescence under the communist regime

Many enthusiasts have restored hundreds of historic SHP micromachine sites

From the perspective of the philosophy underpinning support for RES—in this case, SHPs—the primary rationale and objective are environmental protection and achieving broader climate and decarbonisation goals. These efforts promote the sustainable use of natural resources and contribute to the long-term sustainable development of society. Furthermore, this support establishes the conditions necessary to meet binding targets regarding the share of renewable energy in gross final energy consumption in Czechia, as set out in Directive 2009/28/EC on the promotion of renewable energy use. Due to increasing political and societal pressure for accelerated decarbonisation across the European Union, these targets are regularly updated. As noted earlier, SHPs and other supported energy sources remain economically uncompetitive under current market conditions. To address this, Act No. 165/2012 on Supported Energy Sources introduced a framework for operational and investment support, specifically designed to ensure that SHPs achieve a basic return on their initial investment over a 15-year period. This framework also stipulated the provision of operational support for the entirety of an SHP's defined service life, which, according to this law and its associated regulations, was set at 30 years.

Subsequent amendments to Act No. 165/2012 by Act No. 382/2021 altered these provisions. Newly commissioned facilities are no longer guaranteed a return on investment; instead, the operational support is calculated to ensure that, over their service life, the sum of discounted cash flows equals zero.

The service life of SHPs has been defined as 30 years under Act No. 586/1992 on Income Tax, Act No. 165/2012 on supported energy sources, and Decree No. 296/2015 on technical-economic parameters. However, an amendment to this decree has reduced the service life of newly established SHPs to 20 years.

Public support for supported energy sources must remain proportionate and comply with European Union competition law and state aid regulations, ensuring it does not distort the market. These issues are addressed through formal notifications. Positive decisions by the European Commission confirm that such public support complies with EU rules and does not contravene competition laws within the member state. Operational support for SHPs in Czechia is provided through feed-in tariffs or green bonuses ("surcharge" on the market price of the "power" electricity produced and sold by the producer on the market to traders). More recently, support through auction prices has been introduced.

The green bonus is determined as the difference between the purchase price and the equivalent price of power electricity (EPPE - approximate price determined by the regulatory authority). The EPPE is "set annually through a consultation process with electricity traders and buyers, reflecting market price developments". In lay terms, the supported price under the former legislation was defined as the price of electricity generated by SHPs (or similar supported energy sources) that ensured a simple payback period of at least 15 years for the initial investment.

A "reasonable" profit could then be achieved by receiving this supported price for the remaining 15 years, making up the 30-year service life of an SHP. However, SHPs commissioned under the amended supported energy sources law no longer receive any guarantee of return on investment.

This means that for various categories of SHPs and other renewables, depending on their commissioning year, the older legislation established "price levels" under which individual producers operate. Essentially, this means that if the market price of wholesale electricity falls, the green bonus increases; conversely, if the market price rises, the green bonus decreases. This system is designed to ensure that producers on average "maintain their financial position", achieving not only a simple return on their initial investment but also a "corresponding profit". Hypothetically, if a producer were to benefit simultaneously from higher market electricity prices, a higher green bonus, and, for instance, investment support, this could result in overcompensation, which would violate European regulations. Such overcompensation constitutes the receipt of unjustified excessive public support, potentially requiring the repayment of these "improperly acquired funds". Under older legislation, the green bonus for SHPs with lower installed capacities (below 100 kW) is paid on an annual basis, whereas for higher capacities, it is provided on an hourly basis. SHPs commissioned under newer legislation and receiving green bonuses are eligible only for the hourly scheme. Additionally, during periods of negative electricity prices on the day-ahead market, SHPs are not entitled to claim an hourly green bonus or full compensation under the feed-in tariff scheme. Instead, under the feed-in tariff regime, producers are obligated to reimburse the purchaser for the negative price of electricity supplied to the grid during that time (as stipulated in §11(4) of Act No. 165/2012 on Supported Energy Sources and related amendments). Producers receiving feed-in tariff support must pay the negative hourly price for the electricity they supply during those hours.

COMMERCIAL BATTLE OVER WATER ON CZECH WATERWAYS

Recently, opposition to SHPs and their operations has become increasingly aggressive, particularly among representatives of sport fishing and recreational boating communities. Beneath the guise of noble motives, such as protecting waterways or promoting leisure activities, their actions often conceal commercial interests and attempts to gain competitive advantages while deflecting attention from the negative impacts of their own activities.

Hydraulic structures at SHPs significantly retain water in weir pools within riverbeds, contributing to water retention across the broader landscape

All the activities of these two groups on our waterways share a common denominator: the excessive and continually increasing mass participation in their pursuits.
This trend stems from their efforts to secure advantages for further expanding the intensive use of waterways to serve their own interests.
The activities of these two interest groups, particularly due to their scale, inevitably bring about a host of negative and undesirable impacts on waterways and the environment. Their strategic opposition to the SHP sector often appears as a convenient cover to obscure and deflect attention from the challenges and adverse effects caused by their own activities (Annex 8).

DIRECT AND INDIRECT IMPACTS AFFECTING THE SHP SECTOR AND ITS DEVELOPMENT

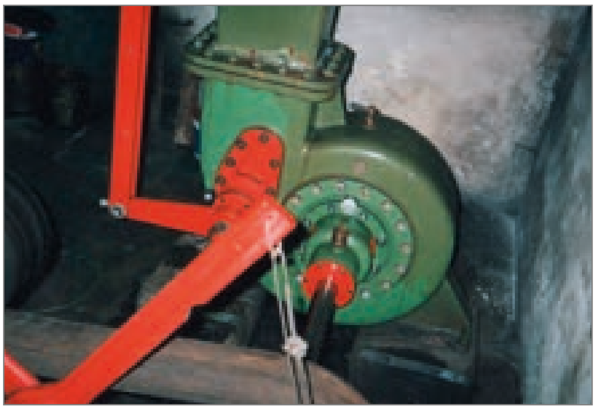
Direct and indirect influences, which can further be classified as either positive—supporting development—or negative—hindering progress—frequently shape the SHP sector to varying degrees.

Among the most critical factors influencing the SHP sector are undoubtedly political decisions and the effects of public opinion, which subsequently manifest in those political decisions. Additionally, Czechia's international commitments and the obligation to incorporate relevant European directives and regulations into national legislation play a significant role in shaping the development of the SHP sector.

Key Positive Impacts on SHP Operations:

Historical, Cultural, and Social Contexts.
SHPs and their associated waterworks often constitute important regional, and in some cases supra-regional, biotopes or significant components thereof.
SHPs play a significant role in landscape formation, frequently serving as prominent landscape and landscape-forming features in undeveloped areas, as well as key urban elements in developed areas.
Multi-purpose weir structures in watercourses, in addition to creating the necessary head for SHPs, significantly contribute to water retention and accumulation in weir pools, slow the runoff in watercourse channels, stabilise groundwater levels in the floodplains of regulated rivers, and create a more favourable microclimate in river valleys and their immediate surroundings.
The operation of all 1,361 SHPs contributes significantly—and in ways often underappreciated —to the cleaning of watercourses, primarily by removing floating contaminants, particularly plastics.

Cleaning of watercourses during SHP operation is socially underestimated



SHPs conceal a number of historically unique machineries

All water engines (turbines) installed at the SHP locally help to aerate the water in the watercourses.
Support for the restoration and further development of micro-SHP sources with capacities of approximately 100 kW, including the restoration, maintenance, and improved operation of at least part of the historical network of water channels, could significantly help in returning water to our landscape and improving its hydrological stability. In the first half of the 20th century, the area of today's Czech Republic had around 10,000 water mills with associated channels and small water storage reservoirs (ponds), which, analogous to the human body, formed an essential "capillary network" within the Czech landscape. There are many significant environmental, ecological, and historical reasons for the restoration, reconnection, and reintegration of at least part of the network of small water channels, which has been built over a thousand years and is naturally akin to small streams. This network should be reintroduced into our landscape wherever it is still technically and economically feasible. The regular maintenance of these small water channels could be effectively co-financed and physically secured by the operators of the SHPs situated in these areas.
From an energy perspective, the stability of electricity production from SHPs, its good predictability, and the decentralisation of the plants, which are fairly evenly distributed across the entire country, are key advantages.

Possible negative impacts of the construction and operation of SHPs include:

Damage to parts of natural habitats along watercourses caused by insensitive interventions during the construction of SHPs – this can be significantly or entirely mitigated with appropriate, nature-based compensatory measures during both the construction and operation phases of SHPs.
Environmental damage arising from improper operation of SHPs, technical faults, or non-compliance with relevant legal provisions – such negative occurrences are rare, mainly caused by human factors, and cannot be entirely excluded or eliminated. In the end, such actions and their consequences reflect poorly on the entire sector and, by extension, on the vast majority of operators who run their SHPs properly and adhere to all regulations.
Transverse barriers in watercourses (e.g. risers) that restrict the bidirectional passage of aquatic and water-dependent animals (especially their migratory passage). This issue (though it is not always a negative) can be addressed or at least significantly reduced with technical solutions. The passage of such barriers is the subject of ongoing, intensive research, seeking and applying both technical and non-technical innovations (Annex 9).
Damage to living organisms passing through turbines during the operation of SHPs, although this is minimised by relevant technical adjustments. These damages are often exaggerated by SHP opponents for populist purposes, even though there is a lack of detailed, relevant domestic scientific studies and long-term observations on this issue.
Deterioration in the living conditions of aquatic animals and water-dependent organisms in depleted sections of watercourses. Due to the lack of extensive, objective, and detailed scientific studies on this topic, and the absence of impact analyses, it cannot be definitively stated that less water in certain sections of watercourses always results in lower biodiversity and fewer aquatic organisms. On the contrary, various expert biological assessments of SHP operations, supported by control catches, measurements, and observations, indicate that in many cases, biological life is actually more valuable and diverse in the depleted sections of watercourses compared to their unaltered parts.

One documented example is a depleted section of a watercourse with a significant presence of the protected river lamprey (because in this depleted habitat, there are fewer trout, which are part of the lamprey's food chain). Additionally, the intake canal of an SHP is considered a unique habitat, which, unlike the main river channel, is full of river pearlshells and, for this reason, is given priority protection over the main riverbed.

SHP STATISTICAL DATA

(Annex 10)

REALISTIC AND UNREALISTIC POSSIBILITIES FOR FURTHER SHP DEVELOPMENT

(Annex 11)

According to the study by SPVEZ, the real average potential for further expansion of the installed capacity of SHP in Czechia is estimated at between approximately 30 - 50 MW, which represents about 10 – 15% of the current installed SHP capacity. This estimate (taking into account particularly the tightening of legislation) is about 2.5 times lower than the "optimistic" figures used in previous years by the Czech Ministry of Industry and Trade (up to 110 MW).
From the perspective of further development of the entire SHP sector (and the renewable energy sector in general), this represents a relatively small potential for the real growth of installed SHP capacity in terms of overall electricity production in our country. However, it is still significant in terms of the various important positive externalities described above.

Hundreds of abandoned mill races can still be traced in our landscape

River Vltava, Rožmberk area – a realistically or unrealistically usable location?

Of this considered real potential for further development, a total of 14 – 28 MW, which is 25.6 – 51.3% of the overall SHP development potential, falls into the lowest power range (0 – 0.1 MW). For further growth of micro-sources (up to three times the current number of installations), particularly in the 0 – 0.035 MW range, the level of support is inadequate, and the current legislative obstacles have already rendered these projects unfeasible.

According to the approved new scheme for operational support for the period 2020 – 2030, even for new SHPs with an installed capacity over 1 MW, operational support is auctioned. Given that there are only about 3 – 5 such unused locations available in our country, this legally mandated approach by the Ministry of Industry and Trade in the SHP sector seems entirely redundant and counterproductive. While for other types of renewable energy, the state needs to set the level of operational support as low as possible through the auction system using

SHP micro-sources need daily care, sometimes even concern

economic market mechanisms, and regulate any uncontrolled development of these sources with the auction volume, in the case of SHP, these regulatory elements are naturally replaced by limiting natural conditions and legislative restrictions. Therefore, this reason for regulation (to limit the disproportionate growth of relevant capacities) is unnecessary in the SHP sector.
The above is confirmed by the fact that in the first two auctions for SHP, no applicants registered at all (summer 2023; in the second half of 2023, the state enterprise Povodí Vltavy won the auction for the construction of SHP Klecany II, for the first time and so far only once, with a fixed purchase price).
Today, facing the need to restore and build new small water reservoirs in our landscape for rainwater retention, it has been forgotten that the vast majority of small water reservoirs and ponds in the Czech landscape, that are located on small watercourses with fluctuating flows were built with the intention to accumulate water for hydropower use. All were built in past centuries, mostly during the feudal era. For centuries, these reservoirs have held rainwater and runoff, allowing their hydropower to be gradually and efficiently used. During dry periods and low flows, this energy was used to drive even the smallest water engines. Economic efficiency always emphasised the multifunctionality of these structures. It is also worth mentioning that another now-forgotten important use of these small reservoirs, in addition to hydropower and fish farming, was the targeted intensive cultivation of willows for basket-making materials. These were essential ecological products for the everyday needs of the population in all areas of life (Annex 12).
Today, we often replace economic efficiency with "project sustainability". This involves setting the number of years needed to maintain these waterworks, mostly funded by grants, so the subsidies do not have to be repaid. But after this time... what happens?

TECHNICAL PREREQUISITES FOR FURTHER REALISTIC DEVELOPMENT OF SHP

All the necessary basic technical prerequisites for further realistic development of the SHP sector in our country - although strongly limited- are in place. These include a full range of available technological equipment types, such as water engines for all flow and gradient conditions, as well as their sizes. The sector has many high-quality small and large manufacturers and providers of other essential services, several of whom operate their own SHPs. Experienced project designers and construction firms are also available. Finally, there are experienced investors, both individuals and legal entities, ready to engage further in the development of the SHP sector in locations where it will be technically, economically, and, above all, legislatively and legally feasible.

Operators of micro-sources are used to manage most of the work themselves

Historically valuable parts are well maintained

LEGISLATIVE BARRIERS TO FURTHER REALISTIC DEVELOPMENT OF SHP

In both European and domestic legislative areas, there is a gradual implementation and enforcement of efforts—some successful—that aim to introduce various controversial and debatable restrictions and measures. These, in turn, lead or could lead to the practical obstruction of permitting and constructing SHPs, especially micro-sources (Annex 13).

Some examples:
Across Europe, under the pretext of protecting watercourses (fulfilling the objectives of the Water Framework Directive) and ensuring migratory passability, pressures from opposing interest groups are growing to label all SHPs with installed capacity below about 2 MW as sources where the economic benefits do not outweigh the overall environmental negatives resulting from their operation and existence. These groups demand the physical removal of such water works under the term "removal of transversal obstacles in watercourses", instead of implementing complex technical solutions and modifications that would allow for migratory passability, as well as for recreational boating and the utilisation of the hydroenergy potential of these water structures. These structures are usually essential not only for energy production but also for navigation, water supply, flood protection, and other important functions.
The European Regulation on landscape restoration adopted this year (2024) includes among its objectives the restoration of 25,000 km of rivers to free-flowing status by 2030. Member states will specify concrete measures in their National Nature Recovery Plans. However, stretches where fish passages or other measures ensuring flow passage have been implemented will not count among the restored free-flowing rivers. For the purposes of this Regulation, only the complete removal of obstacles will be considered. In Czechia, the estimated length of possible modifications to free-flowing rivers is between 250 and 400 km, while there are a total of 16,326 km of significant watercourses and 86,556 km of smaller watercourses recorded in the country.
Public sources indicate that in Czechia, there are around 6,000 to 6,600 transversal obstacles (mostly weirs) over 1 meter high on watercourses. However, only a few hundred of the existing transversal obstacles are suitable for further development of the SHP sector. Given the current total number of SHPs (1,361), it is clear that the vast majority of these obstacles have nothing to do with energy production and are unnecessary from this perspective, unless they serve other essential functions (in public interest). Therefore, it is entirely appropriate for the Czech Ministry of the Environment to move beyond the repeatedly stated argument of the general need to increase biodiversity (Appendix No. 14), reduce unwanted fragmentation of watercourses, and other "mantras". The Ministry should present a concrete and serious list for public expert discussion, identifying unnecessary transversal obstacles on our watercourses that could be physically removed (including documentation of these structures and confirming agreements from relevant river basin managers). Most importantly, they should estimate the cost of this removal and determine who will pay for it. It is clear to everyone that the state currently lacks the capacity and resources for such a "river network unblocking" initiative (Czechia is missing 200-250% of its GDP in essential investments in key areas). Public information shows that the Ministry of the Environment currently does not have any relevant, detailed list of unnecessary transversal obstacles on watercourses. As a result, all comments and statements from Ministry staff on this topic remain in an unsupported theoretical and unprofessional realm, "on paper".

Currently (summer 2024), legislators in our country have approved the general presumption of public interest in building and operating RES. However, this excludes new SHPs in a discriminatory manner. This decision, along with other restrictive measures already in place (and growing pressure to expand them), such as those in Plans Povodí, will nearly halt the construction of new SHP facilities.
The preparation of so-called acceleration zones for RES development also does not consider zones for new SHP construction. This is despite the clear opportunity to include the previously mentioned few hundred existing transversal obstacles suitable for further energy use. In such zones, SHP construction could be conditioned on ensuring two-way fish migration, improving habitats for aquatic and water-dependent organisms, and enabling recreational navigation. Only then could a balanced assessment of public interest be made—whether to use and operate a small portion of these obstacles or to identify and remove truly unnecessary and redundant structures, provided such “redundant constructions” objectively exist.

The topic of “free-flowing rivers” also raises a significant aspect that has yet to be publicly addressed. It is legitimate to demand that in such fully natural sections of free-flowing watercourses, all activities such as sport fishing, fishery management, recreational boating, and other human interventions should be entirely prohibited.

CONCLUSION

The use of hydropower has been an integral part of our civilisation for a thousand years. Throughout this time, it has positively shaped our landscape and environment while supporting our technical progress. To continue this tradition in modern conditions, the appropriate development and construction of SHPs is a logical extension of the legacy left by countless generations of our ancestors (Appendix 15). Providing reasonable support for the SHP sector can ensure its sustainable growth. This, in turn, would contribute significantly to addressing issues such as drought and preserving our cultural landscape, particularly in areas with smaller watercourses and related water management infrastructure.
In response to baseless attacks—often from militant opponents of SHP—on its usefulness and necessity (as a matter of public interest), there should be louder expressions of support and solid arguments from the majority of our citizens. As these citizens are not only voters, but also taxpayers.

Will we choose to enable or block further development of hydropower?

Let us preserve the legacy of our ancestors‘ technical skill for future generations

ANNEXES

The operation of SHP micro-sources helps finance the maintenance of often extensive historical buildings and complexes associated with them

Annex 1

The Water Wheel – The Sole Universal Source of Mechanical Energy in the Feudal Era

Though it might seem that the water wheel, as a type of water engine, has been relegated to the annals of history, the reality is quite the opposite. Across Western Europe, especially in Germany, the water wheel has experienced a renaissance over recent decades. It is now regarded as an environmentally friendly type of water engine, particularly suitable for micro-scale SHPs on small streams. In Germany and other Western European countries, several thousand modern water wheels have been installed over the past few decades. These are made from durable, corrosion-resistant materials and are often placed in their original historical settings. Economic reasons are certainly not the primary, let alone the sole, motivation behind the construction and operation of such micro-sources. The legacy of our ancestors, a sense of nostalgia, the unique atmosphere of historical sites, and their urbanistic appeal are just a few of the many reasons. Our country, too, can draw valuable inspiration from this approach to preserving and further developing the precious heritage of harnessing water power—particularly in small-scale micro-sources.

We don't have to go too far–let's take inspiration from our neighbours in Bavaria

One hundred years ago there were 10 000 water wheels in Czechia, only a few are left today

Annex 2

How the Catholic Church Helped Build Western Civilisationi

Although it may seem unbelievable from today‘s superficial perspective, monks played a decisive role in the progress of Western civilisation throughout the centuries. Western monasticism owes much to Saint Benedict of Nursia. Benedict founded twelve small monastic communities in Subiaco, 38 miles from Rome. He then moved south and established Monte Cassino, the great monastery for which he became famous. It was here, around 529, that he composed the famous Rule of Saint Benedict, which was almost universally adopted across Europe in the following centuries.

Benedictine monks typically lived at a material level comparable to that of an Italian peasant of the time. Wherever monks went, they introduced the cultivation of grain, manufacturing techniques, or production methods that people had never known before. They introduced cattle and horse breeding, brewing, beekeeping, and fruit cultivation. Sweden's corn trade owes its existence to the monks, as does the production of cheese in Parma, salmon farming in Ireland, and in many places, the finest vineyards and breweries. The invention of champagne can be traced back to Dom Pérignon from the Abbey of Saint Peter in Hautvilliers on the Marne. Pérignon was appointed cellar master of the abbey in 1688 and created champagne by blending wines. He established the basic principles that still govern sparkling wine production today.

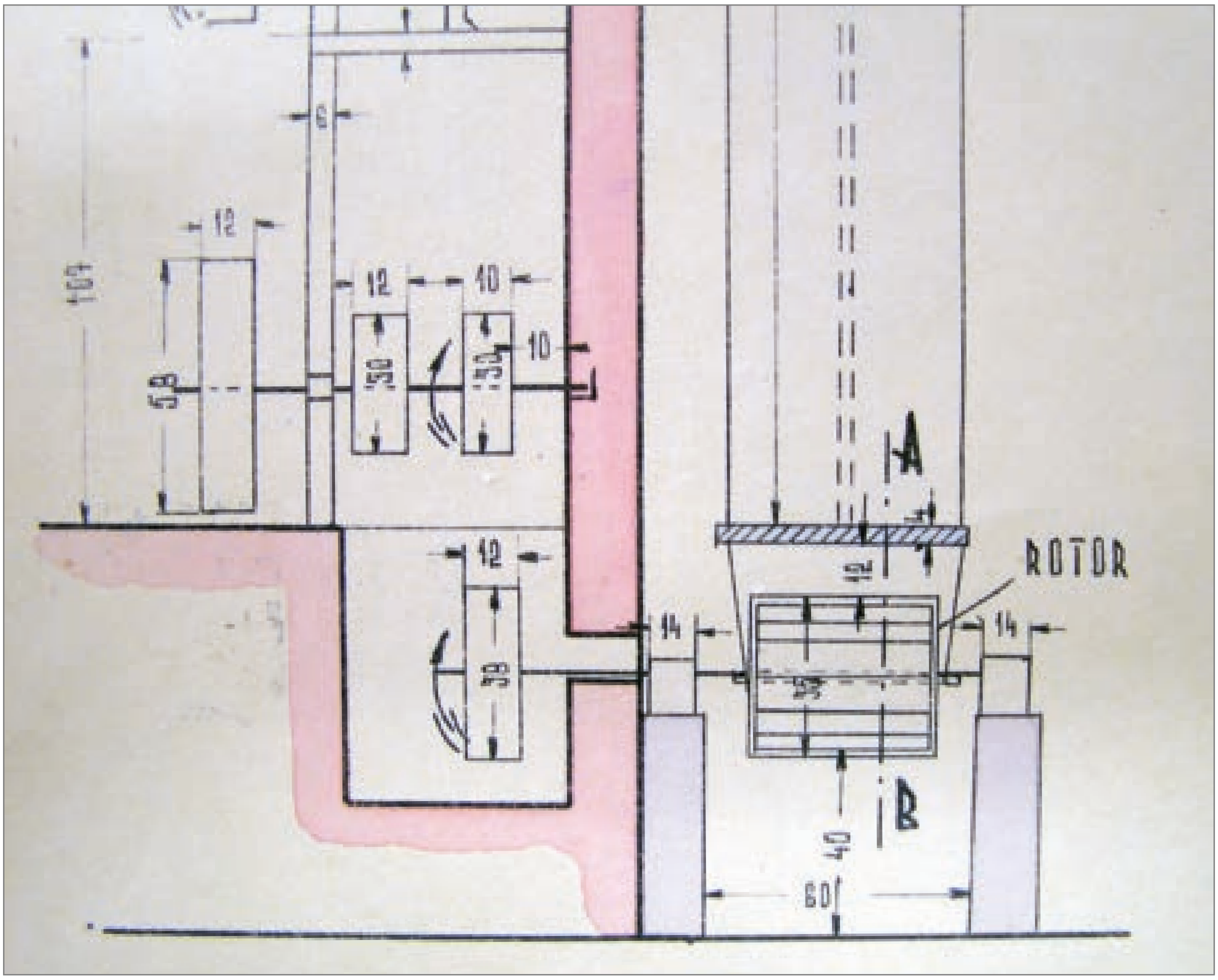
Monks were also creators of medieval technologies. One of their most underrated contributions is the expansion and improvement of the use of water power through water wheels for mechanically powering various agricultural machines throughout Europe. This became the only viable way of using mechanical power until the industrial revolution. The Cistercians, a reform branch of the Benedictines founded in Cîteaux in 1098, were particularly known for their technological expertise. Through their communication network linking different monasteries, technological information spread incredibly quickly. As a result, similar systems using water power could be found in monasteries thousands of miles apart. A Cistercian monk from the French Clairvaux in the twelfth century described in his writings how water power was used for threshing grain, sifting flour, weaving cloth, and tanning leather. Historian Jean Gimpel, in his book The Medieval Machine, explains that this information could have been copied and spread across 742 copies, as this was the number of Cistercian monasteries in Europe in the twelfth century! He further notes that the Cistercians were known as experts in metallurgy. Each monastery had a model factory, often as large as the church itself. It usually stood nearby, and water power drove the machines installed there. Where monks sourced iron ore, they built furnaces to extract the iron. From the mid-13th to the 17th century, they were the main producers of iron in the French Champagne region. Because they always sought to increase the economic efficiency of their monasteries, they used slag from their furnaces as fertiliser, which, due to its phosphate concentration, proved particularly useful for this purpose…

Source: Thomas E. Woods, Jr., How the Catholic Church built Western civilization (Regnery Publishing, Inc., 2005)

The Cistercian Abbey in Vyšší Brod has also continued the millennia-long tradition of its order in this field and operates a micro-hydropower source at its historic location in Vyšší Brod.

Example of the gradual electrification of a small village in southeastern Moravia in the first half of the 20th century

For instance, in the village of Lipov (Hodonín district, 1,500 inhabitants), both local millers had installed dynamos with an output of about 3.5 kW to their waterwheels after World War I. With the light bulbs of 25W (or even 15W) used at the time, this meant that each miller could light up to 140 bulbs (and even more when they were small), so a total of 280 bulbs in the village, which had just over 300 residential houses. The lights were on for about 2 hours after dusk and about 1 hour before dawn, mainly during the autumn and winter months, significantly extending the time available for domestic work for the local agricultural population. The millers' income from these lighting services was already a significant boost to their economic results. This ended in Lipov in 1937 with the nationwide electrification and connection of the village to the power grid of Západomoravské Elektrárny, a.s., with a thermal power plant in Oslavany near Brno, which, of course, they were unable to compete with. Thus, this was the most advantageous economic use of the energy potential of these, from today's perspective, miniature sources up until that time.



Bánki's turbine for the lighting purposes of miller Hudeček

"...Right after the war, my father also bought a dynamo for lighting. It was an amazing thing when the lights lit up everywhere in our mill and the neighbours' house. There was also light in the street, it was a real celebration. People danced in front of the mill until late at night. But other citizens also wanted to have lighting. And so it spread across the village, even reaching the church, and soon no one had light because it was overloaded.
New problems arose. In the evening, when everyone had the lights on, a lot of water had to flow to the wheel to make it work. After nine o'clock, when people started turning off their lights, it lit up too much again, and we had to reduce the water flow, so someone had to keep an eye on it all the time. And another thing– I was the only electrician. Whenever something broke, they'd come to me, and I would go from house to house fixing things. There were all kinds of installations, today they would never be allowed to be wired that way. A piece of wire was stretched along the wall or beam, and the lights would come on. There was no proper insulation, nothing. At most, each wire was pulled separately.
This makeshift solution lasted until 1936. After a long struggle in the village, where they didn't want to take out more loans for electrification, we, the local entrepreneurs, managed to gather the money, and it was done. And once it was finished, the main opponents were the first ones to want electricity"...
(From the memoirs of local miller Bedřich Čerešňák)

On 18th February 1936, the municipal council of the heavily indebted village (due to the construction of the Civic School) finally decided, after several years, to proceed with the full electrification of Lipov and its power supply from Západomoravské elektrárny (a company originally founded in the late 19th century to supply electricity to industrial textile and engineering businesses in Brno, with German-Jewish capital and a thermal power station in Oslavany). The council signed an agreement with the company outlining the conditions for the electrification and electricity supply to Lipov. These conditions were binding for both parties until the year 2000!
The construction of the local electrical network took place in the summer of 1937. The village of Lipov was responsible for the transportation and distribution of the necessary building materials, particularly the delivery of impregnated wooden poles from a sawmill in Rohatec (with 52 local horse-drawn cart owners, each working for 2 days) and also for assisting with other tasks. The actual installation work was carried out by the technicians of Západomoravské elektrárny.

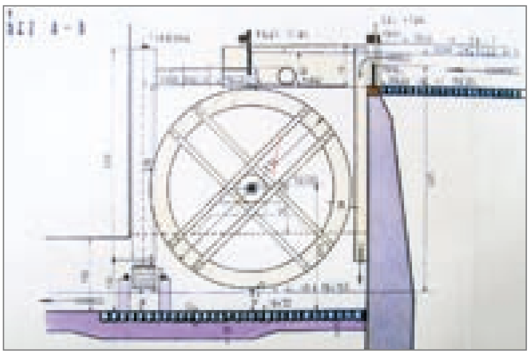
The project was officially inspected on 5th February 1940. The investment costs amounted to CZK 179,186.50, with the village receiving a state subsidy of 30%, or CZK 53,760.
In this first phase, a total of 98 electricity consumers (about a quarter of the village's homes) were connected to the grid. The electrification also included public lighting for Lipov's main square, which consisted of two 40-watt light bulbs(!), suspended on steel wires stretched between the school and the rectory buildings, and between the school and the church.
The cost of electricity was CZK 2.80 per kWh for lighting (in the evening – during "peak hours"), CZK 1.70 per kWh for powering devices (during the day), and CZK 0.90 per kWh for heating ("night-time current").
For comparison: the daily wage for a worker in agriculture at that time was between 10 and 20 CZK.

Taxation of Water Power

"Water power tax is an indirect excise tax. It was introduced in Czechoslovakia by the law of 12th August 1921, No. 338 Coll. and amendments, with the implementing decree of 12th May 1922, No. 142 Coll. and amendments, supplemented by the government decree of 22nd December 1925, No. 7 Coll. of 1926. The subject of the tax is water power used for mechanical drive, measured at the shaft of the driving device. The base tax is 4 hellers, with a surcharge of 1 heller for each horsepower (hp) per hour. Water works with a performance of up to 2 hp are exempt from the tax, and water works up to 5 hp are exempt from the surcharge. Water works constructed or reconstructed after 1st January 1919 may, under certain conditions, be exempt from the tax. The taxpayer is the operator of the water work. The tax is paid via special forms at the postal cheque office to the account of the regional financial authorities. The taxpayer is required to submit monthly statements to their supervising authority. The tax can also be paid as a flat rate, agreed upon between the financial office and the taxpayer; the flat rate is paid on a quarterly basis in the same manner. Flat-rate agreements are generally concluded for 3 years, with an option for mutual annual termination. Recently, discussions have been underway about converting the water power tax into a purpose-specific tax, with its proceeds to be allocated to water management funds intended for the regulation and improvement of water management and drainage systems". (1930)

The abolition of the water power tax was achieved by Dominik Čipera, the Minister of Public Works in the Protectorate government of Rudolf Beran, and a long-time senior manager at the Baťa conglomerate.

1. 8. 1928
Overshot water wheel.
Flow rate 0.224m³ × head 5.35m × efficiency 60% = 9.5 hp
Average output 8 hp
Water availability 153 days per year with 9 hours of operation in one go = 1,377 hours × 8 hp = 11,016 taxable hp.
The total flat tax on water power amounts to: 11,016 hp x 5 heller = CZK 550.80



Water-powered sawmills were economically very important

Annex 5

The Modern Renaissance of SHP in the 1980s Czechoslovakia

The modern history of SHP in our "socialist" country began with the Resolution of the Presidium of the Government of the Czechoslovak Socialist Republic, dated 20 December 1979, No. 304, "on the possibilities of using small hydroelectric plants for electricity production". In this document, the Presidium approved the intensified use of the hydroenergy potential of Czechoslovakia through the gradual and purposeful construction or modernisation of power plants, including those at small waterworks. It also adopted principles for the intensive utilisation of the hydroenergy potential of watercourses for generating electricity in small hydroelectric plants.

In the 1970s, a number of higher-capacity SHP facilities were also established

At that time, the government's representative for SHP matters, Engineer František Pažout, who later became the founder and first chairman of the Association of Entrepreneurs for the Use of Energy Resources (SPVEZ), "smuggled" into the draft of the aforementioned government resolution the possibility for citizens—natural persons—to operate SHP facilities, albeit with restrictions: an installed capacity limit of 35 kW and a maximum annual production of 200,000 kWh.

The beginning is always the hardest

Some turbines weren't to be saved

Repairable turbines were being brought back into operation

In this manner, under the authorisation of Local National Committees and during the height of totalitarianism, the foundation of private enterprise in this field was established—a phenomenon in the modern history of SHP.

The first dozens, and later hundreds, of these micro-sources emerged, mostly through the restoration or at least partial reuse of historical waterworks. This revival of the SHP sector was supported by numerous members of miller families, as well as other enthusiasts who, after more than thirty years of neglect, revived the valuable knowledge and expertise of previous generations. They managed, with what now seems an almost unbelievable level of personal dedication, creative ingenuity, and considerable sacrifices, to repair and bring back into operation dilapidated turbines. They also manufactured missing components—all this in an era when all means of production were under "socialist ownership". For this historical reason, more than one-third of all SHP facilities (nearly 500 plants) in this power category remain in operation to this day.

Annex 6

Examples of SHP installations

It is often overlooked that SHP in Czechia does not form a compact group of equal energy sources.
In 2023, SHPs with an output ranging from 0.1 MW to 10 MW decisively and dominantly contributed to the total volume of electricity production from SHP and their performance. In this category, there are 469 plants with a total output of 317 MW (approximately 90% of the installed capacity of all SHP), producing 1,111,526 MWh annually (89.7% of the total annual production of all SHP).
The more numerically significant group of SHP is the micro-sources with an output of up to 100 kW (0.1 MW), however, in terms of total output (37 MW – 10.5% of the total SHP capacity) and their annual production (114,894 MWh – about 10% of the annual production of all SHP), they represent a marginal group within the entire range of SHP outputs in Czechia. Although these plants are relatively numerous, they are characterised by their small output and dispersion across the whole territory of Czechia. A substantial portion of these plants consists of waterworks in historical locations, often with preserved technologically valuable heritage units, especially former mills, ironworks, glassworks, or textile plants. This group contains the largest real potential for further development of SHP.

A technical innovation, the vortex turbine, has already found use in micro-SHP installations

Large machines evoke admiration and awe among members of the power plant community

Powerful turbines are operated, for example, by state-owned enterprises like Povodí and ČEZ

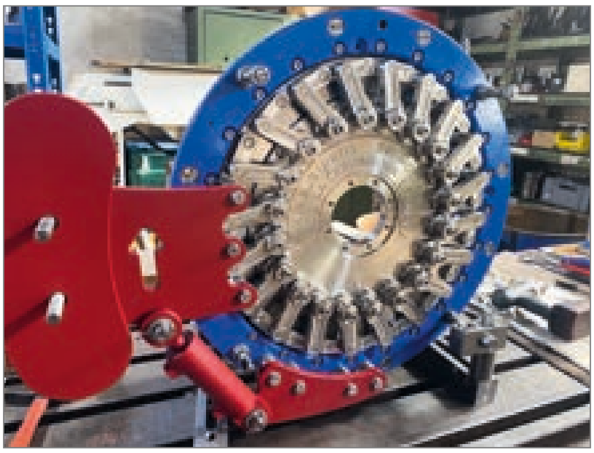
The Kaplan turbine is the most versatile water engine

In the last two decades, state-of-the-art facilities have been built

A model of the impeller made from a meltable material, created using 3D printing

Stainless steel castings of the "heart" of the turbine

Turbine assembly



Turbine regulating system

Annex 7

An example of the "prevailing public interest" – Electricity production in SHP SmVaK Ostrava

SmVaK Ostrava – a significant water supply company in the Moravian-Silesian region – serves more than 700,000 end consumers, providing drinking water for 1 million people, and manages wastewater treatment for half a million people.

In 2023, seven SHPs located at the central water treatment plants and significant reservoirs of the Ostrava regional water supply produced 4.72 GWh of electricity. All three central drinking water treatment plants of SmVaK Ostrava (Podhradí u Vítkova, Nová Ves u Frýdlantu nad Ostravicí and Vyšní Lhoty in the Frýdek-Místek region) were able to produce more electricity last year than these facilities consumed for their operations.
The green electricity production also significantly exceeded the consumption at four major water reservoirs of the Ostrava regional water supply in the areas of Ostrava – Krásné Pole, Zelinkovice, Bílov, and Frýdek-Místek. The wastewater treatment plant in Opava is 79% self-sufficient in terms of electricity consumption.
The water treatment plants in Podhradí, Nová Ves, and Vyšní Lhoty produced over 4 GWh of electricity in total last year, 30% more than they consumed. In Vyšní Lhoty, the production was more than double the consumption, in Podhradí, it was 10% more than consumption, and in Nová Ves, the production exceeded consumption by 28%.

The most powerful SHP

For example, during the modernisation of the Nová Ves Water Treatment Plant in recent years, the original SHP with two 200 kW generators was replaced with a single flow turbine with a 463 kW generator. Comparing 2019, when the replacement occurred, and the following year, the production of the SHP increased two and a half times to 1.94 GWh.
The first SHP in SmVaK Ostrava's operations was built in 1993 on the raw water intake from the Šance Reservoir. Following the launch of the new facility in the autumn of 2019, it now houses the most powerful and modern facility of its kind.
SHPs are built at water treatment facilities on raw water intakes from valley reservoirs. Efficient operation is ensured thanks to the constant flow and adequate drop of the incoming water. Smaller capacity plants are installed on potable water intakes with suitable parameters. The electricity produced is primarily consumed directly at the place of production, with surplus electricity supplied to the grid. Three SHPs of SmVaK Ostrava are located at drinking water treatment plants, while four are installed at significant reservoirs.
The SHPs located at the reservoirs in Frýdek-Místek, Zelinkovice, Bílov, and Ostrava-Krásné Pole produced many times more electricity than is consumed there (12x, 7x, 2.4x, and 2.3x).

Source: www.smvak.cz

The flip side of a sustainability use of our waterways “Battle over Water” and failure to address serious problems

In the area of river management and surface water management, particularly in recent years, the public debate has intensified, with representatives of various interest groups fighting for better starting conditions at the expense of others. This has been accompanied by deliberate attempts to influence public opinion and rally support for their cause, while simultaneously pushing for various legislative changes aimed at increasing the possibilities for commercial activities of these groups. These efforts are often accompanied by the use of false, misleading, imprecise, or out-of-context arguments and claims.

A common denominator of this effort is that these groups often justify their actions by claiming they are protecting nature and watercourses, promoting ecological sustainability, and providing significant economic, environmental, and other benefits to society. Another common denominator is the demagogic opposition to the existence and operation of SHPs, presenting them as the “common enemy” that causes more harm than it benefits society, while intentionally covering up or downplaying the negative effects resulting from the activities of these groups. These phenomena mainly stem from the ever-increasing mass exploitation and greed of some (business) activities “on water”.

Sport Fishing and Angling

In Czechia, there are about 350,000 sport fishermen, who, according to official statistics, annually catch around 3,500 to 4,000 tons of fish in our waters. This, in terms of fishing rights, requires continuous and massive restocking (over-stocking) of fishing waters, especially by annually releasing thousands of tons of carp, just below production size, into all of our non-trout waters (“every fisherman has the right to take home a carp they caught themselves”). These carp, among other things, intensively disturb the sediment in the watercourses. The army of sport fishermen, often equipped with the most modern tools, including devices such as fish finders, then spends the year fishing for these thousands of tons of carp and, in the best-case scenario, takes them home to consume. In the worst case, for purely recreational purposes, they repeatedly “catch and release” the fish “ecologically,” which is becoming a more frequent subject of criticism from the “non-fishing” majority of society.

In trout fishing waters, a similar situation occurs every spring, just before the end of the closed season (April 15). A significant number of market-sized fish, mainly non-native species such as rainbow trout, American char, or industrially bred forms of brown trout, are released into the watercourses. These fish are euphemistically referred to by anglers as “intensive stocking with attractive fish”. The release of the last-mentioned species leads to the destruction of native trout populations, as hybrid populations are not able to adapt to the conditions in our flowing waters.

With the beginning of the trout season, holders of permits for trout waters make their mass incursions for “sport” fishing of these fish. With a slight exaggeration, it can be said that these stressed, hungry fish, artificially raised on pellets in commercial breeding facilities, jump at the lures used by anglers engaging in this "sport" activity.

Citation from the website: www.rybsvaz.cz:
"Trout season (2024) is slowly beginning
Author: Václav Horák

The endless winter wait ends on April 16 – trout waters open to sport fishermen. For more than 250,000 holders of trout permits, this day is the main event of the fishing season. In the last week, the first wave of stocking took place in the Eastern Bohemian trout waters, in many cases involving intensive stocking with attractive fish species. Stocking will, of course, continue".

Industrially farmed trout *Sport fishing of these trout*

Often overlooked controversial issues in sport fishing:

Over-stocking watercourses and reservoirs with attractive fish species
Increased stocking of non-native fish species that are highly competitive with our native species
Supplementary feeding of non-native fish species
Questionable quantity stocking with (fishing-attractive) predatory fish
Genetic relatedness of stocked fish (relatively small numbers of breeding fish in hatcheries)
Rising share of predatory fish of trophy sizes in large reservoirs
Health damage to fish from rough handling during fishing

Although tens of thousands of recreational anglers undoubtedly carry out a great deal of commendable and selfless work every day to preserve diverse life in our watercourses, the above-mentioned negatives cannot be ignored. This issue must be understood in its full context, within the overall performance of fishing rights in sport fishing, it cannot be said that the natural balance in watercourses is being maintained.

Sport and recreational boating

Representatives of the Association of Water Tourism and Sports have long been critical of SHPs and their operations, claiming that they restrict and hinder the further development of recreational boating on our rivers. This is, among other things, a strategic move to secure more favourable conditions for their (business) activities within the legislative process.

Members of the association repeatedly argue that *"around 670,000 boaters take to the Czech rivers annually, so water tourism generates billions in turnover, and it is no longer just a pastime for a few people. Boaters support rental shops, manufacturers, travel agencies, campsites, and restaurants, thus benefiting far more entrepreneurs than the operators of SHPs".* Today's boating is a full-fledged entertainment industry and business that employs countless people and brings in substantial income.

Negative impacts of mass recreational boating

In this case, it is also possible to look at recreational boating from a different perspective, through the eyes of its critics. The heavy business that today's water tourism has become logically brings with it a range of negative impacts and phenomena. Masses of undisciplined boaters leave behind tons of waste in the river floodplains after each season. Single-use plastics and waste harm aquatic animals, leading to mechanical damage to the riverbeds and shores of these habitats. Not to mention vandalism, disturbing wildlife both in the water and on land, and disrupting the peace at campsites and resting areas.

Recently, due to legislative concessions, we are slowly but surely seeing a rise in "drunken boaters", or people who go to the water primarily and intentionally to "let loose". Various floating bars selling drinks in plastic cups with plastic straws are catering to these experiences, ensuring that these "boaters" can have a perfect time.

For example, in the upper Vltava region, the most used water area for boating in Czechia, around 250,000 water tourists set off annually during the relatively short boating season.

Citation from the website: www.avts.cz :

"For many boaters, the river becomes a convenient trash bin. Plastic bottles filled with beverages are often kept on a string trailing behind the boat, allowing the water to cool them. Unfortunately, strings frequently break due to branches or other submerged obstacles, leaving the waste behind in the river. On the banks, especially near weirs, empty bottles are often discarded carelessly into nature. The river is not a garbage dump, and as the land belongs to someone, others have to clean up the mess left behind by boaters. It's no wonder landowners have a negative perception of boating activities".

Mass summer boating of recreational canoeists

Due to these and other reasons, questions are increasingly being raised about the need for appropriate regulatory measures or restrictions in recreational boating. Such steps could help mitigate the numerous pressing negative impacts of this activity, particularly those harming the environment and disturbing the lives of residents near watercourses. This would ensure that recreational boating could remain a sustainable way of utilising our rivers in the future.

Refreshments are a must

Activities of State and Non-State Nature Conservation Groups and Organisations

Every rational person agrees on the importance of protecting our natural environment and preserving it for future generations. A wide range of people, "well-intentioned" and active in this field, contribute to these efforts in our society. However, differing opinions on the methods and extent of protection frequently spark conflicts, such as attempts to reintroduce predators or other animal species whose presence may not align with human life in densely populated Czech landscapes, especially in urban areas. In the case of watercourses, controversial topics include the artificially induced expansion of the European beaver and the river otter. These expansions often lead to dissatisfaction among certain citizen groups affected by the damages caused by these species. This dissatisfaction increasingly results in verbal disputes with groups and organizations who advocate for and facilitate the expansion.

Nature conservation activities can also involve significant economic and subsidy-related considerations. This means that such endeavours may not always be purely philanthropic or selfless volunteer efforts.

The Life of the European Beaver...

...is incompatible with human life in urbanized areas

Reluctance to address and concealment of cumulative systemic issues for the continued sustainable use of watercourses and surface waters, and the (in)action of the state and state administrative bodies and organisations in their thorough resolution.

Not only do many advocates of the SHP sector generally criticise the state for being insufficiently assertive or even negligent in the systemic resolution of serious issues directly or indirectly related to the condition of waters in our rivers, but also for frequently diverting public attention to substitute problems, such as criticisms of the utility of the SHP sector.

Examples of some serious and difficult-to-solve topics requiring more assertive systemic solutions:

A persistent issue is the contamination of water sources by nitrates from agricultural sources.

Vulnerable areas with waters polluted by nitrates cover 1.8 million hectares, which amounts to more than half of the agricultural land in Czechia.

Nitrates are pollutants that most commonly cause poor chemical water quality, significantly impacting water bodies from which water is extracted for human consumption. In many locations, water supply operators are forced to mix water from various sources to meet the nitrate concentration requirements in drinking water or to use technically complex and costly water treatment processes (the maximum limit for nitrates in drinking water, as stipulated by EU Directive 2020/2184 and Czech Regulation 252/2004 Sb., in its valid wording, is 50 mg/l).

Some areas in Czechia still rely on water supply systems providing drinking water under temporarily granted exemptions for the maximum nitrate limit by the Public Health Protection Authority.

Accidental Pollution.

In 2022, the Czech Environmental Inspectorate recorded 139 instances of hazardous substances leaking into surface waters and 9 instances into groundwater across Czechia. A total of 210 incidents meeting the legal definition of accidents under § 40 of the Water Act were logged by the Inspectorate. During the same year, other accidents were reported to the Inspectorate, but these were not included in the central accident registry due to their negligible scale and lack of impact on water quality.

The newly adopted so-called Accident Amendment to the Water Act (2024) is only one of the necessary systemic steps to address pressing issues in this area.

It is well known that the water stress of agricultural crops, as well as increased water runoff and the transport of pollutants from soil through subsurface drainage, can be significantly mitigated through water retention measures in existing agricultural drainage structures. In terms of reducing agricultural drought, measures regulating drainage outflow in drained soils offer enormous potential. In Czechia's conditions, regulatory drainage systems (i.e. using external water sources for irrigation) or systems with drainage outflow regulation (i.e. regulating indigenous water sources) represent measures with significant potential for retaining water within the soil profile, with volumes ranging from 800–1,500 m^3·ha^{-1}·year^{-1}. Of the total area of registered drainage structures in Czechia (1.2 million hectares), areas suitable for applying these principles are estimated at approximately 450,000 hectares (for drainage outflow regulation) and about 150,000 hectares (for regulatory drainage). The potential for effective drainage outflow regulation applies to a total of 195,000 hectares of existing agricultural drainage structures. Unfortunately, the state (Ministry of the Environment and Ministry of Agriculture) shows little significant activity in this crucial area.

Problems in Wastewater Treatment and Discharge.

Czechia fails to meet the requirements of Article 3 of the Urban Wastewater Treatment Directive in 186 agglomerations as adequate sewerage through collection systems is not ensured.

There is poor (virtually non-existent) management of rainwater, a lack of retention basins, and outdated sewerage systems.

There are approximately 7,000 overflow chambers in sewer systems across Czechia, with questionable regulation, control over their function and operation, and no retention basins to capture the initial rainwater runoff.

The major revision of this European directive, currently being finalised in 2024, will bring significant tightening or introduce limits on discharge parameters for nitrogen and phosphorus (nutrients), as well as the introduction of quaternary treatment—removing micropollutants (metabolic residues of pharmaceuticals, residues from the use of personal hygiene products, cosmetics, detergents, etc., as well as agrochemical products, micropollutants and polyfluorinated alkyl substances - PFAS). This directive is expected to come into full effect by 2027, even as Czechia fails to comply with many parameters of the current directive.

In Czechia, there are 7,000 overflow chambers in sewerage systems

The costs of adapting or constructing the necessary technologies will amount to hundreds of billions of CZK, which will almost certainly not be feasible to pass entirely onto end-users through wastewater fees.

Source: Water Management Status Report 2022 (Ministry of Agriculture)
State of the Environment Report 2022 (Ministry of the Environment)

Annex 9

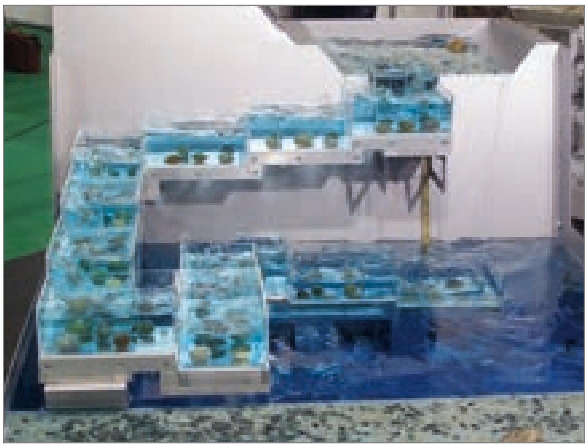
Modifications of Transverse Structures in Watercourses to Ensure Migration Connectivity for Aquatic Fauna and Water-Dependent Organisms

"Building fish passes is less challenging than operating and maintaining them properly".

In accordance with European legislation, steps are gradually being taken to make the cross barriers (steps), i.e. mainly the construction objects of the watercourse rising facilities on our watercourses, passable for migration. This mainly involves the construction or modification of these steps, commonly referred to as fish passages. Currently, a wide range of continuously improving technical solutions is available, which can be adapted to the specific conditions of watercourses to effectively mitigate the impassability of these obstacles for aquatic animals and organisms.

Enabling migration in watercourses for fish and other aquatic organisms also brings certain risks that have not yet been thoroughly investigated. Increased migration connectivity, for example, significantly raises the risk of greater spread of diseases and parasites affecting fish and aquatic organisms (e.g., crayfish plague) and facilitates the unwanted spread of invasive, non-native, or undesirable species. There are also cases where fish populations migrate "upstream" in search of cleaner water and better living conditions.

A potential solution to this issue could involve integrating approximately 200 selected existing weirs, which are currently unused for energy production, into acceleration zones for the development of SHP. Utilising the hydro-energy potential of these zones could be contingent on simultaneously implementing solutions that ensure the connectivity of these transverse structures for bidirectional fish migration and aquatic fauna, as well as facilitating recreational navigation.



Fish passage design is addressed by leading experts

Not every fish passage is as optimally designed as this one

Even SHP micro-sources are designed sensitively with respect to the surrounding environment

There's not always enough space

Annex 10

Source: ERÚ (OTE)

STATISTICAL DATA ON SHP

Data as of 31 December 2023

1) A total number of SHP in Czechia:	1 361

2) Total number of SHP holders in Czechia:	1 038
Natural persons (NP)	649
Legal entities (LE)	389

3) Number of SHP holders by power categories

Installed capacity (MW)	Number of holders (rows cannot be summed, as some holders own multiple SHPs and are included in multiple categories. NPs and LEs can be summed)			
od	**do (inclusive)**	**FO**	**PO**	**Celkem**
0	0.035	350	67	417
0.035	0.05	125	46	171
0.05	0.1	127	102	229
0.1	0.5	89	194	283
0.5	1	2	33	35
1	5	0	22	22
5	10	0	8	8

4) Number of SHP holders by the number of plants

Number of plants				
From	**To**	**NP**	**LE**	**Total**
1	1	591	317	908
2	2	45	43	88
3	3	11	9	20
4	4	1	3	4
5	9	1	8	9
10	100	0	9	9

5) Number of SHP holders by power categories

PLANTS					
	Number of Plants				
Installed Capacity (MW)	2019	2020	2021	2022	2023
0 - 0.035 inclusive	540	520	514	494	451
0.035 - 0.05 inclusive	183	181	184	185	180
0.05 - 0.1 inclusive	278	276	273	269	261
0.1 - 0.5 inclusive	350	356	356	359	355
0.5 - 1 inclusive	53	53	54	53	54
1 - 5 inclusive	51	51	51	51	50
5 - 10 inclusive	10	10	10	10	10
Total	**1 465**	**1 447**	**1 442**	**1 421**	**1 361**

6) Total installed capacity of SHP by power categories

TOTAL INSTALLED CAPACITY (MW)					
Installed Capacity (MW)	2019	2020	2021	2022	2023
0 - 0.035 inclusive	11	10	10	10	9
0.035 - 0.05 inclusive	8	8	8	8	8
0.05 - 0.1 inclusive	21	20	20	20	19
inclusive	80	81	82	83	82
0.5 - 1 inclusive	39	39	39	39	40
1 - 5 inclusive	120	120	120	121	119
5 - 10 inclusive	75	75	75	75	76
Total	**353**	**354**	**354**	**355**	**353**

7) Total installed capacity of SHP by power categories

GROSS ELECTRICITY PRODUCTION (MWH)					
Installed Capacity (MW)	2019	2020	2021	2022	2023
0 - 0.035 inclusive	26 252	29 932	31 230	25 386	27 661
0.035 - 0.05 inclusive	21 414	23 877	26 228	22 488	24 326
0.05 - 0.1 inclusive	56 156	65 421	69 130	57 821	62 907
0.1 - 0.5 inclusive	245 534	272 928	295 654	258 510	285 567
0.5 - 1 inclusive	112 677	131 581	146 117	120 747	140 402
1 - 5 inclusive	403 160	465 271	471 645	413 437	441 851
5 - 10 inclusive	213 524	238 699	253 139	231 132	243 706
Total	**1 078 718**	**1 227 710**	**1 293 142**	**1 129 521**	**1 226 420**

8) SHP 2023 – Number, installed capacity, production - narrowed categories

Installed Capacity	No. of Plants	Total Installed Capacity	Gross Total	
0 - 0.1 MW	892	36	114 893	(average 40 kW/SHP)
0.1 - 1 MW	409	121	425 969	(average 297 kW/SHP)
1 - 5 MW	50	119	441 851	(average 2390 kW/SHP)
5 - 10 MW	10	76	243 706	(average 7594 kW/SHP)

9) SHP by power categories 0 – 2, 2 – 10 MV

Number of Plants					
Installed Capacity (MW)	2019	2020	2021	2022	2023
0 - 2 inclusive	1 424	1 405	1 400	1 379	1 319
2 - 10 inclusive	41	42	42	42	42

Total Installed Capacity (MW)					
Installed Capacity (MW)	2019	2020	2021	2022	2023
0 - 2 inclusive	188	187	188	188	185
2 - 10 inclusive	165	166	166	167	168

Gross electricity production (MWh)					
Installed Capacity (MW)	2019	2020	2021	2022	2023
0 - 2 inclusive	568 243	647 059	684 431	587 842	649 898
2 - 10 inclusive	510 476	580 651	608 711	541 678	576 522

10) New SHPs

SHPs newly commissioned in 2021		
Name of SHP	**River**	**Installed electrical power (MWe)**
MVE Rosice - Bílá voda	Bílá voda	0.00750
MVE Petrovický mlýn	Losinský potok	0,00220
MVE Ledečko	Sázava	0.03700
MVE Karas	Blanický potok	0.02800
MVE Jesenice	Želivka	0.40000
MVE Dubí	Bystřice	0.20100
	Total	**0.676 MW**

SHPs newly commissioned in 2022			
Name of SHP	**River**		**Installed electrical power (MWe)**
MVE Kunovice 12	Ostružná, Kunkovický potok		0.02200
MVE Mostky (Květoňov) p.č.181	Kamenice		0.02200
MVE Oslavany I	Oslava		0.07500
MVE Podhora	Teplá		0.02200
		Total	**0.141 MW**

Comments on SHP Statistical Data as of 31. 12. 2023

1) Out of the total 1,361 SHPs, two-thirds (892) have an installed capacity of up to 0.1 MW. In the category of SHPs with the lowest installed capacities of up to 35 kW, there has been a consistent decline in numbers since 2018, as their operation ceases to make economic sense (2018: 1,468 SHPs; 2023: 1,361 SHPs).

2) The total installed capacity of the 892 SHPs with up to 0.1 MW is 36 MW, which represents 10.2% of the total SHP capacity.

3) The electricity production of all SHPs up to 0.1 MW amounted to 114,894 MWh in 2023, accounting for 9.4% of the total production from SHP.

4) The largest share in the SHP sector is held overwhelmingly by entities owned by or with significant state participation: the state enterprises group Povodí and the ČEZ Group operate over one-third of the SHP capacity and production (approximately 120 SHPs with a total installed capacity of around 123 MW). In the case of Povodí, revenues from operating their 106 SHPs with a combined installed capacity of 56 MW form an important part of their income and financial management (e.g., CZK 618, 000, 000 in 2022—more than 10% of total revenue for the River Basin Enterprises).

5) In the highest capacity category of SHPs (5–10 MW), there are only 10 plants, with a combined installed capacity of 76 MW. However, these plants produce 243,706 MWh annually—more than double the production of the hundred times larger category of SHPs with up to 0.1 MW (114,894 MWh).

6) In the ownership structure of SHPs with capacities up to 0.1 MW, the majority of owners are natural persons. In the 0.1–1 MW category, the owners are predominantly legal entities, while in the 1–5 MW and 5–10 MW categories, SHPs are exclusively owned by legal entities..

7) Among natural persons owning SHPs, a significant portion consists of either original owners or new acquirers of historical sites where water energy has been utilised for centuries, particularly former grain mills.

In the category of legal entities, the owners of SHPs include a diverse range of subjects: state enterprises group Povodí, the ČEZ Group, E.ON, various water and sewage companies, a university, several fishery enterprises, water companies, water treatment plants, operational grain mills, one city and several municipalities, as well as, for example, the Cistercian Abbey in Vyšší Brod, which operates an SHP in its historical location (Annex 2).
In addition, some companies (fewer than ten) formed by private investors also operate in the SHP sector. These legal entities own and operate SHPs, making up another significant share of the sector in terms of both numbers and installed capacity, with each company managing plants with capacities in the range of several megawatts.

Annex 11

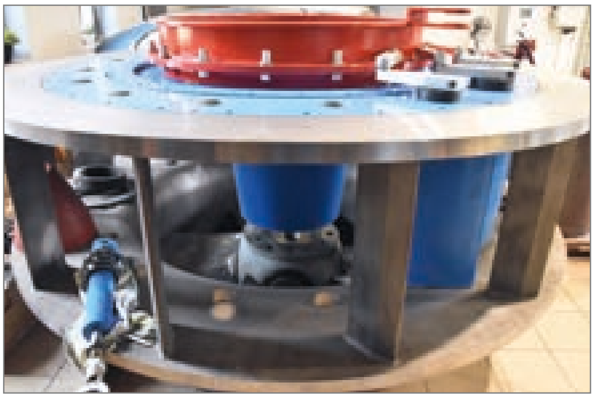
Realistic and Unrealistic Possibilities for Further SHP Development

Based on several years of data collection, continuously updated through an extensive survey conducted both among members of SPVEZ, z. s., and outside this group, an estimate of the realistic development potential of SHPs for the next decade has been established. The entire process of data collection and evaluation was significantly complicated by the fact that it often involved highly sensitive internal business information. For this reason, such data were converted into general, non-specific tabular estimates. This estimated development is further conditioned by the fulfilment of several direct and indirect factors that will significantly influence the actual outcomes. These factors include primarily the improvement of legal stability in this sector and the acceleration of permitting processes. An important supporting external factor will also be the broader societal recognition and understanding of the benefits and importance of further potential development in the SHP sector.

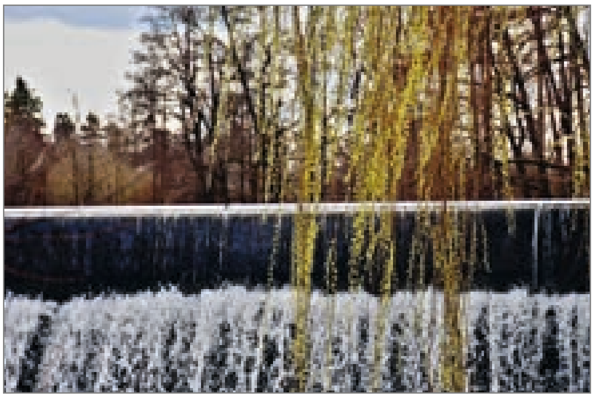
Realistic Potential for SHP Development

0 – 0.035 MW	(average 0.001 MW)	1 000 – 2 000 pcs	10 – 20 MW
0.035 – 0.1 MW	(average 0.06 MW)	50 – 100 pcs	3 – 6 MW
0.1 – 0,5 MW	(average 0.2 MW)	24 – 30 pcs	4.8 – 6.0 MW
0.5 – 1.0 MW	(average 0.7 MW)	8 pcs	5.6 MW
1.0 – 5.0 MW	(average 3.0 MW)	3 – 5 pcs	9 – 15 MW
5.0 – 10.0 MW		0 pcs	0 MW
TOTAL			**32.4 – 52.6 MW**

A separate chapter in the further potential development of SHPs is the utilisation of so-called hidden energy, which is contained in as-yet untapped discharges from various drainage systems, potable water networks, wastewater systems, and other industrial systems. These opportunities are not included in the aforementioned estimates for SHP development due to the lack of relevant statistical data.



Existing technical solutions are of top quality



In Czechia, there are still sites with concentrated gradients that remain without energy utilisation

Factors Excluding or Questioning the Feasibility of Specific SHP Projects

- Economic unviability.
- Project locations within national parks and their protected zones.
- Unresolvable complex property ownership issues in the respective locations.
- Opposition from local governments–zoning plans excluding the implementation of specific types of projects.
- Expansion of existing SHPs that would require new (and stricter) water rights permits.
- Practices of watercourse administrators (e.g., Povodí Moravy, s.p.) issuing negative opinions on diversion SHP projects with intake and discharge channels longer than 100 metres.
- Increasingly restrictive legislation on SHPs, particularly rendering projects with the smallest outputs unfeasible.
- Projects with an elevated risk of potential negative environmental impacts.

Source: Internal SPVEZ Survey

In addition to the historically valuable equipment in operation, there are other turbines in enthusiasts' warehouses, awaiting possible resurrection

Annex 12

Ponds and Pond Systems as Important Components of Watercourses

In Czechia, there is no official comprehensive registry of ponds. Public sources generally state that there are approximately 24,000 ponds in the landscape, covering a total area of 41,000 to 53,000 hectares (the difference in the given range depends on whether only the water surface or the entire cadastral area is included).
It is further reported that around 8,000 ponds have an area larger than 1 hectare.
The estimated volume of water retained in ponds is approximately 420 million cubic metres, along with 200 million cubic metres of sediment. Most ponds are used for production purposes, yielding an annual catch of around 19,000 tonnes of fish, 85% of which are carp.
During pond harvests, a significant portion of pond sediments is released into the watershed. The formation of these sediments is influenced by both pond management practices and erosion within the catchment. These sediments gradually travel through pond systems into watercourses. Ponds function within watersheds as phosphorus retention systems. For this reason, pond sediments can serve as a significant resource for improving agricultural soil quality.
However, the comprehensive and effective utilisation of pond sediments to enhance agricultural soil is hindered by numerous legislative, economic, technical, organisational barriers, and prejudices. Above all, the lack of willingness or capability of the state to support and address this issue effectively over the long term remains a major obstacle.

Source: "Ponds as Part of the Surface Water Network – Overview, History, Functions"
Author: RNDr. Josef Fuksa, CSc.

Most of our ponds are used for production fish farming

Annex 13

The Creeping Creation of Legislative Barriers to the Further Development of SHP

In recent years, there have been repeated and intensified attempts to restrict the field of SHP by tightening existing or introducing new restrictive legislative norms, regulations, decrees, methodological guidelines, and similar measures. The submitting initiators, mostly from the Ministry of the Environment, usually try to bypass public expert discussion and comments, if possible, in order to quickly and smoothly promote their plans.

4 concrete "model" examples

1) Attempt to legalise the right of water management authorities (under the pretext of combating drought) to amend or revoke existing valid water management decisions (water permits)..

This proposal was introduced as part of the so-called Drought Amendment to the Water Act, submitted to the legislative process by the Ministry of Agriculture. The Ministry of the Environment supplemented it with an amendment, introduced only during the second reading in the Chamber of Deputies of the Czech Parliament, thus bypassing the standard feedback process. If approved, this proposal would have granted water management authorities (and their officials) unprecedented powers. Fortunately, members of Parliament across the political spectrum recognised the dangers of this proposal—such as the unpredictable risks of potential corruption. Despite significant opposition from the Ministry of the Environment, this amendment was rejected thanks to extensive feedback from SPVEZ, z. s.

2) Amendment to the decree on the plans of the enterprises group Povodí.

The proposed Decree on Povodí Management Plans, submitted by the Ministries of Agriculture and the Environment and approved in 2022–2023, applies to the third planning cycle of Povodí's plans. It included an addition to §11, paragraph 2, letter c):

"(2) Permissible uses under §2, letter f) include:
c) the generation of electricity within water bodies classified as lakes and within water bodies classified as rivers, provided the installed capacity exceeds 2 MW and relates to a single obstruction on the watercourse".

The proposed decree includes among the "permissible uses" of surface water bodies – i.e., uses that may lead to hydromorphological changes in these bodies – in Section 11, Paragraph 2, Letter c), (only) "the generation of electricity within water bodies in the categories of lakes and rivers, where the installed capacity exceeds 2 MW, and this generation is related to a single obstruction on the watercourse".
For SHP under 2 MW, measures would have had to be implemented to remedy the "damaging" situation, i.e., achieving good ecological status equivalent to a natural surface water body. However, this requirement was unreasonable, unsupported by any legislative framework, and

could have proven catastrophic for SHP under 2 MW. It also remains unclear on what basis the 2 MW threshold was established. In Czechia, there are 1,319 SHPs under 2 MW (as of 2023), producing approximately 60% of the total electricity generated by SHP.
In this context, attention was also drawn to Section 12, Paragraph 3, Letter a) of the Water Act, which states that the water authority may change or revoke a permit for water use, even in proceedings under Paragraphs 1 or 2, if necessary to achieve the water protection objectives set in the Management Plan of Povodí (§ 24 and 26).
After a relatively complex and extensive counter-argumentation by SPVEZ, the proposed limiting threshold was removed.

3) Valid Limiting Conditions in Existing Management Plans of Povodí

The managers of our watercourses, usually the state-owned enterprise Povodí, issue binding opinions on the plans to build SHPs. In order for these opinions to be positive, they must be in compliance with the approved valid Management Plans of Povodí (these plans are approved by the government and are legally binding).
In the currently valid Management Plan for the river Morava (Povodí Moravy, s.p.), one of the documents titled "List of Measures" contains a chapter called "Correct Procedures in the Field of Water Protection as an Environmental Component" (MOV207501). Within this three-page document, the following conceptual measure is hidden in the text: "Do not permit new water use for exploiting the energy potential of watercourses, which involve diverting surface water from the watercourse and releasing it back into the watercourse section of 100 meters or more (derivational method), unless it is in the public interest". As a result of applying this measure, the development of additional SHP projects has effectively come to a halt in the area covered by Povodí Moravy.
It is also worth noting that Povodí Moravy operates the smallest hydropower plants in terms of capacity among all the Povodí companies. It has the smallest revenue from this segment and the poorest electricity sales compared to the other Povodí companies.

4) Rebuttable Presumption of Overriding Public Interest in RES

During the discussions surrounding the so-called Emergency Amendment to the Water Act, a group of MPs introduced, again during the second reading (thus bypassing prior public consultation), an amendment originating from the Ministry of Industry and Trade and the Ministry of the Environment. This amendment established a *"Rebuttable Presumption of Overriding Public Interest in the Planning, Construction, and Operation of Facilities Generating Energy from Renewable Sources"*, but specifically excluded new SHPs.
This discriminatory provision against the SHP sector could not be overturned due to strong resistance from the Ministry of Environment. The Ministry argued that the construction of new SHPs would result in excessive fragmentation of watercourses and deemed the construction of new cross-weirs in streams unacceptable.
Explanatory Argument by SPVEZ, z. s., which was not accepted:
In Czechia, there are currently around 5,000 existing hydro-energy-unutilised water structures—existing cross-weirs within riverbeds (a total of approximately 6,600 transverse barriers over 1 metre high, of which 1,361 are used by SHPs).

Out of the total number of existing cross-weirs, approximately 200 locations are currently viable for the installation of additional SHPs (see the Analysis of the Effective Use of SHPs from the Perspective of the Natural Potential of Watercourses as an Energy Resource, VRV Programme Project No.: TB010MZP066, Technology Agency of Czechia).

SPVEZ, z. s. also does not plan on the construction of new cross-weirs in streams.

In Bobrová in the Vysočina region, it would be enough to lift the sluice and release the water - if it were not for the prohibiting legislation

The idle unused site in Uherský Ostroh on the Morava River

Annex 14

State of Czech Surface Waters

Under the Water Act, the state of surface waters is understood as the general expression of the status of a surface water body, determined by its ecological or chemical status—whichever is worse. A "good chemical status" of surface waters refers to the chemical quality necessary to achieve water protection objectives as part of the environment, where concentrations of pollutants do not exceed environmental quality standards. These standards define concentrations of pollutants or groups of pollutants in water, sediments, or living organisms that must not be exceeded to protect human health and the environment. "Ecological status" refers to the expression of the quality of the structure and functioning of aquatic ecosystems associated with surface waters. Ecological status is assessed by comparing the current state with natural or near-natural reference conditions.
Between 2019 and 2021, a **good chemical status was not achieved in 57.6% of water bodies**. The key problematic indicators included polycyclic aromatic hydrocarbons, mercury, and brominated diphenyl ether in the "biota" matrix. **A good ecological status/potential was not achieved in 92.3% of water bodies**, with key issues being biological components and phosphorus.

Source: "Assessment of the State of Surface Water Bodies in Czechia for the Period 2019–2021" Authors: Petr Vyskoč, Hana Prchalová, Martin Durčák, Silvie Semerádová, Alena Jačková, Pavel Richter.

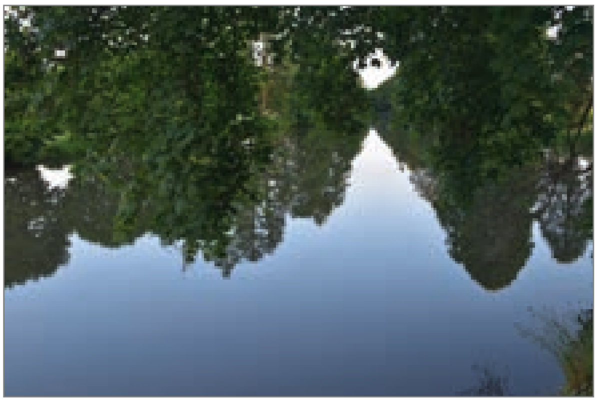
Hydrobiology Research on the Development of Biodiversity of Watercourses

Hydrobiologist Petr Pařil was part of an international team of around 100 scientists working on an extensive comparative study of the development of biodiversity in European watercourses. This study was published in the summer of 2023 in the journal Nature under the title "The Recovery of European Freshwater Biodiversity Has Come to a Halt". Another team of hydrobiologists from the Institute of Botany and Zoology, part of which was Marie Zhai, studied trends in biodiversity changes in Czech undisturbed (so-called reference) streams.
According to the Nature study, over the past 50 years (1968–2019), scientists observed a surprising increase in species diversity in flowing waters, particularly since 1990. Both the number of species and individuals increased during this period. Functional diversity, that is the diversity of roles species play within a community, also grew significantly (by approximately 2.5% annually). The abundance of species and individuals increased by about 1% per year on average. Sensitive insect species such as mayflies, stoneflies, and caddisflies returned to streams, although their diversity growth was less pronounced than that of other aquatic invertebrates. The observed increase in biodiversity was likely caused by improved water quality due to better wastewater treatment (based on EU legislation) and, to a lesser extent, river revitalisation efforts.

Longer-term trends in biodiversity development along the river continuum–from headwaters to large rivers–were described by Marie Zhai in her article *“Climatically Promoted Taxonomic Homogenization of Macroinvertebrates in Unaffected Streams Varies Along the River Continuum”*, published in Scientific Reports by the NATURE Portfolio. She explained: “Unlike the pan-European study, we analysed biodiversity changes separately from small streams to lowland rivers. This provides a clearer understanding of what is happening to species diversity in individual parts of the river continuum. At the same time, we accurately measured the changing environmental conditions and linked them to species changes. **We found that many of our species are increasing in abundance and spreading to new, previously unoccupied locations. Surprisingly, only a very small number of species, mostly cold-adapted ones, are declining so far. The increase in biodiversity observed at undisturbed Czech sites over the past two decades was truly unexpected. Moreover, some species have increased their abundance manyfold. It is surprising that this increase is almost entirely driven by native species, rather than invasive ones often linked to climate change”.**

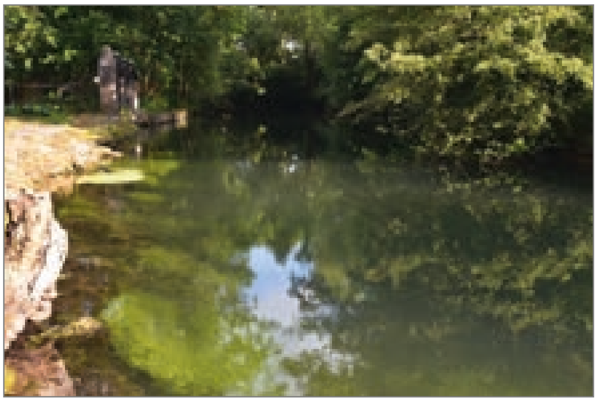
Source: “How Is the Biodiversity of Watercourses Developing? Hydrobiologists Seek Answers”. Author: Zuzana Jayasundera.

The above information shows that a good chemical and ecological status of Czech surface waters has not been achieved in more than half of the water bodies. In contrast, biodiversity (species richness and diversity) in watercourses has significantly increased in recent decades, despite frequent contrary claims by nature conservationists or Ministry of Environment staff.



Weirs accumulate water

More than half of our watercourses are not in good chemical and ecological condition



SHP inlets and outlets create their own habitats, called ecotones

Despite all the problems, the biodiversity of our watercourses is increasing

Annex 15

Example of a Micro Hydropower Plant in a Restored Historical Site, Historical Context

SHP Hradčovice – "SHP with a story"

In southeastern Moravia, on the Olšava River in the village Hradčovice, there is a historical mill site with a documented history stretching back to 1360. As early as 1247, the local lands came under the stewardship of the Velehrad Cistercians, who likely introduced their pioneering knowledge of using water power for mechanical operations (Annex 2).

In 1901, the local mill was purchased by Michal Stolař, a professional teacher from Napajedla, along with his wife, for 18,000 gulden from Svatopluk Vrána. Vrána had modernised the mill the year before with the assistance of the firm Hubner and Opitz from Pardubice but likely fell into unsustainable debt. Michal Stolař hired millers to manage the operation until 1929. He continued to upgrade the mill's equipment, installing water turbines and a dynamo to generate electricity, which was supplied to a nearby dairy. In addition to milling machinery, the turbines powered frame saws for wood processing.

In 1929, Michal Stolař handed the mill down to his eldest son, Jaroslav, and his wife, Marie, who hailed from a nearby mill in Biskupice. Jaroslav continued modernising the mill over the years. However, in 1941, Jaroslav was arrested by the Gestapo following a verbal denunciation by a fellow villager. He was sentenced to death and executed for sabotage during martial law—accused of grinding more flour for locals than allowed by rationing regulations. He left behind three children, including one-and-a-half-year-old Luděk. Jaroslav's widow, Marie, operated the mill alone until the early 1950s, when the Communist regime shut it down.

Over the following decades, the mill's feeder canal was filled in, the old weir removed, the Olšava River regulated, and a new stabilisation weir constructed at a different location.

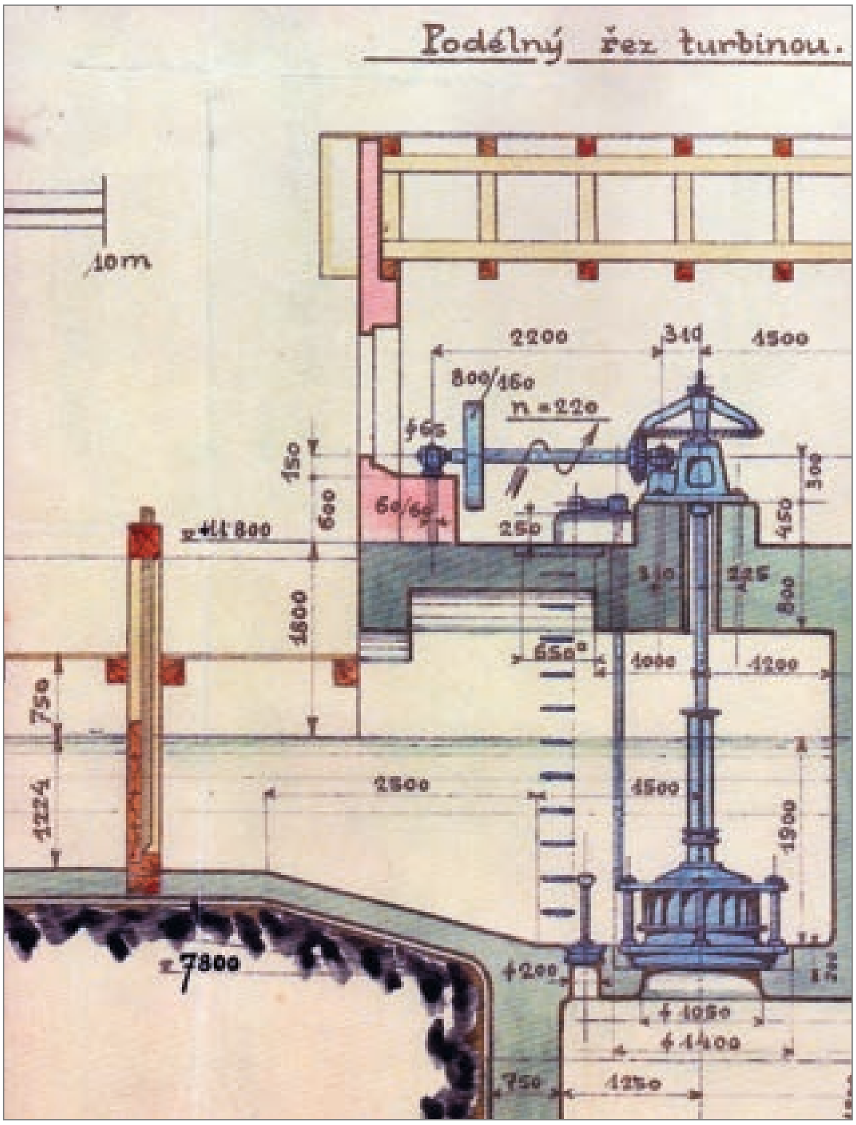
In 1980, as soon as Communist legislation permitted, Luděk Stolař, by then an adult and lifelong advocate of water energy utilisation, began the process of obtaining the necessary permits to build a micro hydropower plant. He was among the first in the then Czechoslovak Socialist Republic to take this step. Luděk benefited from the fact that he and his mother had safeguarded an unused Francis turbine from Josef Prokop & Sons, Pardubice, which his father had purchased during World War II but never installed. A second turbine, buried in the remains of the mill, was excavated and restored. The entire family, relying on their lifelong savings, constructed a micro hydropower plant with an installed capacity of 28 kW. The plant was built near the river, in the historic site with a centuries-long legacy, using authentic historical water turbines.

Luděk Stolař's mother, the widow of the executed Jaroslav, never remarried, raised her three children alone, and lived to the age of 94. She witnessed the commissioning of her son's micro hydropower plant, and her favourite activity in her later years was walking to the nearby plant and resting on a bench by the machine house.

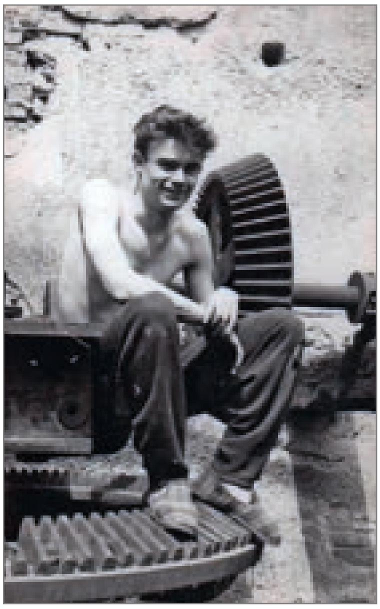
The circle had closed ...


Building of the former mill No. 51 in Hradčovice


Michal Stolař's family around the year 1918 – Michal Stolař on the left, his oldest son Jaroslav standing second from the left



In 1918 Michal Stolař installed a vertical fountain Francis turbine from the Union České Budějovice company in his mill. His grandson Luděk still operates this turbine on his SHP



Young Luděk Stolař with the turbine – beginning of the 1960s

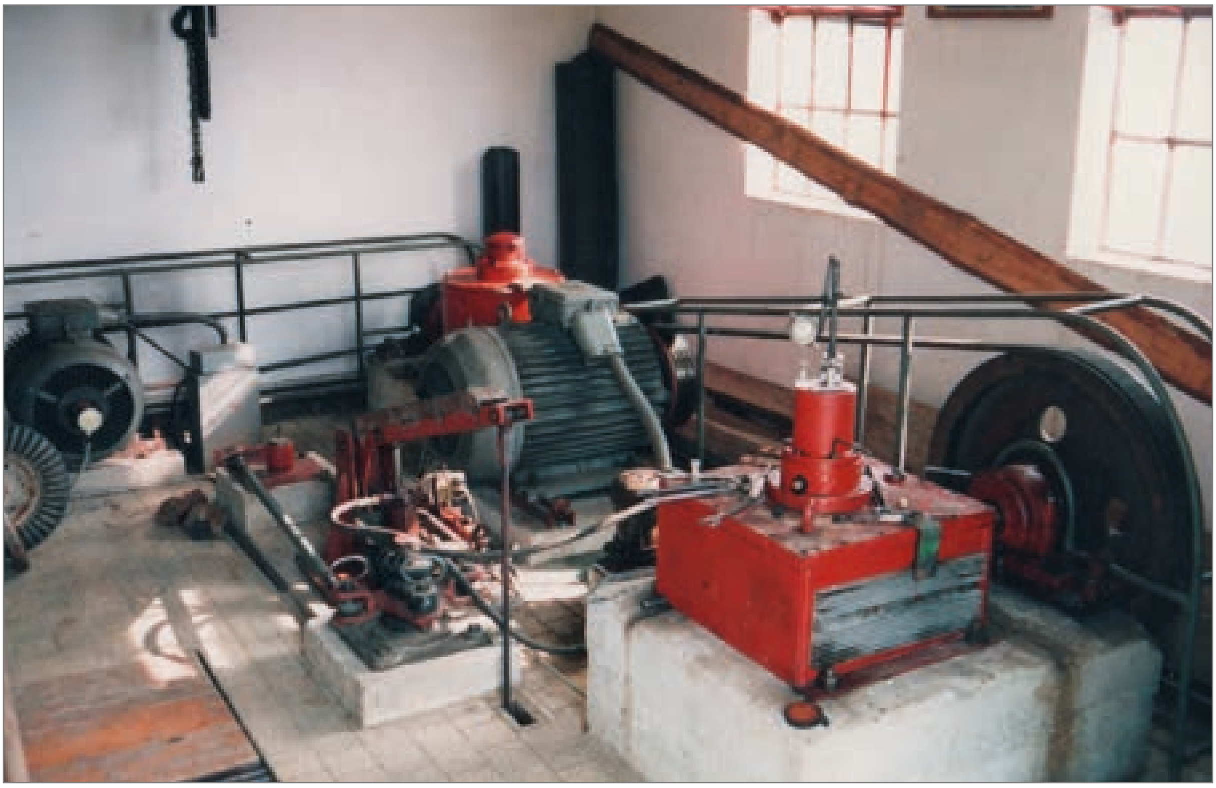
The whole family, including women, took part in building the SHP


Construction of the SHP took one year with the technology being prepared along the way

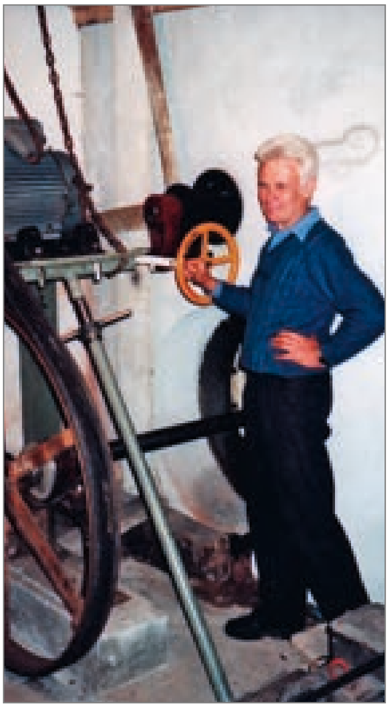
Business on "small water" is sometimes business on big water

Weaker natures could fall into feelings of doom

SHP's operation cleans waterways of floating debris



A glimpse into an SHP machine room



As time went on: "miller Luděk Stolař, a lifelong enthusiast of the use of waterpower"

SHP Hradčovice (Olšava) u Uherského Brodu

The bench now seats Luděk, his wife and granddaughter, carrying on in place of his mother

...and the water keeps flowing

SPVEZ, z. s. – RELIABLE POWER OF SMALL WATER

Members of the management of SPVEZ, z. s., during a professional excursion to SHP Přepeře

The Association of Entrepreneurs for the Use of Energy Resource (SPVEZ, z. s.)

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