boDEREC-CE
WORKPACKAGE T4

O.T4.3. TRANSNATIONAL STRATEGY FOR PPCP MITIGATION IN DRINKING WATER -TRAST-PPCP

PIP VIK SPLIT / CROATIA

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1. Introduction

In recent decades, the most important processes taking place in the world are climate change, rapid urbanization and population growth. These processes threaten basic human rights to use sustainable water resources, which is particularly evident during the ongoing COVID-19 pandemic, which has demonstrated the critical importance of water safety for disease prevention. The availability of safe and clean water supplies depends on how this water is managed after its use. Worldwide, 80% of wastewater flows untreated back into the environment, and nearly 2 million people are exposed to contaminated water from a variety of drinking water sources.

The European Union is making efforts to protect water resources through its legislative work and several activities. The most important legal act or rather the umbrella legal act in the field of EU water policy is the Water Framework Directive (further: WFD), which precisely defines the methods of assessing the status of water bodies, river basin management plans and monitoring of diffuse sources of pollution by so-called combined approach "(discharge and emission control). The WFD lays down a series of objectives, the ultimate one of which is to reach a" good "status of all water bodies within the EU territory. end, the WFD merged into its provisions the rules which had been set forth by prior Directives with respect to water quality and discharges into groundwater and surface waters.

Two other directives (Directive 91/271 / EEC on urban waste water treatment and Directive 91/676 / EEC on the protection of waters against pollution caused by nitrates from agricultural sources) that constitute major pieces of EU water legislation, both in terms of their important contribution to the protection of human health and the environment and by the level of judicial activity they have generated and will likely keep generating for the years to come, are dealing with very important types of discharges into the aquatic environment.

The main objective of boDEREC-CE is the design of an integrated management of waterworks that guarantees increased quality of drinking water. Work package (WP) 4 - Attenuating emerging contaminants - prospects and new approaches aims to provide waterworks with a tool to tackle PPCP issues by capacity building activities: a comprehensive catalogue of globally existing technical and management solutions for PPCP mitigation, demonstrating efficient and feasible solutions. Output for the WP 4 derives from the following activities: Establishment of Board of experts for institutionalization of future cooperation in CE, Elaboration of capacity building concept for waterworks and tackling future challenges – innovative legislative action.

Preliminary monitoring within the boDerec CE project in 8 pilot areas identified low concentrations of PPCP in 2/8 areas, while in the remaining 6/8 areas identified concentrations that could affect human health in drinking water. As the maximum permissible concentrations (MAC) of individual compounds (PPCP) in drinking water have not yet been precisely determined from the aspect of the impact on human health, further research is needed. Consequently, the determination of relevant MACs will be one of the most important points of future legislative changes on this issue and an important component of the Strategy. However, due to the above, it is necessary to significantly increase the existing fund of knowledge about PPCPs in drinking water. It is clear that the problem of PPCP in drinking water requires change, adaptation, that is, the optimization of existing resources dealing with the problem of public water supply. Each of the countries participating in the project has its own organization of water management

systems, but in all countries, there are waterworks (distributors of drinking water). Therefore, within the project, it was concluded that water supply, i.e., professionals from their ranks, will be the main bearers of activities for the adoption of the Strategy, i.e., action plans, of course with the expert assistance of external associates. In this regard, the question arises - what activities need to be further implemented in order to adopt the Transnational Strategy for the Reduction of PPCP in Drinking Water (TRAST-PPCP)? Each of the countries participating in the project has its own organization of water management systems, but in all countries, there are waterworks (distributors of drinking water). Each of the countries participating in the project has its own organization of water management systems, but in all countries, there are waterworks (distributors of drinking water).

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Therefore, at the very beginning of this document, we must state that our knowledge of PPCPs in water, that is, their impact on human health, is literally "in its infancy." But, on the other hand, the positive circumstance is that the problem is "initiated", so that practically every day new knowledge arrives that needs to be selected, processed and transferred to other partners. All these findings should ultimately lead to the change in legislation that is necessary given the (newly established) problem of the PPCP. The amendment in question must be fully in line with the principles of the WFD, and each of the Member States will incorporate it into national legislation, of course, respecting the specifics identified.

2. Further activities

All further activities are aimed at amending the legislation on the PPCP, and each Member State should do so at the level of national legislation, adhering to the "umbrella directive" (WFD). However, before these changes, it is necessary to carry out a number of activities, but it is positive that the problem of PPCP has been recognized, and that the first activities in this area are already being implemented. True, these activities are reduced to the activities of individual Member States (mainly Germany), but their synchronization can have much greater effects, which is one of the tasks of TRANS.

Despite the lack of individual actions, each Member State seeks to address priorities by updating the national legislative framework with previous priorities and monitors candidate pollutants from the watch list that are being considered for inclusion in Union-wide monitoring programs. However, most substances in use are not included in the legislation, with an emphasis on pharmaceuticals and personal care products (hereinafter: PPCP) that have been completely omitted by the legislator. As one of the key tools for the implementation of the Water Framework Directive, the River Basin Management Plans adopted by the Central European Member States do not provide any specific and explicit references to the PPCP, but only take into account priority substances and monitoring substances.

As already mentioned, the results of the PPCP monitoring so far divide the pilot areas into two main groups: a) areas where (for now) there is no need to think about reducing the concentration of PPCP in drinking water, i.e., the concentration is not too high and b) areas in which one should immediately think about how to reduce the concentration of PPCP in drinking water. Consequently, it is evident that different issues require different measures, but the question arises as to whether there are measures that are common to the areas listed under a) and under b), or to all pilot areas? The answer to this question is quite unambiguous and we can freely say that a full consensus of experts of various profiles involved in the project has been reached, and that is the continuation of targeted monitoring. Namely, monitoring definitely has its price.

Consequently, we believe that a combination of regulatory mechanisms, strategic management and technological and industrial solutions in terms of locating PPCP sources and activities to remove / reduce them in these locations as opposed to removing PPCP from wastewater or raw water through devices is the best way achieving a reduction and limitation of PPCP at source. Further activities will emerge from the results of targeted monitoring, so the continuation of targeted monitoring is marked as a "must have". In addition to monitoring, it is necessary to

introduce record keeping of sold (used) PPCPs, primarily through records of consumption of veterinary and human medicines containing higher concentrations of PPCPs.

2.1. Targeted monitoring and recording of environmental loads by PPCP

The most important step in monitoring emerging contaminants is sampling. Sampling is fundamental for the collection of representative data, so its main determinants will be harmonized among Member States. Sampling includes issues of frequency of measurements, which compounds are addressed and measures, from which matrices samples are taken, which minimum standards for sample storage and preservation should be applied, etc. Currently no Member State has developed regulations (or guidelines) specifically for PPCP or EC in general.

Given the indisputable importance of data collection for the purpose of making sound decisions in water management, Member States should regulate the implementation of monitoring in a way that will ensure a comprehensive legal framework, i.e. changes to it. An observation list is certainly included in this regulation. It is important to mention that no Member State has (yet) introduced the PPCP on this list, but there are some countries that have taken steps to monitor certain contaminants.

Austria monitors (at a lower level) pharmaceuticals and pesticides in groundwater and in drinking and waste water, but although this is not part of officially prescribed monitoring, it is a good start.

As for Germany, she identified wastewater from wastewater treatment plants as the main source through which most PPCPs enter the environment. Therefore, Germany has imposed an obligation on manufacturers and operators of wastewater treatment plants to apply the best available techniques and practices. This is especially true for water-threatening compounds, many of which include EC and PPCP. Any organization dealing with these compounds must ensure that there are no adverse effects on the quality of the surrounding water bodies. Another step towards proper pollution control and management of PPCPs is reflected in legislative changes regarding veterinary antibiotics. The German authorities are working on a strategy to reduce the amount of veterinary antibiotics used in intensive livestock farming, and in this regard have begun to take appropriate legal measures. According to Article 48 of the Arzneimittelgesetz (Law on Medicinal Products), quantities of veterinary medicinal products must be reported in order to allow an estimate of annual emissions. During the pharmaceutical approval process, a benefit-risk balance is derived for each compound that includes potential risks to humans and the environment.

The Czech Republic does not have specially regulated laws specifically regulating PPCPs, but recognizes, manages and treats PPCPs as hazardous waste. For example, under Czech law, medicines must be disposed of and eliminated in a way that does not harm the lives or health of people, animals or the natural environment.

Italy has established the certification of an environmental management scheme by which organizations assess the impact of their activities on the environment, inform the public about the current impact assessment and improve the efficiency of work in accordance with environmental requirements.

Also in Croatia, drug monitoring in 20 Croatian rivers was conducted once a year in 2012 and 2013 and four times in 2014, but it is not clear whether the study was part of official monitoring or scientific research. In any case, random monitoring practices and research studies from time to time are not sufficient for a proper and timely risk assessment.

Of course, "random monitoring", periodic studies and analyses do not represent a serious basis for the analysis of PPCP problems, so monitoring should be systematic, i.e., "targeted". In addition to “targeted” monitoring, it is necessary to have basic data on the production / loading of PPCP through individual preparations (usually drugs), in order to obtain basic information on the transmission of PPCP (where which PPCP ended, after use). Regarding "targeted" monitoring, monitoring at the outlet of the drug production facility would be an extremely important factor. Experiences of targeted monitoring to date at these sites have shown high concentrations of PPCP. Another important place for targeted monitoring is discharges from public and agricultural wastewater treatment plants. Namely, a good portion of PPCP from pharmaceuticals enters the environment through urine and faeces. Particular attention should be paid to the use of manure that is spread over the fields and thus facilitates the entry of PPCP into the water. The third way of releasing PPCP from medicines into the environment is landfills. Unfortunately, there is no data on more reliable monitoring of leachate quality from landfills, as required by the PPCP, but these sites should certainly be included in the monitoring plan, given their contribution to environmental pollution.

Furthermore, it is essential to take into account the EC load of pollutants in order to facilitate further steps in the monitoring process. Member States are aware of the importance of pollutant burdens, but have not made it legally binding to report on the amount of EC or PPCP sold and consumed. One of the basic tasks is to work on identifying the amount of pollutant, the place where it was detected and the general route and time, which is crucial to help decide where to conduct sampling and where to focus the mitigation strategy.

2.2. Setting preventive measures

As already mentioned, the key condition for the implementation of preventive measures is the most precise definition of sources, as well as the burden of PPCPs in the basin. These sources can be different - from wastewater treatment plants, industrial plants, hospitals, nursing homes, households, animal farms, agricultural land, ponds and the like. Also, the source of PPCP in water can be some periodic / seasonal activities in the pool, such as mosquito spraying, which is done seasonally, making it harder to detect. The common denominator for all these sources of PPCP are questions - whether preparations (containing PPCP) are used optimally, whether they can be replaced by less harmful preparations, whether unused preparations are properly disposed of / taken care of, etc.

Equally, it is not entirely clear what pharmacies continue to do with the collected drugs, or to whom they are handed over for further processing? According to available information, controlled burning of these drugs is a fairly effective measure, but we have no data on whether and where they are processed. Also, it would be advisable to raise the issue of the use of some drugs, especially antibiotics, to a higher level, and for the health and pharmaceutical professions to provide guidance to health professionals on their use and dosage.

Also, the (optimal) size of drug packaging can be considered, as well as extending their validity, all in order to reduce waste that, frankly, we do not know how to dispose of, or which we know, very likely, directly or indirectly, discard in water. Consequently, a program to reduce (quantitative) dispensing of drugs while monitoring the amount of drugs consumed, along with monitoring the collection of unused drugs with accompanying educational activities, is certainly the basis for a future action plan that would undoubtedly have significant effects on several fronts. Also, according to available information, pharmaceutical companies are increasingly aware of the negative public perception of the harmful effects of using some of their preparations on the environment. In this sense, they have recently become quite open to the so-called.

2.3. Setting the legaslative framework

The issue of PPCP in water bodies is a complex problem that requires more than one simple solution. In addition to emerging pollutants, which are regulated by the established list of priorities of the Water Framework Directive, the first step is the adoption of national legislation governing the PPCP. This should be further accompanied by the definition of environmental quality standards for PPCP pollutants in surface and groundwater bodies and the inclusion of PPCP pollutants in the assessment of the chemical status of water bodies as mandatory. For this to happen, new legislative action must be rooted in a data-based approach. The lack of mandatory monitoring and regular studies prevents Member States from determining the full extent of the problem. Currently available data on emerging contaminants hardly allow a broad overview of the overall level of water pollution. Limited data on PPCP concentrations preclude accurate assessment of removal efficiency and thus selection of appropriate technologies.

In order to obtain reliable, accurate data relevant to the time and place and to ensure a proper understanding of the occurrence of PPCP in the aquatic environment, targeted monitoring should be mandatory, regular and non-selective, which means that PPCP should be covered in full instead of individual compounds. treated as an exception. Provisions for thorough monitoring will make it possible to control the level of PPCP pollution and improve water purification methods that will lead to the elimination or reduction of PPCP content. Probably the most important step in monitoring contaminants that occur is sampling. Sampling is fundamental to obtaining basic data and as such should be subject to mandatory legal construction. Sampling should also be mandatory for surface and groundwater bodies in the case of PPCPs.

For now, only Germany has an official national standard (DIN) that is indirectly applied to PPCP in water, wastewater and sludge. Pollutant load reporting is another tool that needs to be regulated. In order to be able to estimate the annual emission loads, legislators, in cooperation with the hydrological, meteorological and seismological professions, should make solutions on how to estimate the amount of PPCPs sold and consumed. The Czech Republic and Germany stand out for that, although so far only veterinary drugs are in focus. Both Member States have established a legal obligation to report on the amount of veterinary products used in order to assess the annual amount of veterinary medicinal products entering the environment, and thus the risk that comes with it. In the future, it is necessary to establish national regulations on environmental risk assessment, as well as guidelines for the assessment of PPCP. In this regard, consistent, detailed and uncompromising source control is a direct and effective strategy in reducing the diffusion of PPCP in water bodies.

It is important to devise a legal construction in such a way as to close the regulatory loopholes that allow the approval of PPCP compounds without a detailed consideration of the benefit-risk balance of their impact on drinking water. So far, the current legal systems have not been designed to address micro-pollutants on this scale. Although there are certain remedies - such as unauthorized possession, negligence, interference and strict liability - that may be applicable to issues related to the emergence of PPCPs in water supply, they rely heavily on litigation that is often costly, lengthy and specific. In addition, success in litigation requires the plaintiff to prove a causal link between the PPCP in question and the alleged damage, i.e., which producer produced the PPCP, which is an obstacle that is difficult to overcome.

The main source of PPCP discharges into the aquatic environment are wastewater treatment plants. The efficiency of PPCP removal in sewage as well as in beverage treatment plants needs to be improved by introducing advanced wastewater treatment technologies to increase wastewater treatment rates and avoid direct discharges into water bodies. Any illegal discharge of wastewater into spring water should be strictly prohibited. In addition, the landfill, the use of livestock waste and the irrigation of rehabilitated water require a more careful evaluation with regard to the possible introduction of PPCP into the soil and groundwater environment.

Management and control of drinking water sources need to be strengthened by legal provisions prescribing the mandatory distance of drinking water sources from possible sources of pollution by PPCPs (e.g., wastewater treatment plants, livestock, hospitals, cosmetic plants). Expired medicines should be collected through the establishment of a drug management and return scheme, while antibiotic abuse should be strictly regulated and placed under constant surveillance in relation to the emergence of resistant strains of bacteria of public health concern.

2.4. Wastewater treatment to reduce PPCP

In terms of water purification, two types can be distinguished - those at the outlet of the wastewater treatment plant and those at the entrance to the public water supply system. With regard to wastewater from wastewater treatment plants, Germany has identified these plants as a major source of pollution by the PPCP, and in this regard has recommended that various manufacturers and operators of the plant apply "best available technologies and practices". Therefore, we consider the recommendations to manufacturers, especially pharmaceutical companies, to be extremely useful, as it effectively solves the problem at the point of origin.

The main goal is that every industrial plant should bring wastewater to the standard of municipal (domestic) wastewater before connecting to the public sewer, which is of course the obligation of producers / polluters. Since PPCPs have not been on the Watch list so far, they have not been a problem. But with future changes in legislation, the manufacturer decides how to reduce the amount of PPCP in its wastewater. The manufacturer can do this either by using new raw materials and a different technological process or by pre-treating the wastewater. The decision is up to the manufacturer and he needs to find a “cost-effective” way to reduce the amount of his wastewater to a given value. Given that the concentration of PPCPs is highest at these sites / plants, it is to be expected that PPCPs will be able to eliminate them in the most efficient way. No, it would certainly be useful to start with non-binding measures, advice, recommendations, etc. (soft law) first, in order to facilitate making legally binding decisions at some future time

(hard law). On the other hand, the removal of PPCP from the wastewater of wastewater treatment plants is very likely not possible for the following reasons: The existing technology in these plants is clearly inadequate to eliminate PPCP, so new technology or additional treatments should be introduced. The first problem that arises is - is there room inside the device for additional changes and measures? removal of PPCP from wastewater of wastewater treatment plants is very likely not possible for the following reasons: The existing technology in these plants is clearly inadequate to eliminate PPCP, so new technology or additional treatments should be introduced. The first problem that arises is - is there room inside the device for additional changes and measures? removal of PPCP from wastewater of wastewater treatment plants is very likely not possible for the following reasons: The existing technology in these plants is clearly inadequate to eliminate PPCP, so new technology or additional treatments should be introduced. The first problem that arises is - is there room inside the device for additional changes and measures?

Namely, these devices represent a functional unit and are designed for one level of problem solving, and each change in the envisaged concept opens up new problems that need to be solved. Second, even if there is room for additional changes, they represent additional costs. Regarding the possible replacement of the existing technology with a new one, a good part of the newer wastewater treatment plants (at least in Croatia) were built with co-financing from EU funds. This equipment has a lifespan of 25 to 30 years and the EU would most likely not look favourably on replacing the correct equipment. Equally, the approval of (non-refundable) EU funds is the result of complex analyses, primarily through feasibility studies, which included an accessibility analysis.

In addition, the water from the wastewater treatment plant to the drinking water goes through various processes, including those of self-treatment in the pool, so that the concentrations that enter the watercourse are significantly lower than those at the outlet from the device. Therefore, it is more efficient to purify exactly the amount of water we need at the entrance to the public water supply system. Consequently, we believe that when discharging wastewater, more attention should be paid to eliminating illegal discharges, where water is discharged without any purification and control, and not "upgrading" existing plants that, realistically, meet the purpose for which they were designed. As for the design of new devices, there are no obstacles to envisaging a reduction in the concentration of PPCP in wastewater as part of a single technological process, because when designed "from scratch", it is more likely to find optimal technologies.

As far as drinking water treatment is concerned, as already mentioned, water treatment before entering the water supply system is the "last line of defence" of drinking water quality, because after entering the water supply system, we can no longer treat it. For this group of measures, it is necessary to resolve the "preliminary issue" before choosing the technology, which is the already mentioned issue of maximum permissible concentrations of PPCP in drinking water from the aspect of harm to human health. Of course, these concentrations need to be legally defined, so the issue of the MDK is one of the most important related to future changes in legislation, i.e., the adoption of the Strategy. It will define "limit conditions", i.e., the concentrations of individual PPCPs that can be found in drinking water after raw water treatment. The choice of technology itself will depend on these concentrations, as well as the treatment capacity,

The catalogue of available technical solutions for reducing PPCP, developed as part of the boDEREC-CE project, provided an overview of available technologies for reducing PPCP in water, identified their main advantages and disadvantages, and provided approximate treatment costs per m^3. Of course, these costs will vary from case to case, and will directly depend on the PPCP concentrations at the inlet to the device, as well as the (future) defined maximum allowable concentration of each PPCP in drinking water. In any case, we want to emphasize that raw water purification is a relatively expensive measure that can greatly affect the affordability of public water supply as a whole, so the choice of technology should be given considerable attention.

One of the most important conditions that all water supply and sewerage systems built or renovated as part of EU projects had to prove in the feasibility study is the acceptability of the price of water supply and sewerage paid by end users. Affordability is expressed through the price of water supply and sewerage services of the average household in relation to the income of that household and currently this ratio can be max. 3%. The EU's position is that any increase in this ratio jeopardizes the sustainability of the services in question, as public water supply and sewerage lose their basic function if they cease to be available to a certain section of the population. In this context, one term will be mentioned that seems to have nothing to do with the technology of water purification at the entrance to the public water supply system, but will be seen to be very interconnected, and that is water losses from the public water supply system. Namely, if we analyse the treatment technology that has a specific cost of, for example, 0.5 EUR/m^3, it does not mean that the price of water increases by that much (0.5 EUR/m^3). Average water losses in the Republic of Croatia are 50%. This means that 50% of the quantities that have entered the water supply system are lost or do not reach the consumer. In other words, in order for the final consumer to reach 1 m^3 of water, we must capture and purify 2 m^3 of water at the entrance to the system, which means that the cost of purification is 1.0 EUR/m^3 of delivered water, instead of the originally declared 0.5 EUR/m^3. Thus, the difference in the incremental cost of additional purification is not less than 100%. This defines certain priorities, i.e., the parallel management of certain activities. Average water losses in the Republic of Croatia are 50%. This means that 50% of the quantities that have entered the water supply system are lost or do not reach the consumer. In other words, in order for the final consumer to reach 1 m^3 of water, we must capture and purify 2 m^3 of water at the entrance to the system, which means that the cost of purification is 1.0 EUR/m^3 of delivered water, instead of the originally declared 0.5 EUR/m^3. Thus, the difference in the incremental cost of additional purification is not less than 100%. This defines certain priorities, i.e., the parallel management of certain activities. Average water losses in the Republic of Croatia are 50%. This means that 50% of the quantities that have entered the water supply system are lost or do not reach the consumer. In other words, in order for the final consumer to reach 1 m^3 of water, we must capture and purify 2 m^3 of water at the entrance to the system, which means that the cost of purification is 1.0 EUR/m^3 of delivered water, instead of the originally declared 0.5 EUR/m^3. Thus, the difference in the incremental cost of additional purification is not less than 100%. This defines certain priorities, i.e., the parallel management of certain activities. 0 EUR/m^3 of delivered water, instead of the originally declared 0.5 EUR/m^3. Thus, the difference in the incremental cost of additional purification is not less than 100%. This defines certain priorities, i.e., the parallel management of certain activities. 0 EUR/m^3 of delivered water, instead of the originally declared 0.5 EUR/m^3. Thus, the difference in the incremental cost of additional purification is not less than 100%. This defines certain priorities, i.e., the parallel management of certain activities.

On the other hand, it is a positive circumstance that in the case of Croatia (yet) one should not think about a device for purifying raw water, but that is why one should really think about remediation of losses. However, countries in need of raw water treatment should primarily look at the state of their systems in terms of losses, and decide on priority actions. The positive circumstance is that the water supply systems of these countries are in a much better condition than the systems in Croatia, so it is correct to assume that their water losses are much lower. Also, the selection of optimal technology can be done in parallel with the remediation of losses, but it is important to emphasize that, regardless of the state of losses, approach the design of the device after reducing losses to an acceptable level and enter in the calculation of actual treatment costs.

Based on the above, it is evident that experts within the water supply system will have an important role in making decisions related to water purification. In this sense, as part of the self-assessment process, it will assess its own capacity / capacity to select technology as well as to manage the future raw water treatment plant, taking into account not only the staffing but also the financial capabilities of the water utility. In this regard, we are of the opinion that each of the partner countries should decide when and how to start making the devices.

Our recommendation is to pay due attention to the selection of optimal technologies, not by building pilot devices of larger capacities "in situ", but by building "micro pilot devices" of significantly smaller dimensions and capacities in laboratories within which all relevant parameters would be monitored. We propose the above primarily due to the reduction of testing costs, i.e., the possibility of testing several technologies at the same time under the same conditions. We also believe that work on testing and evaluating available technologies should be transnational in nature, such as the boDEREC CE project itself, in a way that avoids "duplication" of activities, ie that each partner country tests certain technologies and informs other partners. Equally, it is possible to trade those devices between Member states, to check specific boundary conditions.

Thus, the design of these micropilot plants should be minimalist, all with the aim of reducing costs and obtaining a wider range of results (parallel testing of multiple technologies) and of course sharing the acquired knowledge. Therefore, in the implementation of these activities, the greatest role is played by water utilities, who must use the method of self-assessment to assess their own capabilities and opportunities for their implementation.

In this sense, there is no doubt that it will be necessary to make changes to existing organizational structures in order to optimize them, primarily in terms of adapting to their future role in ensuring public water supply, which will also be defined by the Strategy. Finally, the Strategy itself is expected to, based on the conducted analyses and lessons learned, make quality proposals for amending the legislation on the reduction of PPCP in drinking water.

3. Conclusion

The aquatic environment in the EU and the world is under threat of deteriorating water quality as a result of excessive and negative anthropogenic impacts. Society develops linearly, while

nature is cyclical. In order to avoid overloading the environment, it is necessary to respect natural cycles and manage water resources accordingly.

The Water Framework Directive (WFD) has laid a successful foundation for the adoption and harmonization of the national legislation of individual Member States. The WFD's ultimate goal is to achieve at least "good status" of water bodies in the EU, but as the PPCP problem introduces new Watch List requirements, the problem of achieving "good status" becomes more complex. Therefore, it is necessary to adapt the legal legislation to the new knowledge that we have yet to reach. Thanks to previous activities, primarily monitoring, we divided the pilot areas into two basic groups - those in which a negligible concentration of PPCP in drinking water was found (2 out of 8 areas) and those in which concentrations were determined. require concrete measures to reduce them (6 out of 8 areas). Continuation of targeted monitoring in all areas,

It is also necessary to keep records of (quantitative) consumption of products containing higher concentrations of PPCP, especially veterinary and human drugs. After discovering the source and type of PPCP in drinking water, it is necessary to implement preventive and curative measures. Preventive measures are aimed at eliminating PPCP at the place of its origin / use through various activities that include monitoring and reducing consumption of products containing PPCP, introduction of alternative products, education, promotion, counselling, etc. Curative measures are technological measures to eliminate PPCP, both from wastewater treatment plants and from raw water at the entrance to the public water supply system, to concentrations that will be determined by the activities within the Strategy. These curative measures are associated with relatively high costs of construction and operation and maintenance, so they should be approached with extreme caution, especially since we have no experience in working with such facilities, i.e., there is no "case study" for this. "

In view of the above, the measures envisaged by the strategy will be a combination of preventive and curative measures, and this ratio will depend on the specifics of each individual area, which will be determined, among other things, by self-assessment by water experts. As a result of all the previously described activities, a Transnational Strategy for Reducing PPCP in Drinking Water will be developed, which, in addition to the previously described specific measures to reduce PPCP in drinking water, will include measures and activities to change and improve organizational structures. water supply, in order to adapt to the new tasks set before them, as well as changes in existing legislation in terms of reducing PPCP in drinking water.

While Strategy does not bring, national authorities and economic operators can focus on alternative strategies to respond to PPCPs in water by concentrating on removing / limiting PPCPs at source, which may include informing users on how to dispose of unused PPCPs, encouraging PPCP producers to develop recovery arrangements and appropriate care / recycling programs, inform medical staff and patients about the negative effects of PPCP on the environment, develop disciplined protocols for dispensing and inventory control to reduce disposal of unused drugs and reduce the volume of PPCP entering the system water.

4. References

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