BEST
Better Efficiency for Industrial Sewage Treatment

ASSESSMENT OF THE CURRENT SITUATION CONCERNING INDUSTRIAL WASTEWATER DISCHARGE INTO MUNICIPAL WASTEWATER SYSTEMS IN THE BALTIC SEA REGION

RIGA TECHNICAL UNIVERSITY

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Main outcomes of the assessment

According to the Council Directive of 1991 on urban wastewater treatment (91/271/EEC, Article 11 and Annex I part C), Member States shall ensure that, before 31 December 1993, the discharge of industrial wastewater into collecting systems and urban wastewater treatment plants is subject to prior regulations and/or specific authorizations by the competent authority or appropriate body. However, according to the information collected in this assessment from the countries surrounding the Baltic Sea, many countries have been postponing the implementation of this Directive in part of obligation of industrial wastewater pre-treatment in their national legislations. These delays have led to unregulated relations between municipal water utilities and industrial organisations discharging their wastewater into municipal sewerage for a long time. Therefore, it is challenging to change the strategy of industrial wastewater management after such delays and habits have developed. These issues are especially topical in the relatively new EU countries (Estonia, Latvia, Lithuania, and Poland) and in Russia. Accordingly, there is lack of good practices in regard to successful cooperation models on industrial wastewater pre-treatment. In the other Baltic Sea Region (BSR) countries (Finland, Denmark, Sweden, and Germany) the legislation has been in force for a longer period and there are long standing precedents of proper industrial wastewater management. With that, sound management practices are more widespread to provide guidance and good working models. In terms of this assessment, shortcomings in industrial wastewater management have been reported in all BSR countries.

Challenges and bottlenecks in the regulation of industrial wastewater management

The legislation on industrial wastewater discharge into municipal wastewater systems at the EU, national and regional levels **is in place** in most of the BSR countries. However, the **implementation of such laws presents challenges,** mainly due to the political will of the authorities to protect the industrial organisations and local businesses. Also, insufficient knowledge by water utilities and industrial organisations on industrial wastewater characteristics and its influence on the municipal wastewater system and receiving water bodies leads to a failure to protect the environment more effectively.

The results of the interviews with industrial organisations carried out in this assessment show that the legislative acts are pushing to have contracts with water utilities. However, there are numerous cases when these contracts are not implemented word for word due to various political and economic reasons within specific municipalities. For example, an industrial organisation is the only employer in the municipality, and thus the local government is afraid to pressure the organisation to meet the industrial wastewater requirements of the water utility because of a possible closure of the industry. Also, in most cases water utilities are owned by the municipality, therefore utilities may be under additional economic and political pressure.

Since indirect discharges are not in the scope of an integrated permitting system in numerous

BSR countries (Estonia, Latvia, Lithuania, Poland, Russia), current legislation **places most of the responsibility towards national and regional authorities** on **water utilities** regarding wastewater treatment efficiency and discharges to receiving water bodies **.** In these cases, legislation sets that industrial wastewater discharge is the subject of a contract between the water utility and the industrial organisation, and the limit values for effluent discharge into the environment at municipal wastewater treatment plants (MWWTPs) must not be exceeded. This means MWWTPs must take care of any pollution (evaluate it and include in the contracts) and bear responsibility towards the authorities and the environment. Nevertheless, water utilities are not capable of investigating processes and procedures at industrial organisations, and they are left to trust the declarations submitted by industrial organisations regarding their industrial wastewater discharge characteristic. In the case of an incident, the water utility is responsible for the environmental pollution and it might lead to criminal charges, while the industrial organisation is obligated to bear financial consequences only. The situation could be **improved by strengthening the power of environmental authorities** and controlling institutions, which have more rights to intervene in the operations of industrial organisations than water utilities. Also, the legislation on integrated permits of indirect industrial wastewater discharges should be revised in the Baltic States and Poland to ensure that water utilities have a partner with the very authorities which provide assistance in handling issues caused by improper industrial wastewater discharges into MWWTPs. The division of responsibilities is different in countries such as Finland and Sweden, where indirect discharges are the subject of an **integrated permitting system, which assigns responsibility to industrial organisations as well. Thus,** industrial organisations are obliged to comply with the requirements set by the environmental authorities and to bear responsibility in the case of an incident. Indirect wastewater discharges should be within the scope of an integrated permitting system. Moreover, the **control of industrial wastewater discharges** into MWWTPs would be considerably more efficient if carried out by influential environmental authorities instead of a water utility, as is the case now. This would minimize political and economic pressure on the municipality. The expenses of industrial wastewater analysis **should be covered by industrial organisations** instead of water utilities or environmental authorities, as it is in most cases.

Currently, in numerous cases and countries, if a water utility is not capable of forcing an industrial organisation to handle industrial wastewater in accordance with the requirements, it leads to exceedance of the limit values of the effluent discharge into the MWWTP and environmental pollution, for which no one is held accountable.

Main sources of highly polluted industrial wastewater and pollutants

The sectors of specific concern that can cause disturbances in operation and treatment efficiency at MMWTPs are the **Processing and preservation of meat and production of meat products (C10.1), Manufacture of dairy products (C10.5) and Manufacture of beverages (C11).** In some of the BSR countries problematic sectors include also the Manufacture of coke and refined petroleum products (C19), Manufacture of chemicals and chemical products (C20), Manufacture of fabricated

metal products, except machinery and equipment (C25), and Waste collection, treatment and disposal activities and materials recovery (E38). However, this selection is country specific. Since there are no nationwide databases in any of the BSR countries regarding industrial wastewater discharges into municipal wastewater systems, the overview of potential pollution of wastewater treatment systems and receiving water bodies is very limited. This assessment analysed the available economic data on industrial organisation in each of the BSR countries and asked experts to identify industrial sectors which discharge industrial wastewater into MWWTPs. Identified were at **least 3,281 industrial organisations** that can discharge industrial wastewater into MWWTPs and are potential sources of pollution in the BSR, and therefore, in terms of sectors, are of specific concern.

Overall, the situation concerning industrial wastewater discharge into municipal wastewater systems in the BSR is **country and region-specific**. Most of the industrial sectors selected by the experts as the ones of specific concern deal with **food and beverage production** (C10 and C11), and incidents of environmental pollution caused by these sectors are readily detectable, often visually or by smell. These two sectors are known contributors of pollution from past and existing experience, but they are not as consequential as other sectors in terms of the threat they pose to the environment in the long term (in regard to hazardous substances, pharmaceutical residuals, etc.)If there was more information on actual concentrations of priority and hazardous substances in industrial or municipal wastewater, there might be alterations in the selection of industry sectors of specific concern.

In Estonia, Latvia, Lithuania, Poland and Russia, **the priority and hazardous substances in most of the cases are not listed** in contracts or integrated permits, therefore, in most of the reported cases, they are beyond the scope of a water utility or environmental authority. In these cases, general legislative acts set limit values of such substances, but the values are not transposed to municipal regulations, permits and contracts. This must be given careful consideration and measures have to be taken to assess the risks of presence of such substances in every case of industrial wastewater discharge into MWTTPs. So far in most of the contracts the priority and hazardous substances are not mentioned at all, meaning that water utilities are taking the responsibility of treating them when detected in the municipal wastewater system. Finland, Germany and Sweden are good examples of where priority and hazardous substances are **partly listed in contracts and integrated** permits, however, the risk assessment of the presence of these substances in industrial wastewater could be greatly improved. The control and monitoring of priority and hazardous substances in industrial wastewater must be improved at all levels, meaning that environmental authorities, water utilities and industrial organisations should be aware of potential discharge of such substances and the imminent impact on municipal wastewater systems. However, the possibility of the presence, detection, environmental impact and financial investments in analyses and monitoring of any priority and hazardous substance must also be considered and evaluated very carefully at all levels (i.e. at the EU, national, and municipal levels). The legislation and actions should not lead to unreasonable expenses in terms of environmental protection.

Based on the EU legislative acts, **small organisations are out of the scope of environmental authorities and water utilities**, therefore a municipal wastewater system can be polluted without

anyone bearing consequences. In most cases, small organisations are also out of the scope of an integrated permitting system. However, what must be evaluated is the use of financial resources by water utilities to recognize the potential scope of each small-scale industrial organisation as a source of industrial wastewater pollution proportional to their actual threat to the MWWTP and the environment. In terms of the most hazardous industrial sectors such as the Production of pharmaceuticals (C21) or chemical products (C20), potential pollution even from small-scale organisations must be evaluated.

Cooperation and management models for industrial wastewater management

The **overall knowledge** of industrial wastewater characteristics, treatment technologies and impact on municipal wastewater systems, that **both industrial organisations and water utilities have, has proven to be insufficient.** Cooperation on industrial wastewater treatment should be carried out more effectively and rationally (e.g. cooperation on nutrient-rich industrial wastewater treatment). A good example of cooperation models was found in Finland, where water utilities and industrial organisations have regular (at least annual) meetings on industrial wastewater quality, pre-treatment, changes in production and potential increases or decreases in pollution. Both parties have acknowledged the potential threats and necessary activities. Some of the interviews done within this assessment have initiated cooperation, additional acknowledgment of potential threats and possible cooperativity and assistance between water utilities and industries across other BSR countries.

Unfortunately, in most cases **investments in industrial wastewater pre-treatment facilities are motivated by a fining system**, rather than a thorough understanding of the impacts of industrial wastewater and the role of industrial organisations. These organisations are ready to invest in industrial wastewater pre-treatment only when they are obliged to do so by law or by implementation of relatively high fines. An example of this is the fact that the introduction of new regulations and a fining system in Latvia was followed by immediate installation of pre-treatment facilities in most dairies and meat processing facilities.

As far as industrial organisations are concerned, **sludge is considered to be a waste product** and, in most cases, is simply sent to landfills or transported away from the industrial organisation without any sort of chemical or nutrient recovery. Yet, after interviews performed in the context of this assessment, some industrial organisations have changed their operations in a way that some of the liquids previously discharged to wastewater (e.g. blood) are now used as ingredients for new products. Although far from common, in some cases, in potentially polluted industries, sludge is collected, rightfully handled and deposited as hazardous waste. There might be many more organisations that create sludge which should be deposited as hazardous waste.

The interviewing process of this assessment has already raised greater awareness of industrial wastewater management in municipalities and industrial organisations. In the expert discussions on legislation in each of the countries, good **cooperation practices** between municipalities and industrial sectors **was a central and highly sensitive topic**. Insufficient understanding of the

matters and consequences for both parties gives rise to misunderstandings. Therefore, best practices of cooperation models between industrial sectors and municipalities will be collected and shared across the BSR countries to encourage their application elsewhere.

Improvements could be achieved by formalising the relationship between industrial organisations and municipal water utilities on commercial grounds, which means that there must be a contract between the two in order to avoid differing interpretations of legislative issues and ensure transparent cooperation on the industrial wastewater management model. Additionally, contracts should envisage and mandate that situations which are understood as incidents at industrial organizations be immediately reported to municipal water utilities. While these changes may be seen as widening the gap between the two sides, they are in essence an improvement as both sides will know the "rules" and have more defined understanding of what is expected of them and their responsibilities to each other.

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Introduction

Municipal wastewater treatment plants (MWWTPs) are primarily designed to remove nutrients and pathogens from wastewaters collected in the public sewerage systems. However, the municipal sewers may receive discharges not only from public buildings but also from industries such as chemical, pharmaceutical, and food producers. The hydraulic regime of discharge and the composition of these wastewaters are very different from that of the public sources. If the ways of handling these highly contaminated and concentrated wastewaters are not well synchronised between industrial wastewaters generators and the MWWTP, it may lead to failure of wastewater treatment and the degradation of the receiving water bodies. The outcomes are dependent not only on the regulations and guidelines, but also on cooperation modes between all stakeholders involved in managing this complex system.

The BEST project – Better Efficiency for Industrial Sewage Treatment funded by the European Regional Development Fund Interreg Baltic Sea Region programme, attempts to enhance collaboration between municipalities, industry, and waterworks, and to promote the best practices in the management of industrial wastewater, with the overall aim to reduce the risks related to the contamination of the Baltic Sea by pollutants from industrial wastewaters. There are four main results expected in the project:

1) **assessment of the current situation** concerning the industrial wastewater discharge into municipal wastewater systems in the Baltic Sea Region;
2) **capacity development** within wastewater treatment plants, industrial companies, and local and regional authorities to support more efficient co-treatment, management, and monitoring of industrial wastewater;
3) **investments in industrial** wastewater pre-treatment technologies, which demonstrates how cooperation between local and regional stakeholders and the implementation of the most suitable technological solutions result in better process control and treatment of industrial effluents, and thus reduces the load of nutrients and hazardous substances in outgoing wastewaters;
4) **guidelines** for improved management of industrial effluents, based on the project results.

In this report, the assessment of the current situation regarding industrial wastewater discharge into municipal wastewater systems in the Baltic Sea Region is presented.

MWWTPs are recognized as one of the pathways of both nutrients and hazardous substances entering the Baltic Sea. Even though many cities in the Baltic Sea Region (BSR) have a good level of performance of their wastewater treatment plants, challenges still exist. One of the key challenges is adequate monitoring and treatment of industrial wastewaters entering MWWTPs. Industrial effluents cause capacity problems for these treatment plants, inhibit biological treatment processes, and pollute wastewater sludge, preventing its recycling. Inadequately monitored and treated industrial wastewaters partly undermine the technical advances that have recently been achieved in

the municipal wastewater treatment across the BSR. One of the potential causes of inadequate industrial wastewater handling on the part of industrial organisations is insufficient knowledge of industrial wastewater characteristics, treatment options, and cooperation models between industrial organisations and municipalities. Lack of knowledge is demonstrated by all the involved parties: industrial organisations, water utilities, environmental agencies, and governmental institutions.

Currently, lack of coherent understanding regarding the varying circumstances and capacities around the BSR hinders efficient planning, resourcing, implementation and monitoring of industrial wastewater treatment at the local, regional and national level.

The overall aims of this report are:

1) to overview the situation concerning industrial wastewater effluent discharge into MWWTPs in the BSR, therein identifying the main polluters and their possible impacts on the treatment processes at MWWTPs;
2) to identify the existing best practices, challenges and bottlenecks in institutional capacity, stakeholder cooperation, management models and legislative implementation regarding water utilities, industrial companies, permitting and legislative authorities, in the scope of industrial wastewaters discharged into MWWTPs;
3) to demonstrate examples of well-established cooperation models on a local level between water utilities, industrial companies and permitting and monitoring authorities.

1. Methodology

This study is based on data collected from literature and a survey conducted by Riga Technical University and the responsible project partners in each BSR country. To conduct a comprehensive evaluation of the current situation in the BSR concerning industrial wastewater discharges into municipal wastewater systems, a two-stage questionnaire was developed. The first stage (Steps 1-3) of the questionnaire was implemented to assess the existing legal aspects of industrial wastewater discharges to the centralised municipal sewerage system in the BSR. The second stage (Steps 4-5) was provided to assess the industrial sectors of specific concern, which discharge highly polluted industrial wastewater into municipal wastewater systems (Table 1.1).

Table 1.1

Methodological steps used in the questionnaire

Steps	Description
1	Collection of information regards industrial companies in each country Within this step, the information regarding the total numbers of industrial companies in the country was collected. The classification of the industries is based on the Nomenclature of Economic Activities codes (NACE in the BSR and КДЕС in Russia). The collection of data was outsourced and provided by organisations which maintain the data base of economic activities in the given country. It means that the collection could be outsourced and done by an organisation that supports the database of the economic and statistic data. The industrial sectors that might have industrial wastewater and discharges to municipal sewerage systems have been selected by experts and are described in the template (Appendix I). To assess the situation in terms of each sector, the sector was divided into organisations on three scales: small, with annual turnover of EUR <100,000; medium, with annual turnover of EUR 100,000-500,000; and large, with annual turnover of EUR >500 000.
2	Collection of information on legislation and the management of industrial wastewater discharges into the centralised municipal sewerage system The collection of information on legislation was done by the responsible project partners by organising interviews or discussions with national experts. The recommended option was interviews and discussions with experts. In total, six main topics with specific questions were covered in the questionnaire (Appendix II). The national experts were represented by national lawmakers (e.g. ministries), institutions that ensure control of wastewater discharges (e.g. an environmental protection agency), water utilities (the association of utilities was preferred), industrial organizations (the association of industrial sectors was preferred), academic institutions (e.g. universities), and consultants and/or engineers from the field of industrial wastewater management.
3	Selection of industry sectors of specific concern in each country An additional selection of industrial sectors of specific concern in Estonia, Finland, Latvia, Lithuania, Lithuania, Poland, and Russia (Kaliningrad) was performed. During the interviews in STEP 2 and the analysis of industrial sectors in STEP 1, at least three additional industry

	sectors of specific concern in each country were identified as industrial sectors that might have the highest impact on centralised municipal sewerage collection and treatment systems. As food production (C.10) was selected as the most problematic industrial sector, it was further divided into subsectors. Of specific concern selection, two subsectors were selected within the food sector and at least one sector from other sectors mentioned in the questionnaire. In total, at least three industry sectors of specific concern were selected in each of the included countries.
4	Selection and interviewing of industrial organizations that represent industries within industry sectors of specific concern For each of the previously selected sectors, at least three industry sectors of specific concern in each country's nine industrial organizations, which have industrial wastewater discharges into the centralised municipal sewerage network, were chosen (three per each level of annual turnover). All the selected organizations were interviewed regarding industrial wastewater management within their organisations. Also, the utilities to which the selected organizations discharge their industrial wastewater were interviewed. The interview questions are included in the template (Appendix III). To maintain the anonymity and social status of the industrial organisations, all the interviews were anonymous.
5	Summarization of information All the data gained in the previous steps were summarized and submitted to Riga Technical University (RTU) to carry out the overall assessment of the current situation.

The questionnaire was distributed and collected through the responsible project partners for each BSR country as follows:

1) Denmark - John Nurminen Foundation and City of Helsinki
2) Estonia - Estonian Water Works Association (EVEL)
3) Finland - John Nurminen Foundation and City of Helsinki
4) Germany - John Nurminen Foundation and City of Helsinki
5) Latvia - RTU
6) Lithuania – Regional Environmental Center (REC Poland)
7) Poland - REC Poland
8) Russia (Kaliningrad) - State Autonomous Institution of Kaliningrad region "Environmental Center" (ECAT Kaliningrad)
9) Sweden - John Nurminen Foundation and City of Helsinki

2. Legislation

This section reviews current legislation in respect to relationship between municipal and industrial wastewaters both at national and EU level.

The industrial wastewater discharge into municipal wastewater systems is subject of EU, national and regional legislation. In 1991, the European Council published the directive concerning urban wastewater treatment (91/271/EEC), where Article 11 and Annex 1 prescribe that all "European Member States shall ensure that before 31 December, 1993, the discharge of industrial wastewater into collecting systems and urban wastewater treatment plants is subject to prior regulations and/or specific authorizations by the competent authority or appropriate body" and "Industrial wastewater entering collecting systems and urban wastewater treatment plants shall be subject to pre-treatment." Industrial wastewater entering collecting systems and urban wastewater treatment plants must provide pre-treatment as required in order to:

- protect the health of staff working in collecting systems and treatment plants;
- ensure that collecting systems, wastewater treatment plants, and associated equipment are not damaged;
- ensure that the operation of wastewater treatment plants and treatment of sludge is not impeded;
- ensure that discharges from treatment plants do not adversely affect the environment, or prevent receiving waters from complying with other Community Directives;
- ensure that sludge can be disposed of safely in an environmentally acceptable manner.

The EU legislation does not envisage any specific limitations for the industries discharging industrial wastewater into municipal wastewater systems. Yet, it prescribes that all industrial discharges into the municipal sewerage must be pre-treated and must not impact the work of the MWWTP.

2.1. European Union legislation regulating the operation of industrial organisations

To control industrial emissions, the EU has developed a general framework based on **integrated permitting**. This means the permit must take account of an industrial organisation's complete **environmental performance to avoid pollution** being shifted from one medium - such as air, water, and land - to another. Priority should be given to **preventing pollution** by intervening at the source and ensuring prudent use and management of natural resources.

2.1.1. Directive on industrial emissions (2010/75/EU)

The so-called Industrial Emissions (IE) Directive aims at reducing harmful industrial emissions across the EU. It introduces a framework for environmental permitting and establishes the **Best Available Techniques** (BAT) conclusions as a reference for setting permit conditions for industrial activities covered by the directive (energy, metal production and processing, minerals, chemicals,

waste management and other sectors such as pulp and paper production, slaughterhouses and the intensive rearing of poultry and pigs).

Industrial installations can only operate if in **possession of a permit** and have to **comply with the conditions** set therein.

The IE Directive also requires that the Member States set up a system of environmental inspections with site visits and ensure that the public has a right to participate in the environmental permitting process by granting access to permit applications, permits, and monitoring results. Competent authorities need to conduct **regular inspections** of the installations. The **public** must be given an early opportunity to **participate** in the **permitting process**.

Key term: Best Available Techniques (BAT) - the most effective techniques for preventing or reducing emissions which are technically feasible and economically viable within the sector.

Full text: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32010L0075

2.1.2. European Pollutant Release and Transfer Register (PRTR) (166/2006)

The European Pollutant Release and Transfer Register (E-PRTR) Regulation obliges major industrial installations and major wastewater treatment plants to **report releases** of certain **harmful substances into the air, water or ground**. The reporting obligation also concerns the volume and characteristics of the wastewater generated by an industrial plant and the conveyance of that wastewater into the sewer network. The regulation includes a **list of 91 substances** that should be reported if the limit values of the substance (in kilograms per year) are exceeded. Information gathered at the **national level** by EU countries and reported to the **European Commission** is fed into the **database** on a regular basis. This information is submitted annually to the competent national authority by the operators of the concerned establishments.

This EU electronic database is available to the public and should contribute towards **reducing pollution**. This register is available to the public **free of charge** on the internet. The information it contains can be searched using various criteria (e.g. by the type of pollutant, geographical location, affected environment, source facility, etc.).If an industrial plant falls under the E-PRTR Regulation, the information on pollutant release events is documented. Releases are reported when the level of emissions exceeds a certain threshold and they originate from one of the **65 activities listed.** The regulation does not set restrictions for the releases of the substances, however.

Full text: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32006R0166

2.1.3. Regulations on Registration, Evaluation, Authorisation and Restriction of Chemicals (1907/2006) and Classification, Labelling and Packaging of Substances and Mixtures (1272/2008)

The Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation

requires that industries manage the potential hazards from chemicals and provide safety information on the substances they manufacture and sell. The REACH Regulation aims to **protect human health** and the **environment** by ensuring greater safety in the production and use of chemical substances. It requires companies to **identify and manage the risks** linked to the substances they manufacture and sell in the EU. By the law of the European Parliament, this information must be submitted to the European Chemicals Agency (ECA), which collects information for its database **on substances** which are produced or imported (more than 1 tonne/annum per one operator) into the EU area. Registration requires that the manufacturers and importers of these substances acquire all necessary information on **the hazardous properties** of the substances, their methods of use, health and environmental impacts and safe usage. Downstream users of chemicals do not have to register, but they are obliged to use chemicals safely.

Unregistered substances may not be manufactured in the EU or imported into the EU.

Full text: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1580289432759&uri=CELEX%3A32006R1907

The Classification, Labelling and Packing (CLP) Regulation requires that manufacturers, importers or downstream users of substances or mixtures **classify, label and package their hazardous chemicals** appropriately before placing them on the market. When relevant information (e.g. toxicological data) on a substance or mixture meets the classification criteria in the CLP Regulation, the hazards of the substance or mixture are identified by assigning a certain **hazard class and category** (e.g. physicochemical, health hazard, environmental hazard). The hazard classes in the CLP cover physical, health, environmental and additional hazards. The CLP Regulation sets detailed criteria for the labelling elements: pictograms, signal words and standard statements for hazard, prevention, response, storage, and disposal, for every hazard class and category.

The main areas not covered by the CLP Regulation are: radioactive substances and mixtures, cosmetics, medicines and certain medical devices, food and the transport of dangerous goods.

Full text: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1580289607370&uri=CELEX:32008R1272

2.2. EU legislation on the co-treatment of industrial and municipal wastewater

2.2.1. Directive on urban wastewater treatment (91/271/EEC)

The Urban Wastewater Directive (UWWD) sets the requirements for concentration or percentage of reduction of discharges from urban wastewater treatment plants. The UWWD aims **to protect the environment** in the EU from the **adverse effects** (such as eutrophication) of urban wastewater. In essence, the UWWD states that EU countries must:

- collect and treat wastewater in urban settlements **with a population of at least 2,000** and apply **secondary treatment** on the collected wastewater;

- apply more advanced treatment in urban settlements with populations over 10,000 located in designated **sensitive areas**;
- guarantee that treatment plants are **properly maintained**, so as to ensure standards of performance under all normal weather conditions;
- take measures to limit the pollution of receiving waters from **storm water overflows** under extreme situations, such as unusually heavy rain;
- **monitor the performance** of treatment plants and receiving waters;
- monitor **sewage sludge** disposal and reuse.

As to co-treatment of industrial and municipal wastewater, the UWWD requires that **member states establish systems of prior regulation and/or authorisation for discharges of industrial wastewater into collecting systems**. Moreover, it stipulates that industrial **wastewater** shall be **subject to such pre-treatment as is required** in order to:

- protect the health of staff working in collecting systems and treatment plants;
- ensure that collecting systems, wastewater treatment plants and associated equipment are not damaged;
- ensure that the operation of the wastewater treatment plant and the treatment of sludge are not impeded;
- ensure that discharges from treatment plants do not adversely affect the environment, or prevent receiving waters from complying with other Community Directives;
- ensure that sludge can be disposed of safely in an environmentally acceptable manner

This directive is currently under revision.

Key terms: Secondary treatment- a process generally involving biological treatment, so that the requirements in Annex I of the Directive are accomplished.

Sensitive areas - natural waters which are found to be or may become eutrophic in the near future if protective action is not taken, or those which need more advanced treatment to reach compliance with other EU directives (e.g. the Bathing Water Directive).

Full text: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1580293753474&uri=CELEX:31991L0271

2.2.2. Directive on soil protection when sewage sludge is used in agriculture (86/278)

The Directive **sets limit values** for the concentrations of 7 heavy metals (cadmium, copper, nickel, lead, zinc, mercury, and chromium) in soil and **in sludge** for use **in agriculture** and bans the use of sewage sludge that exceeds maximum concentration limits.

Normally, **sludge has to be treated** before being used in farming. However, in some EU countries, farmers may be allowed to use untreated sludge if it is injected or worked into the soil. The Directive also stipulates in which situations sludge may not be used in farming at all.

Responsibility for ensuring that agricultural use of sludge does not exceed the legal limits lies with the national **authorities**, which have **to sample and analyse both sludge** and soils it is used on and keep a record of: how much sludge is produced and used in farming, its composition and properties, how it has been treated, where it is used and who uses it.

Key terms: Sewage sludge - sludge from domestic or urban waste treatment plants, septic tanks, and similar sewage treatment plants.

Treated sludge - sludge that has undergone biological, chemical or heat treatment, long-term storage, or any other appropriate process to make it significantly less likely to ferment (reducing its risk to human health).

Full text: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1580294559672&uri=CELEX:31986L0278

2.3. EU legislation on aquatic environment

2.3.1. EU Water Framework Directive (2000/60/EC)

The EU Water Framework Directive (WFD) sets out rules to halt deterioration in the status of EU water bodies and **achieve a 'good status'** for rivers, lakes and groundwater by protection, restoration, pollution reduction and by guaranteeing sustainable water usage.

The WFD outlines that the Community Water Policy should be based on **a combined approach using control of pollution at the source** through setting discharge limit values and environmental quality standards. Towards this aim, the WFD includes a list of **priority and hazardous substances,** the emissions and discharge of which should be ceased or phased out.

The legislation places clear **responsibilities on national authorities**. They have to:

- identify the individual river basins on their territory — that is, the surrounding land areas that drain into particular river systems;
- designate authorities to manage these basins in line with the EU rules;
- analyse the features of each river basin, including the impact of human activity and an economic assessment of water use;
- monitor the status of the water in each basin;
- register protected areas, such as those used for drinking water, which require special attention;
- produce and implement 'river-basin management plans' to prevent deterioration of surface water, protect and enhance groundwater and preserve protected areas;
- ensure the cost of water services is recovered so that the resources are used efficiently, and polluters bear the financial consequences;
- provide public information and consultation on their river-basin management plans.

Full text: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02000L0060-

20141120

2.3.2. Directive on setting environmental quality standards in the field of water policy (2008/105/EC)

This Directive sets environmental quality standards (EQSs) for **priority substances and eight other pollutants.** These substances include cadmium, lead, mercury, nickel, and their compounds; benzene; polyaromatic hydrocarbons (PAH); and several pesticides. Several of these priority substances are classified as hazardous. The EQSs are concentration limits which **must not be exceeded** if a good chemical status of a water body is to be met. More specifically, there are thresholds for the average concentration (to be calculated from measurements over a 1-year period) and for the maximum allowable concentration (to be calculated from any single measurement) of a substance.

EU countries **must ensure compliance with the EQSs**. They must also take measures to ensure that the concentrations of substances that tend to accumulate in sediment and/or biota do not increase significantly. A full list of the hazardous and priority substances and the applied limitations are compiled in **Appendix IV.**

Full text: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1580301426336&uri=CELEX:02008L0105-20130913

Directive 2013/39/EU further **updated the EQSs** and required that the Commission prepare a watch list of emerging pollutants (established by Implementing Decision (EU) 2018/840). This Directive included **12 newly identified** priority substances, whose EQSs have to be considered when drawing up **supplementary monitoring programmes** and in preliminary programme measures to be submitted to the EC.

Directive 2013/39/EU also requires that the EC establish a **watch list** of substances for which EU-wide monitoring data are to be gathered to support future prioritisation exercises. The compounds included in the watch list are to be monitored and may eventually be classified as priority substances.

Full text: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1580304139426&uri=CELEX:32013L0039 and https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1580304195404&uri=CELEX:32018D0840

2.4. HELCOM Recommendation (28E/5)

These Recommendations on the efficiency of municipal wastewater treatment strive to limit pollution by effective treatment of municipal sewage. Urban (municipal) wastewater derived from households (domestic wastewater) or industrial enterprises should be collected and treated before being discharged into water bodies. By-passes may only be used in emergency cases.

Based on the BAT and BEP, limit values for the substances harmful to the receiving waters which cannot be treated in the municipal wastewater treatment plants or which are harmful to the sewerage systems or the processes of the treatment plant should be established separately for industry and other relevant sectors discharging indirectly. The recommendation also sets strict requirements for treatment results and pollutant reductions for household and urban wastewater effluents of similar type depending on the size of person equivalents in the area of the concerned central sewerage system.

Full text: http://www.helcom.fi/Recommendations/Rec%2028E-5.pdf

2.5. Conclusions on EU legislation

All countries surrounding the Baltic Sea, except Russia, are members of the EU and are obliged to follow the laws and regulations of the EU. It is evident that **industries can impact** and are impacting **municipal wastewater treatment plants** throughout the EU with industrial wastewater discharges which can contain a high organic content as well as various hazardous substances that exceed the regulated limits of their discharge. It is very important to be aware of all possible ways how industries impact centralized municipal sewage systems, municipal wastewater treatment plants, and eventually aquatic environments. Shared understanding of the basic regulations, terminology and having common ground are key to successful cooperation within the EU.

The main conclusions on EU legislation regarding wastewater and industrial wastewater discharges are as follows:

- **Industries** which discharge their wastewater into municipal centralized sewage network **are subject to environmental permits**.
- Before entering a municipal centralized sewage network, **industrial wastewater must be pre-treated** according to the permit conditions and limitations set by the municipal water enterprise which owns the sewage network, applying the best available techniques for its handling and treatment.
- Competent **authorities** need to conduct **regular inspections** of the installations.
- Industries which manufacture **chemical substances** are required to **identify and manage the risks** linked to the substances they manufacture and sell in the EU.
- Classification, packaging and labelling of chemical substances and mixtures are extremely important measures to prevent their possible negative impacts on centralized municipal sewage systems.
- The EU has established **a list of priority substances** and environmental quality standards, i.e. concentration limits, for these. A full list of the **hazardous and priority substances** and the applied limitations is compiled in **Appendix IV.**
- **Industrial discharges** entering municipal centralized sewage networks **can severely impact excess sludge** quality and utilization at municipal wastewater treatment plants, which can lead to the production of toxic waste.

- Municipal water enterprises EU-wide are responsible for their “end user” impact on the environment and aquatic bodies and are obliged to set appropriate limits on industrial discharges via contracts.

2.6. National and regional legislation in the Baltic Sea Region countries

The EU legislation in each of the BSR countries has been adopted in an individual manner, and numerous interpretations and assumptions have been made and implemented in each country. In the next chapters, the overview of national and regional level legislation on industrial wastewater pre-treatment and discharge into municipal wastewater systems and MWWTPs in each of the nine BSR countries is summarized.

2.6.1. Denmark

Regulation of wastewater is mainly based on the **Wastewater Order of 2017** and on the **Environmental Protection Act of 2019**. The responsible authority to adopt the EU Council Directive 91/271/ EEC is **the Ministry of Environment and Food,** which has also published guidelines for the interpretation of the legislation.

The concentration limits are the minimum requirements so an individual municipal council can tighten the requirements as a result of special protection considerations, and it can also impose discharge requirements for other relevant parameters.

The Wastewater Order stipulates that when setting permit conditions for the MWWTP, the municipal council must **ensure that the connection permits do not prevent** the MWWTP from fulfilling its permit for discharge and that the environmental quality requirements for the water area concerned are met. The Environmental Protection Act regulates that the Minister for the Environment and Food **shall grant companies authorization for the discharge of wastewater** and each municipal **council grants permission for the connection** of wastewater to plants belonging to its associated water utilities. It is stated that industrial wastewater supplied to the sewerage system must **be pre-cleaned as required and that** the best available techniques (**BAT)** be used.

If an industrial facility is or is going to be connected to a municipal wastewater collection network and MWWTP, the **municipality prepares a connection permit** , which may include requirements for wastewater quality, pre-treatment and quantity stricter than those stipulated by national legislation. Municipalities register new industrial and other commercial activities via several public databases. **Generally, a permit is unlimited in time.** However, the relevant supervisory authority can change the conditions of approval or prohibit the continued operation. The environmental permit is to be reviewed by the supervisory authority every ten years or when the European Commission has published a BAT conclusion in the Official Journal of the EU The approving and supervisory authority is the same body.

Households and industries are liable to pay a **national sewage tax** on the amount of discharged N, P and organic substances. The municipality can further impose special taxes for the discharge of wastewater into the municipal wastewater system if the wastewater contains higher concentrations of organic matter and nutrients than typical domestic wastewater.

The supervisory authorities are the Environmental Protection Agency (for entities that cause severe pollution) and local municipalities (for other entities). Discharges from industries are

monitored according to **a program agreed between The Danish Environmental Protection Agency (DEPA) and the Danish Society of Municipalities**, implying that municipalities have to inspect industries at a certain frequency. Major industries are requested to self-monitor and report their discharge regularly and the municipalities will receive the results. The analyses of the industrial effluent discharge to the municipal wastewater system are carried out by a registered laboratory. Furthermore, at their own initiative, municipalities can perform wastewater analysis of the effluent from industries or the sewerage system.

If any polluting conduct or breach of an environmental permit or environmental law is discovered, the supervisory authority **can issue operative orders or prohibition orders requesting the recipient to operate in accordance with legislation.**

Annual inspection reports are published in a public database: www.tilsynsdatabasen.dk.

The cooperation between the industrial organisation, municipality, and water utility is very active when a new connection is to be made to the municipal sewerage system. It involves exchanges of information and consultations with the water utility in regard to permit conditions. The general procedure is that before an industry or any commercial establishment (even a small one) releases its wastewater into a system, it makes an application to the municipality. The municipality then sends a draft of the proposed permit to the wastewater utility. Once checked if it can accommodate the load in terms of organic matter, nitrogen and phosphorous compounds, concentrations of heavy metals, polycyclic aromatic hydrocarbons (PAH) and other hazardous chemicals, the wastewater utility approves it, and then the industry is granted a permit with specific effluent limits. The municipality is responsible for monitoring that the industry adheres to the effluent limits and requirements. The analysis of the effluent quality is generally done by a third-party laboratory and the results are sent directly to the municipality. **Any accidents or spills in the industry are to be reported to the municipality, which will then inform the MWWTP**.

<u>The most urgent issues are:</u>

- insufficient communication: due to the lack of competence and sufficient technical knowledge, it sometimes takes a long time before the monitoring authority reports an industrial accident or a spill to the MWWTP. To circumvent the effect of operational accidents or changes in internal processes on the effluent quality and on the MWWTP processes, WWTPs aim to establish a reliable and ongoing dialogue (regular meetings) with the operations staff of the major industrial contributors;

<u>Good cooperation practices not obliged by legislation:</u>

- Smart planning and striving for win-win solutions for both the industry and the MWWTP: e.g. collaboration negotiations in a situation where there is a large contributor to industrial wastewater planning on making a large investment to expand its own wastewater treatment plant, while a local MWWTP has excess capacity. An agreement to send all industrial wastewater to the MWWTP for a predefined cost per m3 saved the

industrial operator new investment as well as general operations and maintenance costs, **while the MWWTP benefited from the high chemical oxygen demand (COD) content** in the industrial wastewater, **reducing the external carbon costs by about DKK 1 million**. As the high values of COD also added to the MWWTP's biogas production, the industry was able to make statements that their waste was actually used as a resource. Another gain was environmental since the effluent requirements of total nitrogen (TN) for the MWWTP were more stringent than those for the industrial WWTP, so the load on the recipient was reduced.

2.6.2. Estonia

In Estonia, the responsible body that must adopt the EU Council Directive 91/271/ EEC is the Ministry of Environment. The objectives of the Article 11 are transposed by **the Industrial Emission Act of 2013**. Paragraph 16 of the Act states that no installation or combustion plant, waste incineration plant or waste co-incineration plant shall be operated without a permit, except in the case of the operators being subject to registration provided for in Chapter 5 of this Act (installations using organic solvents), and **it also states that** independently operated treatment of wastewater must be performed according to the BAT, and the quality standards set in the permit must be fulfilled. Regulation from the Ministry of Environment (08.11.2019) No. 61 sets limits for nutrients and hazardous substances in the effluent. **Permitting** for discharges into **water bodies** is done by the **Environmental Board.** The **Environmental Inspectorate** controls the implementation of an integrated permit as specified by the environmental control program (usually once a year). The Environmental Board includes industries that have their own WWTPs as part of the national monitoring program, but this **program usually does not monitor industrial wastewaters discharged into the municipal sewerage system.**

Industrial production facilities must have an **integrated permit,** which includes the industrial wastewater chapter. An integrated environmental permit is issued to operate industrial plants with a high pollution potential in a way that ensures the least possible impact on the environment and human health. The integrated environmental permit is a set of permits replacing individual environmental permits, i.e. a special permit for water use, a waste permit and an ambient air pollution permit. In doing so, the environmental impact is considered in a complex way, so that one improved indicator should not lead to deterioration of others.

Regarding permits, there is no specific period of permit revision and no specific permitting system for wastewater discharged into municipal sewerage systems. **Furthermore, there is no local or municipal legislation** that sets separate quality standards or regulations for industrial wastewater indirect discharges. Industrial wastewater discharge into municipal sewerage systems is based on the **contract between a water utility and an industrial organisation.** The quality standards for wastewater release into the public sewer system are set in compliance with the rules for the use of public water supply and public sewerage collection system established by the local government council. The contract includes monitoring and a set of quality standards and regulations,

typically for organic waste products such as oils and nutrient parameters (i.e., biochemical oxygen demand (BOD_5), chemical oxygen demand (COD), total suspended solids (TSS), nitrogen (N), phosphorus (P), pH and oil products). In some cases, additional quality standards (e.g. for heavy metals, phenols, and the like) are included. Most industrial plants do not have any special quality standards for wastewater quality. Contracts usually do not set any obligations for pre-treating wastewater from industrial plants, but in many cases the industry has chosen to build pre-treatment facilities in order to save money. Water companies usually do not have any information about whether there are pre-treating facilities in industrial plants. **Contracts between a water company and an industrial client are confidential, but not limited to the controlling authorities.** According to Regulation from the Ministry of Environment (23.10.2013) No. 56, these contracts are one of the pre-conditions for an industry to apply for the integrated permit. In terms of contracts, there are sectors with various co-operative models. In the food industry sector, there are **more pre-treatment facilities and numerous examples of cooperation between water utilities and industries**. In some cases, the industry is operating the MWWTP.

There is no fining system defined by national legislation for exceeding the limits which are specified in the contract between the industrial organisation and water utility; only the Environmental Inspectorate has the right to impose fines when parties are guilty of polluting a water body. At the municipal level, a municipality can levy additional fees regarding the use of the public water supply and the public sewerage system.

There is a **data collection system owned by the Estonian Environment Agency** (https://www.keskkonnaagentuur.ee/en/goals-activities/water), where data on wastewater treatment can be found. However, information about industrial wastewater pre-treatment is not the subject of the database and is for the most part missing. The data **regarding industrial wastewater pre-treatment and indirect discharges can be requested from water utilities**, but in many cases this information is missing or is deemed confidential.

Implementation of legislation **does not necessarily fulfil the expectations regarding wastewater treatment standards**. Practically all industrial plants that have an **integrated permit** and discharge their wastewater into the municipal sewerage system are obliged to have a **contract** with the water company which owns the wastewater treatment plant. The contract and additional materials required in Regulation No. 56, Paragraphs 9-11, have to be presented to the Environmental Board. However, in most cases the data presented to the Environmental Board is not published in the integrated permit, but is replaced with the following line:

"Data is not provided because it is not relevant in this context."

<u>The most urgent issues are:</u>

- Characterised limits of industrial wastewater discharge into the municipal sewerage system should be set.
- Currently there are no characterised permits of industrial wastewater discharge into municipal sewerage systems.

- In most cases, there is no monitoring of industrial effluents discharged into MWWTPs.
- Water company awareness of industrial wastewater characteristics is insufficient and needs to be raised. Usually, the gap in knowledge is not in regard to nutrients, but the impact of hazardous substances on the MWWTP effluent quality and process performance. Another big issue for MWWTPs is the flux in the quality and quantity of wastewater (including shock loads). Industries are often not familiar with the potential and real impact of their wastewater on MWWTPs.
- Although several industries have pre-treatment facilities, problems in public sewer systems and MWWTPs are still common.

2.6.3. Finland

In Finland, the responsible authority for environmental legislation is the Ministry of the Environment, and Article 11 of Directive 91/271/EEC is transposed and implemented in the **Environmental Protection Act (527/2014) and the Environmental Protection Decree (713/2014).**

When an industrial operation exceeds a certain volume, an integrated environmental permit, containing emission and discharge limits for both direct and indirect emissions and monitoring procedures, is required. The permit is obtained from the authority (based on Environmental Protection Decree (713/2014) and Government Decree (1022/2006) on Substances Dangerous and Harmful to the Aquatic Environment). When the operation volume is lower (but above a certain limit) and the industrial operator is discharging its wastewater into a wastewater treatment plant, a notification instead of a permit procedure is followed. The requirements for the notification are the same as for the permit, except that the industrial operator can start its operations at its own risk 120 days after the company has provided the notification without a decision from the authority. The authority can deny or issue the notification and, in the case of issuing, include restricting specifications for the operation. The volume limits for industrial operations within the permit and notification procedures are specified in the Environmental Protection Act (Attachments I and IV). **When issuing the permit or the notification, a hearing of the water utility is required.** Smaller operations (specified in Attachment II of the mentioned Act) not requiring a notification may need to be registered. Additionally, if industrial wastewater is discharged into the MWWTP**, appropriate pre-treatment of the wastewater must be applied, if necessary,** to ensure the performance of the MWWTP. **Permits are public.** Permitting and controlling are independent of each other for bigger industrial operators. At the national level, permits are granted by Regional State Administrative Agencies (AVI) and supervised by the Centre for Economic Development, Transport and the Environment (ELY Centre). For smaller industrial operators, the same body in the municipality performs both functions. In 2015, Finland abandoned the principle of regular revision of permits. The need for revision is within the discretion of the supervising authority. In addition, the injured party (such as an MWWTP) may request the revision of a permit. Water utilities are responsible for the supervision of and adherence to industrial wastewater contracts.

The compliance monitoring of permits and notifications entails:

- approval of monitoring plans;
- inspections that ensure that operations and conditions conform to those described in the permit/notification(i.e. the conditions have been fulfilled, and the permit/notification complies with current legislation);
- review of annual and periodic reports in accordance with the permit/notification or monitoring plan;
- communication prompted by reports, complaints, or notifications;
- further measures if emission or discharge limit values are exceeded.

There is no local or municipal legislation that sets limits or regulations for industrial wastewater discharges.

In the case of non-compliance, there will be negotiations, a request to correct the action, and finally a prohibition to cease permit violations or an order to correct environmental damage. The prohibition or order can be intensified **by a fine or warning** that corrective action is contracted out or that the operation is suspended. If there is suspicion of an environmental crime, the offense will also be reported to the police.

There is no overall database for industrial wastewater treatment and discharge into municipal sewerage systems. However, with regard to environmental permits and notifications, permit and notification holders are required to report their discharges to the ELY Centre (if permitted by AVI) and to their respective municipalities (if permitted by municipal authorities).

The main area of concern related to the legal framework is the risk of conflict of interest when an **industry is a locally significant employer and the associated municipality**, while being the owner of the water utility and sometimes also the permitting and monitoring authority, is dependent on these jobs. However, according to legislation, the role of the environmental authority is defined as independent from the municipality, and its considerations should be based on the law only.

<u>The most urgent issues are:</u>

- outdated wastewater contracts and their interaction with environmental permits;
- knowledge gaps, particularly in regard to hazardous substances;
- incidental discharges;
- exchange of information in the event of an exceptional situation.

<u>Examples of good cooperative practices not obliged by legislation:</u>

- The water utility, environmental authority and industry cooperate through joint meetings, which are held at least annually, and site visits to the premises of the industry and wastewater treatment plant. The monitoring of industrial wastewater is also often handled in cooperation between the wastewater treatment plant and the environmental authority.
- The Finnish Water Utilities Association (FIWA) actively supervises the interest of the

water utility in industrial wastewater issues and organises seminars and educational training on the subject.

2.6.4. Germany

Directive 91/271/EEC is transposed by the German States. According **to the German Wastewater Ordinance**, the discharge of wastewater into waters or municipal sewage systems is only **permitted** if the **pollutant concentration or pollutant load** of the wastewater is kept as low as possible by maintaining the technical state of the art currently defined for municipal wastewaters and wastewaters from 56 industries. **For industrial wastewaters, there are defined** parameter-specific concentrations or loads concerning harmful substances, such as heavy metals, mineral oil, chlorinated hydrocarbons, cyanides and complexation agents. **The technical state of the art** is defined by the federal government and maintained by the water authorities, and the statutory minimum requirements are valid for all German States.

There is **an obligation by water utilities to take over the industrial wastewater**. Yet, if an industry wants to disconnect and become a direct discharger, the municipality cannot object to it.

Germany also applies an effluent tax, which provides an economic incentive to avoid or reduce harmful effluent discharges. The tax rate is based on damage units, which are calculated as the equivalents of pollutants in the discharged effluent. Measured pollutants include phosphorous, nitrogen, organic halogen, mercury, cadmium, chromate, nickel, lead, copper; also, indicators of chemical oxygen demand and toxicity for fish eggs are considered. The tax motivates for water protection as the taxes of several years can be recovered if investments reducing pollution load are made.

The **States and municipalities can decide on specific requirements.** The revenue of the effluent tax is earmarked for investments in water quality programs by the German States.

Contracts between industrial organisations and water utilities are not mandatory and are made on a case by case basis.

Permits and binding licences based on water protection laws are not part of the integrated permitting regime (under the Emission Control Act), but, according to Water Law (Gesetz zur Neuregelung des Wasserrechts), **the discharge of wastewater into municipal wastewater systems is subject to the approval of a competent authority**, provided that the wastewater requirement of the sewage system or prior to its discharge into the wastewater system are specified. Under some conditions, the indirect discharge only requires a notice. The States can also issue further legal provisions on approval requirements, e.g. to supersede the approval of the competent authority with a permit issued by the operator of a municipal wastewater system.

If an industry does not comply with the permitting regime, the relevant competent authorities can request immediate legal compliance, including immediate submission of a permit application. If this is not done, the authorities can order an immediate closure of the facility. The competent environmental authorities **can also impose administrative fines** (up to EUR 50,000). In addition, the competent police authorities (Staatsanwälte) can prosecute individuals for any

environmental criminal offense committed as a result of non-compliance. The offenses are punishable by a fine and/or imprisonment.

The authorising agency for smaller projects is the lower water authority, located in the county government offices, and for larger projects, the upper water authority, located in the district government offices.

According to the Water Law, any person discharging wastewater into a wastewater treatment plant is obliged to have **the sewage examined by qualified personnel/body**. Moreover, both **controlling and self-monitoring** take place. Controls aim at supervision and enforcement of the statutory regulations. They include taking sewage samples on the spot of its discharge into the municipal sewerage system and/or samples of internal effluents before they are mixed with other wastewaters. They also involve the inspection of internal wastewater treatment constructions and an advisory service for industrial enterprises with respect to all issues of internal sewage treatment. In addition, the industrial polluter can be obliged to check its sewage effluent itself. Large dischargers must appoint one or more water protection officers.

The main source of information on indirect industrial discharges is the registers of industrial polluters maintained by MWWTPs.

Efficient supervision and monitoring of industrial wastewater discharge are ensured with the following steps. First, registering of industrial polluters consists of a collection of relevant data and information and verifying this information with a site inspection. Secondly, the spot(s) of discharge and sampling and the parameters to be followed are fixed. Thirdly, the MWWTP evaluates the risks related to the industrial polluter and decides on the frequency and strategy of supervision based on this danger potential.

Category 1 (highest risk) companies may be inspected every 4-5 weeks, Category 2 companies – every 12 weeks, and Category 3 companies – every 6-12 months. The lowest risk companies, Category 4, may not be checked up or sampled, but their data remains in the register.

<u>The most urgent issues are:</u>

- paying attention to pollution caused by indirect discharges (clogging through grease, too high nutrient concentrations, too high or inert organic load, as well as presence of toxic, carcinogenic or any other type of harmful pollutants);
- highly contaminated industrial wastewater discharges due to the maintenance of industrial systems or equipment, e.g. the cleaning of tanks and turbines, surface treatment.

<u>Good cooperative practices not obliged by legislation:</u>

- **Continued training and knowledge exchange**: German Water Association DWA has working groups for industrial wastewaters and organizes expert seminars. DWA also maintains 320 “sewage-neighbourhoods” with the goal of continuous training of MWWTP operating personnel in various areas.

- **Smart planning** – industrial wastewater pre-treatment on the site of the municipal plant, carried out by the staff from the MWWTP.

2.6.5. Latvia

In Latvia, the responsible body that must adopt the EU Council Directive 91/271/ EEC is the Ministry of Environmental Protection and Regional Development. Article 11 of the Directive, which concerns urban wastewater treatment, was transposed into the new **Cabinet of Ministers Regulation No. 174 Regulations on the Provision and Use of Water Utility Services** (adopted 22.03.**2016**).

Industrial organisations are obliged to hold an **integrated permit,** which might include the industrial wastewater chapter. The State Environmental Service issues the permits and controls the fulfilment of the requirements. The permits are open-ended but are reviewed every seven years if no major changes occur at the permit holder in that time.

The local government/municipality determines the requirements of wastewater pollution limits, based on the evaluation of the service provider's capacity and technical capabilities and institutes the **local legislative acts and regulations in regard to wastewater discharge into the public sewerage system**. The maximum permissible concentrations for parameters characterising typical domestic wastewater are stipulated in the law. If the concentrations in the industrial wastewater exceed these values, the **water utility and industrial organisation must have a contract which specifies** the limitations of pollution, the procedure of monitoring and an additional tariff (compensation) for industrial wastewater discharge and treatment. The procedure **of compensation calculation** is set in the Regulation and depends on the industrial wastewater volume and specific costs for each parameter discharge into the municipal wastewater system. **These contracts are not public, are confidential but not limited to the controlling authorities.** The **water utility has the right to decline the discharge.** The permitting authority (the State Environmental Service) has the right to verify the existence of the necessary contracts between industrial companies and municipality/utilities but is not empowered to evaluate them as these contracts are governed by Company Law. The State Environmental Service has **the right to fine industries for inflicting harm on the environment** only in the cases when there is no contract between the water utility and the causative industry. There are **no good cooperation examples** between industrial organisations and water utilities with disparate financial motivations and responsibilities in construction, operation or maintenance works.

Wastewater quality must be monitored at least annually, depending on the amount and quality of the wastewater. In case of non-compliance with the contract, a **fining system** can be applied by the water utility. The amount of the fine is case and concentration dependent. Only municipal water companies are authorized to **perform control functions** according to the service agreement signed. According to the permits issued to the industry by the State Environmental Service (Regional Environmental Boards), the industry has to monitor their effluent (before and after pre-treatment, if such is taking place) quarterly, but it is not a regular practice.

There is no overall database for industrial wastewater treatment and discharge into municipal sewerage systems. However, there is a database for direct discharge of wastewater. The data **regarding industrial wastewater pre-treatment and indirect discharges can be requested from a water utility**, but often is considered confidential. The actual data on industrial wastewater discharges to MWWTPs is not within the scope of national authorities.

The implementation of law does not automatically lead to meeting expectations and needs as it takes extensive **discussions between public water utilities and industries to fulfil the legal criteria** and make the necessary investments. Historically, not all industries have wastewater pre-treatment systems installed, and hardly any funding is available for this purpose. Although most big polluters have wastewater pre-treatment systems installed, not all fit the requirements.

The most urgent issues are as follows:

- Dialogs with industries urging them to install wastewater pre-treatment technologies are too lengthy; mainly due to their unwillingness or incapacity to make financial investments toward this goal.
- According to legislation, water utilities are to impose and collect fines from industries if the wastewater quality differs from that stipulated by the law or service agreements.
- Collecting untreated wastewater from industries can cause significant technical problems for MWWTPs.
- Despite the fact that national legislation sets limits for hazardous and priority substances, they are out of the scope of contracts between industrial organisations and water utilities, as well as permitting and monitoring systems.

2.6.6. Lithuania

The Lithuanian Government adopts and implements EU laws. The EU Council Directive 91/271/EEC is implemented in the **Law on Environmental Protection**, **and the Law on Water** (implementing Article 2 of the Directive 91/271/EEC). These two laws together with the **Law on Drinking Water Supply and Wastewater Treatment** are the main regulations on wastewater. The pollution permit part on wastewater has to be reviewed at least once every 4 years. Wastewater, in which biological oxygen demand (BOD_7) exceeds 500 mg/L, or its contamination with priority hazardous and hazardous substances exceeds the maximum authorized concentrations (MACs) set by the water and wastewater regulations and other legal acts , is classified as industrial wastewater. Industries that have **integrated pollution prevention and control (IPPC) permits,** issued by the Environmental Protection Agency, have to follow the BAT. The permits are issued for an indefinite period, unless stated otherwise by the EPA. The entities which discharge wastewater are controlled by the Environmental Protection Department and the MWWTP of the municipality where the economic entity is located. The industry is required to inform the MWWTP about excessive levels of pollutant concentration, and they have to have a contract. Public water utilities **are obligated to enter into a contract with any entity which applies to discharge industrial wastewater into the**

MWWTP. This application must not be refused, and the industrial water has to be received. However, they are authorized to set stricter parameter concentrations for these influents so that their capacity to treat it is not undermined. Concerning discharges into the sewerage system, the effluent pollution level and the charge for its treatment is estimated in regard to a standard, called "basic pollution", with the concentration of BOD_7 at 350 mg/L, suspended matter at 350 mg/L, N at 50 mg/L, P at 10 mg/L. If an economic entity discharges wastewater with concentrations higher than these, it **is charged a higher price for the treatment**. Also, if the MWWTP detects that the economic entity discharges wastewater with pollutant concentrations exceeding the MWWTP's infrastructure capacity and capabilities to treat it, the **economic entity gets a penalty that is 10 % higher the regular price** for the wastewater treatment for the month when the exceeding wastewater pollutant concentrations were assessed. **These contracts are not public and are confidential but not limited to the controlling authorities.** The permitting authority is not obligated to evaluate the contracts between the industry and water utility. In practice, they might check them only when water utility is not able to treat wastewater well enough. Then the permitting authority can recommend which contracts have to be reviewed. In terms of contracts, there are sectors with various cooperation's models. Overall, there are **more pre-treatment facilities, yet a high degree of cooperation between industries and water utilities** is more and more common. In some cases, the industry also operates the MWWTP.

On national level, the responsible body **for the control of industrial wastewater outflows is** the Lithuanian Environmental Protection Department (EPD), while MWWTPs are also authorized to carry out controls (e.g. take samples)

There is no regional or municipal legislation that sets further limits or regulations for industrial wastewater discharges.

Environmental Protection Agency maintains a database on industrial wastewater discharges. There is an online system through which industries have to submit annual reports on wastewater discharges from their company. The database contains information on the big industrial wastewater dischargers only or those which use hazardous substances in their activities. **MWWTPs usually have a database of industrial wastewater influents**. The data are deemed confidential.

The implemented legislation has some drawbacks. Firstly, . the laws should focus on reducing the usage of priority hazardous substances in industries. Secondly, the control procedure is **not very effective as the controlling authorities are required to notify the economic entity of the planned inspection in advance**. Thirdly, **the penalty system would be improved by laying more responsibility** on the entities carrying out industrial activities rather than on wastewater management plants. Also, the current system (mostly these are increased prices for wastewater treatment) provide an adequate incentive for economic entities to pollute less.

<u>The most urgent issues are as follows:</u>

- There is a need for a better monitoring system as the current system is not very efficient (for example, a company is informed in advance before an inspection takes place, thus

allowing them to improve the wastewater quality for the time of inspection, rather than maintaining a constant standard).

- There should be more economic measures for controlling effluents from the industry. Industries pay a higher price for wastewater treatment with increased or specific pollution; however, this is not enough and most responsibility lies on MWWTPs.
- Greater awareness should be raised with industries regarding the potential deleterious environmental and human health impacts of their activities.

2.6.7. Poland

The Parliament and ministries are responsible for the implementation of EU law. The EU Council Directive 91/271/ EEC is implemented in the following Acts: The Water Law, the Environment Protection Law, the Act on Public Water Supply and Public Wastewater Conveyance and the Act on Maintaining Cleanliness and Order in Communes.

These regulations determine **the obligation to obtain a water permit for the discharge of sewage into waters, the ground or sewerage systems**. A water-law permit is issued based on a water-law report, as well as the evidence, documents and information gathered during the application procedure. The quality of sewage discharged into sewerage systems, obligations of industrial wastewater suppliers, as well as the conditions for the introduction of sewage into sewerage systems are specified in the Regulation of the Minister of Infrastructure and Development of 2015. The implemented law fully complies with the HELCOM Recommendations. The application should be submitted to **Polish Waters** (to their competent local offices called the Regional Water Management Authority) in case of the discharge of industrial wastewater that contains substances particularly harmful to the environment into the sewerage system. The controlling institution can be a water utility, the Voivodeship Inspectorate for Environmental Protection, or Polish Waters. The permit is issued for a period of no more than four years.

Water utilities are required to collect industrial wastewater. The manner of fulfilling the obligations of industrial wastewater dischargers and the conditions for the introduction of sewage into sewerage systems, including permissible concentrations of pollution indicators in industrial wastewater and the method of controlling the quantity and quality of wastewater, are set in national regulations. **There is no local or municipal legislation** that sets further limits or regulations for industrial wastewater discharges.

The water utility sets the maximum permissible concentration limits of pollutant indicators for the wastewater discharged. In the case of exceeding the concentration limits, the water utility is entitled **to charge an additional fee**, usually multiplying the pollution load with the price for exceeding 1kg of discharged industrial wastewater. If the concentration of several indicators has been exceeded, the fee calculation is based on the indicator which is the most expensive to exceed. The contract template is available on the website of the water utility. **The contract containing the data of the industrial company is confidential,** but one can request access to it (while maintaining the secrecy of the company). **Permitting organisations have a right to evaluate the contracts in**

cases of violations.

The controlling authority may be the Voivodeship Inspectorate for Environmental Protection or Polish Waters. Inspections may be carried out by a corresponding water utility. **Controlling institutions have a right to impose a fine,** but these powers are rarely exercised. Measurements of pollutant concentrations should be performed by the producer of industrial wastewater at least twice a year at a location where the sample adequately represents the quality of the discharged wastewater.

There is no overall database for industrial wastewater treatment and discharge into municipal wastewater systems. The data **regarding industrial wastewater pre-treatment and indirect discharges can be found at the water utility**; yet it might be considered confidential.

The current policy on industrial wastewater management does not meet all expectations and needs. That is why the European Commission has begun to demand explanations on several issues (some cases are carried out implicitly), some are linked to **insufficient transparency of reporting on industrial wastewater by municipalities**.

The most urgent issues are as follows:

- A need to introduce a legal act that regulates the surveying of industrial wastewater, collecting statistical data, the introduction of a control system at the municipal level and introduction of real sanctions for failure to perform the above-mentioned activities.
- Currently, many agglomerations do not report any industrial wastewater in the municipal wastewater treatment plants, which is very unlikely and probably derives from the financial benefits of not reporting industrial wastewater. The European Commission should improve their controlling and sanctioning to assure full implementation of the Wastewater Directive.
- Industrial wastewaters discharged to sewerage systems vary in quality, causing problems with their treatment at MWWTPs (e.g. exceeded permissible ratios, change in the volume of wastewater), resulting from the lack of continuous quality control.

2.6.8. Russia (Kaliningrad region)

The Ministry of Natural Resources and Ecology of the Russian Federation is the main responsible body in the field of environmental management. Wastewater treatment is regulated according to **Federal Law of December 7,2011, through the following legislative acts:** No. 416-FZ on Water Supply and Disposal, No. 644 Rules for Cold Water Supply and Disposal, No. 525 Rules for Monitoring the Composition and Properties of Wastewaters, No.167 Rules for the Use of Municipal Water Supply and Sewerage Systems in the Russian Federation. **The requirements specified in the EU Directive and the HELCOM Recommendations are also reflected in Russian legislation.** The concept of the best available techniques (BAT) and the issues of their application are specified in the Federal Law No. FZ-7 of January 10, 2002, **on Environmental Protection**. The main amendments regarding water management issues have been in force since January 1, 2019.

Local authorities approve the standards (originally calculated by water utilities) for wastewater volume discharged from industries. These standards are based on the capacity of a central sewerage system on wastewater treatment and transportation, and the conditions set by the water utility. For municipalities also exists a mechanism for charging companies which discharge their wastewater into the municipal sewerage system and establishing rates for the discharge of each specific pollutant. In order to ensure control over the composition and properties of discharged wastewaters, **industrial enterprises** with the overall effluent to municipal wastewater system of more than 30 m3 per day are **obliged to submit a special declaration to the water utility**. The declaration contains the characteristics of wastewater composition and properties. The declaration must include wastewater discharges that exceed the maximum allowable concentration set for contaminants. However, it cannot foresee prohibited substances and microorganism discharge into the municipal wastewater system. **The water utility has responsibilities to control company compliance of their declarations.** There are also standards established on the effluent volume. **The water utility has no right to refuse a company's** application to connect to the municipal wastewater system if the **utility has technical capacity** for that. In cases where there is no technical capacity and no relevant activities in the investment program to support such capacity, the water utility can make a request to the authorized executive authority to include capacity and quality improvements into the utility investment program.

According to the national legislation, the relationship between a water utility and an industrial enterprise **is regulated by a contract** (for water disposal only or for water supply and disposal jointly). These contracts are standardized; their form was approved by the Decree of the Government of the Russian Federation. **Yet, if the contract is supplemented with personal or commercial data, it becomes confidential.** Permitting authorities **are not authorized to evaluate the contracts** in regard to industrial wastewater. There are **no good cooperation examples** between industrial organisations and water utilities with disparate financial motivations and responsibilities.

Water utilities are responsible **for carrying out control over** wastewater volume, composition and properties. If an industrial company has violated the requirements of pollutant content, the water utility informs the authorized environmental supervision bodies, which can result in an unscheduled inspection.

There is no overall database for industrial wastewater treatment and discharge to municipal sewerage systems. The data **regarding industrial wastewater pre-treatment and indirect discharges may be available at the water utility itself**, although it might be considered confidential. According to a survey conducted at the first regional seminar in May of 2018, **49% of specialists** from industrial enterprises and water utilities consider the **legislation on industrial wastewater management to be the most problematic issue**.

<u>The most urgent issues are:</u>

- obtaining technical specifications and a permit to discharge wastewater into central

sewerage system involves significant bureaucratic red tape;
- local pre-treatment of effluent lacks in quality.

2.6.9. Sweden

The legislation is issued by the Parliament and the Government, and the various Ministries**.** The Regulation on **Environmentally Hazardous Activities and Health Protection** stipulates that the **Swedish Environmental Protection Agency** may issue general prescriptions for a number of areas. Under the provision, the Swedish EPA has issued **regulations on the treatment of wastewater from urban areas** that stipulate that industrial wastewater **must undergo such treatment before** it can be passed on to the MWWTP that the operation of it and the treatment of wastewater sludge are not disturbed, and that the sludge can be disposed of in a safe and environmentally acceptable manner. **Swedish Public Water Services Act** deals with limiting the amount of harmful and environmentally hazardous substances entering municipal wastewater systems and MWWTPs. **The MWWTP is not obliged to connect a property** or allow a property to be connected if its sewerage system installation has significant deficiencies.

Municipalities may issue further regulations on public/municipal water supply facilities. They include more detailed provisions on the rights and responsibilities of MWWTPs, households and indirect dischargers. The **MWWTP is not liable to receive wastewater if its contents deviate significantly from household wastewater**.

There are contracts between industrial companies and water utilities. *Svenskt Vatten* advises their members to use the contract for treatable substances and for **determining higher fees**. **These contracts are confidential.**

Permits are issued by either County Administrative Boards (smaller operations) or the Land and Environmental Courts. Before submitting a permit application, the operator must prepare an environmental impact assessment (EIA) and take part in a consultation process. The MWWTP can declare what wastewaters can and cannot be discharged into the municipal sewage untreated and the conditions for treating specific wastewaters. MWWTPs participating in the Revaq certification for sludge have an interest in transferring their strict requirements for sludge quality into the permits. The permit is normally **not limited in time,** but the conditions can be implemented as circumstances change.

The supervisory authorities include the **Country Administrative Boards and municipal authorities.** They have the mandate to issue orders, prohibitions, **penalties and fines** and to report infringements of the Environmental Code or rules to the police or public prosecution authorities. They also supervise activities that do not require an environmental permit. A monitoring program is to be **developed by the industry and approved by the authority**. An industrial operator violating the permit may also be held **liable under criminal law.**

Swedish EPA maintains a database of permits and discharges. In addition, Revaq has a system of requesting all connected companies' information regarding chemicals they use. The lists are not public for industry competitive reasons.

The most urgent issues are:

- Permits can be outdated. MWWTPs can initiate a discussion based on Article 21 of Public Water Services Act, saying that they have a problem with a new parameter. Tightening limit values for an existing parameter is more difficult but can be achieved on a voluntary basis.
- In the permitting process, the hearing of the MWWTP is based on the scope of the plant's activity. MWWTPs participating in the Revaq certification scheme are active and have resources for this dialogue, but smaller MWWTPs are considered having more problems than the big ones. In Sweden, the situation is evaluated from the sludge quality point of view, and the households and stormwater is more of a problem than industries.
- There are accidental leaks.

2.7. The summary of legislative aspects of industrial wastewater discharge in the Baltic Sea Region

The comparative summary of legislative regulations in the BSR countries can be found in **Appendix V.** The legal aspects of industrial wastewater discharge into municipal wastewater systems and MWWTPs on the EU and national scale is rather comparable in all BSR countries.

In most BSR countries, industrial wastewater discharge into centralized municipal sewage networks is a **subject of permitting, contracts and obligated monitoring** of the wastewater quality, which is regulated by legislation.

Not all BSR countries have rights to act on municipal level, which makes cooperation between municipalities and industrial organizations particularly challenging. **Lack of an overall data base** of industrial wastewater treatment and discharge into a centralized municipal sewage network seems an issue in most BSR countries, as lack of such information may lead to mistakes in permitting procedures and lack of comparison of the best available techniques for different industries. Monitoring for the presence of the priority substances is an issue in almost every BSR country.

In expert discussions on legislation in each of the countries, good **cooperation practices** between municipalities and industrial sectors **was a central and sensitive topic**.

Insufficient understanding of the matters and consequences for both parties gives rise to misunderstandings. Therefore, the best practices of cooperation models between industrial sectors and municipalities will be collected and shared across the BSR countries to encourage their application elsewhere.

3. Industrial sectors

3.1. Industrial sectors discharging into municipal wastewater systems

To identify industrial sectors which discharge industrial wastewater into centralised municipal wastewater systems and might cause problems for MWWTPs, statistical information on industrial sectors was collected, as described in methodology Step 1, and interviews with national experts according to Step 3 were conducted. In total, 30 industrial sectors and subsectors were included as a potential source of highly polluted wastewater (Table 3.1). The sectors which were not mentioned in the assessment were assumed as sectors that do not originate industrial wastewater that is discharged into MWWTPs. The aim of this analysis was to identify the sectors that might discharge industrial wastewater not only by compiled statistical data but also verify them by expert opinions. The experts have selected the most problematic industrial sectors affecting MWWTPs.

Table 3.1.

Industrial sectors included in terms of this assessment

C10. Manufacture of food/feed products		**Other sectors**	
NACE code	Sector	NACE code	Sector
C10.1	Processing and preserving of meat and production of meat products	B05-09	Mining and quarrying
C10.2	Processing and preserving of fish, crustaceans and molluscs	C11	Manufacture of beverages
C10.3	Processing and preserving of fruit and vegetables	C12	Manufacture of tobacco products
C10.4	Manufacture of vegetable and animal oils and fats	C13	Manufacture of textiles and wearing apparel
C10.5	Manufacture of dairy products	C15	Manufacture of leather and related products
C10.6	Manufacture of grain mill products, starches and starch products	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C10.7	Manufacture of bakery and farinaceous products	C17	Manufacture of paper and paper products
C10.8	Manufacture of other food products	C18	Printing and reproduction of recorded media
C10.9	Manufacture of prepared animal feeds	C19	Manufacture of coke and refined petroleum products
		C20	Manufacture of chemicals and chemical products
		C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
		C22	Manufacture of rubber and plastics products
		C23	Manufacture of other non-metallic mineral

		products
	C24	Manufacture of basic metals
	C25	Manufacture of fabricated metal products, except machinery and equipment
	C27 and C26	Manufacture and repairing of electrical equipment, computer, electronic, and optical products
	C28	Manufacture and repairing of machinery and equipment
	C29	Manufacture of motor vehicles, trailers and semi-trailers and other transport equipment
	C31	Manufacture of furniture
	C32	Other manufacturing
	E38	Waste collection, treatment and disposal activities; materials recovery

Companies of industrial sectors in the included countries are grouped according to the Statistical Classification of Economic Activities in the European Community or NACE classification. The industrial sector numbers match the NACE classification codes in all figures and text. During the assessment, 27,539 industrial organisations in the six countries were identified as such that might discharge industrial wastewater and have an impact on MWWTPs. The division of industrial organisations mentioned is shown in Figures 3.1 and 3.2.

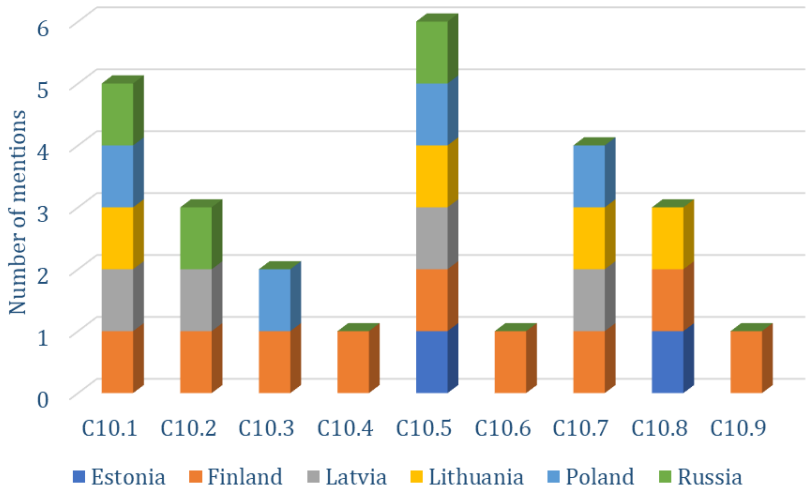

Figure 3.1. Food and feed industrial subsectors selected in the BSR countries

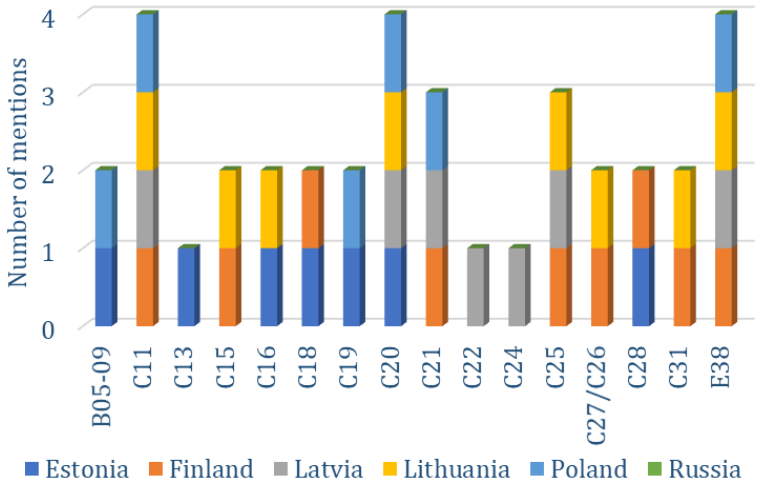

Figure 3.2. Other contributing industrial sectors selected in the BSR countries

It was important to get an overall picture of the potential discharge of industrial wastewater into municipal sewerage systems, however, there was no database found in any of the six countries that provided any data on the actual volume of industrial discharges. Most of the data can be found at water utilities, yet they are not readily accessible, and it would take significant resources to develop such a centralised analysable database. Therefore, it was assumed that the potential discharge capacity is proportional to the annual turnover of industrial organisations. The potential impact on MWWTPs was divided into three scales as described in the methodology. In the sectors that were identified as potential industrial wastewater dischargers to MWWTPs, there were 8,112 small-scale organisations, 7,552 medium-scale organisations, and 11,875 large-scale organisations. Although small-scale organisations can produce a small amount of wastewater, in numerous sectors they can be a significant contributor of hazardous or priority substances. Moreover, small organisations can noticeably impact the efficiency of relatively small MWWTPs, to which organisations are most often connected.

In total, 25 industrial sectors were selected by the experts, of those the sectors identified as of specific concern in each country are shown in Figure 3.3. These were studied more comprehensively during Stage 2 of the methodology, using interviews with industrial organisations and corresponding water utilities. In terms of industry sectors of specific concern, a total of 3,281 industrial organisations in five countries (except Russia) were distinguished as potential sources of highly polluted industrial wastewater. However, there was not a sufficient amount of information on the number of industrial organisations in industry sectors of specific concern available for Russia.

By application of data analysis, no correlation was found between the number of organisations in the industrial sector and their impact (as determined by interviews with the experts) on MWWTPs, and the selection of industry sectors of specific concern.

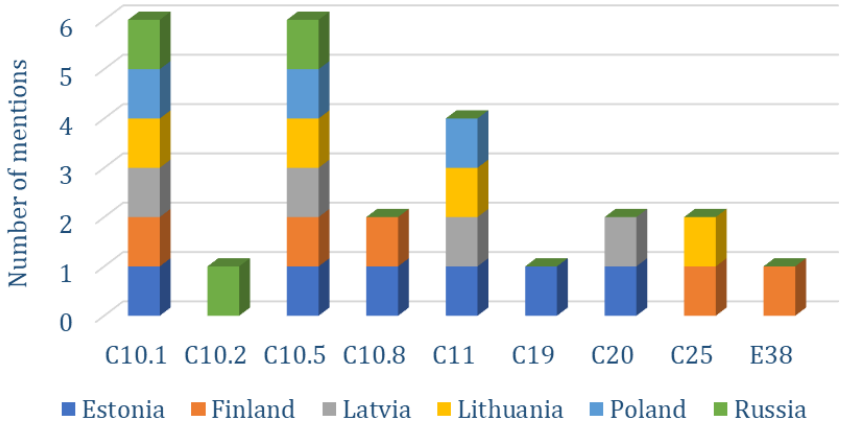

Figure 3.3. Industry sectors of specific concern selected in the BSR countries

In all six countries in the scope of the assessment, sectors C10.1 (Processing and preserving of meat and production of meat products) and C10.5 (Manufacture of dairy products) were selected as the sectors that have the highest impact on MWWTPs. Other industry sectors of specific concern were dependent on the economic development of certain sectors in each country and overall were highly country-specific.

The analysis of the selected industry sectors of specific concern revealed that in most cases these are industrial sectors that have had publicly reported leakage incidents of obvious pollutants, e.g. high load of nutrients, which have resonated with the public. In this consideration, expert opinions might also be based on previous experience and knowledge. However, there are numerous industrial sectors which are continuing to pollute municipal sewerage systems with highly polluted and dangerous wastewater, containing hazardous and priority substances as “invisible” pollutants, and were thus overlooked by experts. Therefore, industrial wastewater management of relatively readily degradable pollutants from food and beverage production (C10.1, C10.2, C10.5, C10.8, C11) was compared to that of poorly degradable and detectable (“invisible”) pollutants from other industries (C19, C20, C25, E38) in terms of industry sectors of specific concern. The findings of the comparison are reported in the following chapters. The division into readily degradable and poorly degradable pollutants is founded on the various challenges, such as quantity, concentration, and type of pollutants that industrial organisations encounter in regard to industrial wastewater management and on potential pre-treatment technologies that can be applied to handle such industrial wastewaters.

3.2. The most problematic industrial sectors discharging industrial wastewater into the municipal wastewater system

In order to assess the situation within the industry sectors of specific concern that are discharging industrial wastewater into municipal wastewater systems, interviews with industrial organisations and their corresponding water utilities were performed. In total, 191 interviews of 20 questions (template in **Appendix III**) regarding industrial wastewater discharges into municipal sewerage systems were conducted. Of these, 133were interviews with industrial organisations and 58 with water utilities. The number of interviews per country is indicated in Table 3.2.

Table 3.2.

Number of interviews carried out in the BSR countries

Country	Number of interviews with industrial organisations	Number of interviews with water utilities
Estonia	13	6
Finland	23	19
Latvia	51	20
Lithuania	24	13
Poland	16	-
Russia (Kaliningrad)	6	-
Total	133	58

The methodological framework envisaged at least 27 interviews with industrial organisations and water utilities per each country, but during the process of interviewing the number of interviews diminished due to the following:

- There was insufficient number of small industrial organisation in certain countries and industrial sectors.
- Small and medium industrial organisations are not aware that they discharge industrial or highly polluted wastewater.
- There is a lack of information on industrial organisations that are discharging industrial wastewater into municipal sewerage system.
- Industrial organisations were unwilling to take part in the interviewing process.

Overall, only 191 interviews of the planned 324 were conducted, reaching approximately 60% of aim set in the methodology.

It is important to interpret the questions and answers in the same manner. Therefore, most of the interview questions were designed to be straightforward and without multiple interpretations, however, some of the questions did require additional explanation on their interpretation. For example, the question to industrial organisations regarding sludge treatment and processing (Appendix III) needed an explanation on such treatment and processing. In terms of this assessment,

sludge treatment is considered as any technology (thickening, dewatering, disposal to biogas stations, etc.) of primary, secondary of flotation sludge processing applied at an industrial organisation. Similarly, an explanation was provided on the concept of nutrient recovery from industrial wastewater by the industrial organisation itself, meaning any technologies applied for recycling nutrients from industrial wastewater (biogas production, energy production, compost production, phosphorus recovery, etc.) at the industrial organisation itself.

3.2.1. Estonia

During the assessment in Estonia, 13 industrial organisations and six water utilities were interviewed. All of the industrial organisations had an annual turnover of more than EUR 500,000, meaning **that only big industrial organisations were within the scope of the analysis**. No information on small or medium organisations was provided. That can be related to the lack of information and contracts in regard to small and medium scale organisations. Although small enterprises have a large impact on wastewater systems, and thus on WWTPs, in small communities, the questionnaire addressed the most serious polluters only. In total, industrial organisations from nine industrial sectors and subsectors were interviewed, which is a higher number than the number of previously selected industry sectors of specific concern. This may be due to the urgency and scope of pollution problems in certain organisations from various sectors.

Food and beverage production industrial sectors

In terms of food and beverage production industrial sectors, 13 interviews were carried out. The division of interviews by sector was:

- C10.1 - Processing and preserving of meat and production of meat products (two industrial organisations);
- C10.5 - Manufacture of dairy products (two industrial organisations and two water utilities);
- C10.2, 10.6, 10.8 – Processing and preserving of fish, crustaceans and molluscs, Manufacture of grain mill products, starches and starch products and Manufacture of other food products (in total, five industrial organisations);
- C11 - Manufacture of beverages (two industrial organisations).

Industrial wastewater contracts and permits

All 11 industrial organisations **have contracts with water utilities** on industrial wastewater discharge. The contracts set the allowed discharge volume of industrial wastewater and the allowed limits of pollutants. The volumes and concentrations in contracts are case specific and based on the capabilities of the MWWTP. The wastewater volumes are in the range of 22-1550 m^3/d, depending on the size, the type of production and the specifics of the industrial organisation. Most of the contracts set the range of limit values for **seven standard water quality parameters**: BOD_5 (280-1500 mg/L), COD, SS (100-2000 mg/L), pH (5-10), TP (12-30 mg/L), TN (40-225 mg/L) and grease

(50-300 mg/L). However, only two contracts envisage obligatory COD monitoring – one in sector C10.5 (927 mg/L) and the other in sector C11 (3000 mg/L), which means specific limits for specific industrial organisations were instituted. Only one contract included an additional list of parameters for chlorides (350 mg/L), dibasic phenols (5 mg/L), monobasic phenols (0.5 mg/L), oil (2.1 mg/L), polyaromatic hydrocarbons (20 mg/L) and sulphates (110 mg/L) or required monitoring. Striking balance between strict environmental rules and deficient wastewater quality regulations within the limitations of wastewater treatment efficiency has been a great challenge for MWWTPs.

Industrial organisations must have an integrated environmental permit that includes a subsection on wastewater quality, however, the limit values of pollutants in wastewater is the responsibility of the MWWTP and are not included in the permit if the wastewater is discharged into the municipal sewerage.

Industrial wastewater pre-treatment and sludge treatment technologies

In most cases only simple and robust wastewater pre-treatment technologies such as fat separation or equalisation and pH adjustment are applied, or no pre-treatment at all that satisfies the requirements and capabilities of water utilities. In some cases, however, industrial organisations applied more efficient treatment methods, e.g. dissolved air flotation, and in one case, even a full cycle biological treatment (SBR reactor) was applied to reach the requirements of the water utility.

There was only **one industrial organisation that applied any sludge treatment technology**, where it was within the scope of overall renovation of industrial wastewater treatment plant to include a full-cycle biological treatment and sludge thickening technology for both flotation and biological sludge. In all other cases, the sludge was collected and transported.

Despite the high potential of sectors C10 and C11, **none** of the organizations interviewed conducted **nutrient recovery** from the industrial wastewater or sludge. This indicates that the industrial organisations are either not aware of technologies for nutrient recovery that might lead to a wide scope of economic benefits or financially incapable to apply any. However, there are some industries not included in this assessment that give their pre-treatment residues to biogas plants for biogas production. Nutrient recovery is usually done only by those food industries that have their own WWTPs. (for example, a yeast factory sells their wastewater treatment by-product as an ECO-certified fertilizer). Industries are more interested in losing less products to the sewer system. For instance, a fish meal factory used to send its blood water to the sewer before the interviewing process, but it now collects the blood and uses it as a product, thus their industrial wastewater is discharged with a lower pollutant concentration.

Cooperation and incidents

In most of the cases there have been some **incidents** regarding industrial wastewater pre-treatment and accidental discharge of polluted industrial wastewater into the municipal sewerage system. In those instances, the additional costs of the wastewater discharge were covered by the offending industrial organisation. There was one reported incident of a system failure at an industrial

WWTP, which caused a short-term shut down of the industrial organisation by the environmental agency until the repair works at the treatment plant were completed.

The limits set in the contracts are case dependant, meaning that even relatively big industrial organisations with a wastewater discharge of approximately 600 m^3/d can discharge industrial wastewater without any pre-treatment. It may be so either because of the rather successful cooperation between water utilities and industrial organisations in the food and beverage sectors or because of economic or political pressure on water utilities to allow high limit values. When additional parameter monitoring is required, e.g. when a dairy discharged approximately 900 m^3/d without a sufficient industrial wastewater pre-treatment, technologies can be applied to collect wastewaters from different production cycles, with equalisation and chemical pH adjustment. Also, incidents on limit exceedance for COD, BOD_5, TP, TN, SS, polyaromatic hydrocarbons were reported on a regular basis in connection with this industry. The cooperation between water utilities and industrial organisations is, therefore, not good enough. It can be assumed that cooperation on industrial wastewater discharge is very case specific and sensitive to the knowledge of both sides, as well as the political and economic situation in the area.

Other industrial sectors

In terms of other industrial sectors, six interviews were carried out. The division of interviews by sector was:

- C16 - Manufacture of wood and of products (one industrial organisation);
- C20 - Manufacture of chemicals and chemical products (four water utilities);
- C27 - Manufacture and repairing of electrical equipment (one industrial organisation).

Industrial wastewater contracts and permits

All six industrial organisations have contracts with water utilities regarding industrial wastewater discharge. The contracts set the allowed discharge volume of industrial wastewater and the allowed limits of pollutants. The volumes and concentrations in the contracts are case specific and based on the capabilities of the MWWTP. The wastewater volumes, depending on the size, type of production and specifics of the industrial organisation, are in the range of 66-1130 m^3/d. Each contract sets a list of specific parameters based on the type of production and possible pollution in the wastewater. For example, in sector C16, a list of 13 parameters can be applied (COD, BOD_5, SS, pH, grease, copper, petroleum products, chlorides, xylene, sulphates, chrome, TP, TN, nickel), in sector C20, a list of 26 (COD, BOD_5, SS, pH, grease, TN, TP, monobasic phenols, dibasic phenols, polyaromatic hydrocarbons, xylene, formaldehydes, surfactants, petroleum products, chlorides, sulphates, sulphides, acetone, benzene, toluene, benzenic acid, benzenic acid glycol esters, titanium, monoethanolamide, chrome, copper), and in sector C27, a list of 8 (COD, BOD_5, SS, pH, grease, copper, tin, nickel). The lists are specific to each organization, these are only examples. The parameters found in lists can also be found in the lists of priority and hazardous substances. It can be assumed that in most cases water utilities are aware of potential pollutants that could be discharged into the MWWTP

and the potential risks to the environment have been considered and minimised.

The industrial organisation must have an integrated environmental permit that includes a chapter specific to wastewater, however, the limit values of pollutants in wastewater is the responsibility of the MWWTP and are not included in the permit if the wastewater is discharged into the municipal sewerage.

Industrial wastewater pre-treatment and sludge treatment technologies

The pre-treatment technologies applied in other industrial sectors are very different and case specific compared to the food and beverage production sectors. In terms of sector C16, almost no pre-treatment is applied, meaning that just equalisation tanks are installed. In terms of the C20 industrial sectors, more effective technologies such as dissolved air flotation (DAF) and raw material recovery (e.g. phenols) are applied to meet the requirements set forth in their contracts. In general, the pre-treatment technologies applied in the C16, C20, C27 industrial sectors should be evaluated and the requirements for industrial wastewater discharged into MWWTPs must be raised to minimise the risks of environmental pollution.

There was only **one industrial organisation that applied any sludge treatment technology,** where the sludge from settling tanks was dewatered. Therefore, it can be assumed that sludge treatment does not take place to the necessary extent. This leads to the finding that **none** of the industrial organisations have applied **nutrient recovery technologies**.

Cooperation and incidents

In most cases there have been **incidents** regarding industrial wastewater treatment and discharge into the municipal sewerage system. In most of them, the additional costs of wastewater discharge were covered by the offending industrial organisation. However, the pollutant limits set in the contracts are specific to the organisation. There are cases when relatively big industrial organisations with a wastewater discharge of approximately 1130 m^3/d can discharge their highly polluted industrial wastewater with almost no pre-treatment, which can impact the operation of the MWWTP and the environment. It demonstrates that there is a lack of a systematic political pressure and unwillingness to correct the situation in all parts of industrial wastewater management. In addition, a more effective control and fining system could discourage and limit deliberate pollution of the environment. Incidents of when various parameter limits are exceeded occur on a regular basis and cause difficulties for MWWTPs (even with relatively high limits set in the associated contracts). The cooperation on the treatment of relatively more dangerous and polluted industrial wastewater must be improved and the awareness raised for all parties.

Overall conclusions

Conclusions from the interviews with industrial organisations and water utilities in Estonia:

- Contracts regarding industrial wastewater discharge into the MWWTP and pollution limits are case specific in all industrial sectors and spotlight potential threats to the

environment, which are known and addressed.

- The lists of pollutants set in contracts are case and industry specific, meaning that the management of industrial wastewater differs based on potential risks and pollution it can cause.
- In terms of food and beverage production sectors, the cooperation between water utilities and industrial organisation is sufficient, although it may be due to economic, political or legislative pressure.
- In terms of industrial sectors producing more dangerous industrial wastewater, cooperation and pollution limits require significant improvement.
- The potential of nutrient rich sludge is unrealised, especially in food and beverage production industrial sectors.
- There is one example of a temporary factory shutdown due to the exceedance of wastewater quality limits.

3.2.2. Finland

During the assessment in Finland, 23 industrial organisations and the associated water utilities were interviewed. Of those, 19 industrial organisations had an annual turnover of more than EUR 500,000 and four had an annual turnover in the range of EUR 100,000 to 500,000. Industrial organisations from the smallest turnover category were not interviewed since the amount of wastewater from these organisations was found too small to be relevant for this assessment. Moreover, the small industrial organisations are not considered as a subject of industrial wastewater discharge and do not have contracts with water utilities. In total, industrial organisations from four industrial sectors and subsectors were interviewed.

Food and beverage production industrial sectors

In terms of food and beverage production, industrial sectors, 22 interviews were carried out. The division of interviews by sector:

- C10.1 - Processing and preserving of meat and production of meat products (six industrial organisations and five water utilities);
- C10.5 - Manufacture of dairy products (six industrial organisations and five water utilities).

Industrial wastewater contracts and permits

In total, 12 industrial organisations from food and beverage sector were interviewed for this assessment. All **eight large-scale** industrial organisations **are obliged to have an integrated environmental permit** that includes a chapter on wastewater, and **all of them have contracts with the MWWTP** regarding industrial wastewater discharge. The permits normally set out limit values, but, in some cases, it is stressed in the permit that the limit values set in the industrial waste water contract must be met. It seems that MWWTPs are satisfied with the limit values in the permits, but

there was also a case where a MWWTP did not agree with the limit values. Compared to other companies in the same sector, these values were higher. On the other hand, there was also a case where a MWWTP would have preferred not have too strict limit values in the permit of their industrial client and rather let the MWWTP do the treatment, which is their core business.

The wastewater volumes of large-scale organisations, depending on the size, type of production and specifics of the industrial organisation, are in the range of 90-1350 m^3/d. In all cases the limit values for the **seven standard water quality parameters**, i.e. BOD_5 (400-1000 mg/L), COD, SS (385-900 mg/L), pH (6-11), TP (18-21 mg/L), TN (112-150 mg/L) and grease (100-400 mg/L), are set in contracts or environmental permits. However, COD monitoring was required only in one case and the total mass of COD that can be discharged from the industrial organisation was 4500 kg/d, which means that specific limits for specific industrial organisations were instituted.

All four small-scale organizations are out of the scope of environmental permitting system; however, they have general contracts with the MWWTP. In one case, where an MWWTP did not have a contract with the industrial client, it admitted that a contract would be beneficial to have, since the load coming from the industrial client had caused harm to the WWTP. In order to be obliged to have an environmental permit or notification, the company with indirect discharge must have relatively big production volumes. Whether this is a problem depends on the WWTP. In the case of a big WWTP, even large industrial clients with permits can discharge wastewater without a contract and not cause harm, because of the WWTP's high treatment capacity and capability. In small municipalities, however, the situation can be different, and the industrial organisation can have an impact on the operation of the WWTP. In cases where the industrial organisation did not have an environmental permit or notification in smaller municipalities, **contracts** were usually concluded which set either the limit values or a quality-based tax.

Industrial wastewater pre-treatment and sludge treatment technologies

In most of the large-scale organisations the simple and robust wastewater pre-treatment technologies like fat separation or equalisation and pH adjustment provide satisfactory quality of the effluent. In some cases, though, no pre-treatment is applied that satisfies the requirements and capabilities of the water utilities. In one case there is DAF treatment plant installed, and in another case, a more sufficient biological fat reduction technology is applied.

Among the interviewed organisations, there was **one industrial organisation that applied sludge treatment technology**; it had invested EUR 2,500,000 in constructing the industrial wastewater treatment plant with DAF treatment (sludge thickening technology for flotation sludge). In all other cases the sludge or grease is collected and transported.

Cooperation and incidents

In most cases there have been **incidents** regarding industrial wastewater treatment and discharge into the municipal sewerage system, as well as exceedances of the limit values set in the permits or contracts. Normally, issues concerning an exceedance would be settled through talks,

agreeing on how the industry would solve the problem. In one case the offending industrial organisation compensated for the damage caused. In another case the industry paid to the WWTP for the damages caused. Cooperation between industrial companies and WWTPs was considered to be good, with meetings between the two when there was a need for that. In some cases, such meetings were regular and involved the controlling and/or permitting authority.

Other industrial sectors

In terms of other industrial sectors, 20 interviews were carried out. The division of interviews by sector was:

- C25 - Manufacture of fabricated metal products, except machinery and equipment (six industrial organisations and five water utilities);
- E38 - Waste collection, treatment and disposal activities; materials recovery (five industrial organisation and four water utilities).

Industrial wastewater contracts and permits

In terms of other industrial sectors, eight large-scale and three medium-scale organisations were interviewed. Generally, **all the industrial** organisations in C25 and E38 have an **integrated environmental permit** and **a contract with** the MWWTP regarding industrial wastewater discharge. However, in one case the company produced such a low volume of wastewater that the MWWTP did not require a contract, yet in another case with E38, the industrial organization was located in another municipality and had a contract with a water utility but not the MWWTP, which led to a situation where the MWWTP was not aware of industrial wastewater discharge into the municipal sewerage. Yet, the industrial organisation claimed that the environmental permit stated the general limit values which the MWWTP had set for all its industrial clients. Thus, even though the company was not known to the MWWTP, the company was complying with the MWWTP's limit values.

Wastewater volumes, depending on the size, type of production and specifics of the industrial organisation, are in the range of 17 to 1633 m^3/d. Each contract sets out the list of specific parameters, based on the type of production and possible pollution. For example, in sector C25, a list of combinations of two to 15 specific parameters can be applied (i.e. SS, pH, grease, copper, silver, cyanide, cadmium, chrome, lead, nickel, zinc, formaldehyde, oil, sulphite, mercury, tin) , but in sector E38 it is a list of combinations of three to 14 parameters (COD, BOD_5, SS, pH, grease, TN, TP, ammonia, mercury, arsenic, cadmium, chrome, copper, tin, nickel, zinc, mineral oil, sulphite, C10-40, BTEX). Overall the lists are specific to each organization. Also, in terms of E38, many of the companies have an environmental permit which does not specify limit values, however, it is stipulated that the requirements set by the industrial wastewater contract or by the WWTP must be fulfilled.

The parameters that can be found in these lists can also be found in the lists of priority and hazardous substances, however, they are not strictly binding. It can be assumed that in most cases

water utilities are aware of potential pollutants that could be discharged into the MWWTP and the potential risks to the environment are minimised.

Industrial wastewater pre-treatment and sludge treatment technologies

The pre-treatment technologies applied in other industrial sectors are very different and case specific compared to food and beverage production sectors. However, industrial wastewater is pre-treated in all the organisations. For example, in terms of sector C25, the applied technologies can vary from simple pH neutralisation, as in two cases, to more sufficient chemical sedimentation, in three cases, and electrocoagulation and settling tanks. In terms of E38, such robust technologies as oil separation and pH neutralisation and more specific technologies like evaporation and DAF are applied.

There are **six industrial organisations that have applied some sludge treatment technology.** The technologies applied are filter press, in four cases, screw press, in one case, and sedimentation, in one case. Sludge from the other industrial sectors within the scope of the interviews is not suitable for agricultural use due to possible contamination, so it is transported to landfills. It can be concluded that **sludge treatment is applied,** thus minimising its amount and depositing. **In two** cases with E38, some **nutrient recovery technologies** were also applied.

Cooperation and incidents

Some of the companies have exceeded limit values, but there have not been any severe consequences. One of the companies used to have regular problems with complying with the limit values, which caused high costs for the company, but after an investment into pre-treatment technologies, the company has been able to comply with the value limits. In general, water utilities and industrial organisations are cooperating on industrial wastewater discharge to a sufficient extent. In some cases, regular meetings and discussions take place, setting the best practice standards on handling industrial wastewater.

Overall conclusions

Conclusions from the interviews with industrial organisations and water utilities in Finland:

- Contracts on industrial wastewater discharge into MWWTPs and pollution limits are case specific in all industrial sectors, and they spotlight potential threats to the environment, which are known and addressed.
- Overall, the industrial sectors that might have potentially hazardous substances in their wastewater are within the scope of water utilities.
- The potential of nutrient rich sludge is unrealised, especially in food and beverage production industrial sectors.
- Water utilities and industrial organisation are cooperating on industrial wastewater discharge to a sufficient extent.

3.2.3. Latvia

During the assessment in Latvia, 51 industrial organisations and 16 water utilities were interviewed (there might be multiple industrial organisations associated with one water utility, therefore the number of interviews with water utilities reached 20). In total, 12 large-scale, 12 medium-scale and 27 small-scale organisations were interviewed, covering **industrial organisations of every scale**. The number of small-scale organisations is rather high because, as it turned out, a number of them did not have actual wastewater volume so the interviewing process was prolonged to reach the necessary number of three industrial organisations per sector that discharge industrial wastewater into the municipal wastewater system. Yet, in most cases the necessary number or small-scale organisations was not reached. In total, industrial organisations from four industrial sectors and subsectors were interviewed.

Food and beverage production industrial sectors

In terms of food and beverage production industrial sectors, 53 interviews were carried out. The division of interviews by sector was:

- C10.1 - Processing and preserving of meat and production of meat products (13 industrial organisations and six water utilities);
- C10.5 - Manufacture of dairy products (12 industrial organisations and six water utilities);
- C11 - Manufacture of beverages (11 industrial organisations and five water utilities).

Industrial wastewater contracts and permits

All 16 large and medium scale industrial organisations in food and beverage production industrial sectors **have contracts with water utilities** regarding industrial wastewater discharge. These contracts set the allowed discharge volume of industrial wastewater and the allowed limits of pollutants. The volumes and concentrations in the contracts are case specific and based on the capabilities of the MWWTP. The wastewater volumes are based on the size, type of production and specifics of the industrial organisation, and are in the range of 80-800 m^3/d. In all cases, the range of limit values for the seven standard water quality parameters were as follows: BOD5 (200-1000 mg/L), COD (625-1360 mg/L), SS (150-700 mg/L), pH (6.5-9), TP (7-60 mg/L), TN (46-90 mg/L) and grease (0-40 mg/L). Typically, there are four to seven parameters set in contracts. Despite the extended lists of parameters in municipal regulations, **no additional parameters are set in** contracts. As far as the 19 interviewed **small-scale** industrial organisations are concerned, **none of them have contracts** with the water utility regarding industrial wastewater discharge. In a number of cases the water utility was not even aware that there was a particular industrial organisation in the municipality. In some cases, water utilities established additional cooperation and performed interviews with small-scale organisations as a result of raised awareness during this assessment. However, the average wastewater volume reported by these organisations was approximately 2 m^3/d (the highest reaching 10 m^3/d).

All of the large and medium-scale industrial organisations **must hold an** integrated environmental **permit** that includes a chapter on wastewater, however, the limit values of pollutants in wastewater is the **responsibility of the MWWTP** and are not included in permits for industrial organisations if the wastewater is discharged into the municipal sewerage. Small-scale organisations are out of the scope of the permitting system due to the low wastewater production rates and the absence of potential environmental pollution sources.

Industrial wastewater pre-treatment and sludge treatment technologies

In approximately half of the cases only simple and robust wastewater pre-treatment technologies such as fat separation or settling tanks were applied or no pre-treatment at all. In most of these cases, the reported pollutant concentrations did not fulfil the requirements of the MWWTP, and the industrial organisations paid additional tariff for industrial wastewater discharge. On balance, more sufficient technologies such as DAF are also widely implemented, and there was one case reported of applying anaerobic biological treatment. In most of these cases pollutant concentrations satisfy the requirements and capabilities of water utilities. To meet the requirements of MWWTPs, industrial organisations have **invested EUR** 400,000 – 1,000.000 **in their industrial wastewater pre-treatment** facilities. These investments were prompted by strengthening the requirements and the fining system through national legislation.

Only **one organisation** has confirmed that they applied sludge treatment and thickening technology as they produced enough sludge to apply anaerobic digestion. In this case the biogas production makes wastewater treatment financially viable. In general, if industrial wastewater pre-treatment is applied and sludge produced, it is transported to the nearest biogas production facility.

Despite the high potential of the C10 and C11 sectors, **none** of the organisations interviewed conducted a **nutrient recovery** from industrial wastewater or sludge, indicating that the industrial organisations are not aware or do not have financial capabilities to apply any technologies for nutrient recovery from wastewater that might lead to potential economic benefits.

Cooperation and incidents

About half of the large and medium-scale industrial organisations admitted some **incidents** regarding industrial wastewater pre-treatment and accidental discharge of polluted industrial wastewater into the municipal sewerage system. In most of these cases, the additional costs for wastewater discharge or fines were paid by the offending industrial organisation. The additional costs or fines depended on the level of exceedance and were set in contracts. Several of the incidents had been reported by the water utilities but not by the industrial organisations themselves. Either the industrial organisation was not aware of such an incident or there were other reasons why the answers differed.

Overall, the cooperation between industrial organisations and water utilities might be improved by implementing regular meetings and the evaluation of actual industrial wastewater impact on MWWTP processes. Also, the efficiency of wastewater treatment both at MWWTPs and industrial

wastewater pre-treatment plants could be improved. Therefore, it can be assumed that the cooperation regarding industrial wastewater discharge is very case specific and sensitive to the knowledge of both sides, as well as the political and economic situation in the area.

Other industrial sectors

In terms of other industrial sectors, 18 interviews were carried out. Within the scope of this assessment there was only one such industrial sector:

- C20 - Manufacture of chemicals and chemical products (15 industrial organisations and three water utilities).

Industrial wastewater contracts and permits

In terms of C20 industrial sector, **only three industrial organisations have contracts** with water utilities regarding industrial wastewater discharge. All **12** other industrial organisations declare that they **do not have any industrial wastewater** discharges and do not need to have any specific contracts. Generally, they are within the scope of the integrated permitting system, however, the chapter on wastewater treatment stipulates that the MWWTP needs to evaluate the necessity of a contract with small industrial organisations regarding industrial wastewater discharge. If there is such a contract, it sets the allowed discharge volume and the allowed limits of pollutants. The volumes and concentrations in the contracts are case specific and based on the capabilities of the MWWTP. The wastewater volumes are based on the size, type of production and specifics of the industrial organisation. These are in the range of 1.6-130 m^3/d. In all these cases the range of limit values for the seven standard water quality parameters were as follows: BOD_5 (300-350 mg/L), COD (600-740 mg/L), SS (300-450 mg/L), pH (6.5-9), TP (4.9-10 mg/L), TN (40-50 mg/L) and grease (40-50 mg/L). In **none** of the interviews **extended lists of parameters** implemented by the local water utility or environmental agency were found or described. Moreover, the extended lists of parameters can be found in local or municipal legislative acts, but they are not set forth in contracts, which can lead to a wide interpretation of the situation in the case of an accident.

Industrial wastewater pre-treatment and sludge treatment technologies

Industrial wastewater **pre-treatment technologies are not widely used** in terms of industrial sector C20. All of the organisations which reported not having any industrial wastewater also did not have any pre-treatment facilities. Of those industrial organisations which had contracts with water utilities regarding industrial wastewater discharge, one had the settling tank, one had the settling tank and DAF, and one did not have any pre-treatment facilities. Only one of the organisations had made significant investments of EUR 150,000 in industrial wastewater pre-treatment. It can be concluded that industrial sector C20 must be additionally analysed in regard to wastewater pre-treatment. Also, the actual pollutant concentrations in their wastewater must be evaluated by water utilities. None of the interviews reported any sludge treatment or nutrient recovery.

Cooperation and incidents

Since most of the industrial organisations declared not having any wastewater, no incidents in regard to them had been reported. One of the industrial organisations which has a contract with the water utility had a **sampling device** installed, and in the case of the exceedance of the limit values, the wastewater is sent back to the industrial organisation. There are cases when industrial organisations discharge wastewater with almost no pre-treatment. It may contain various chemical compounds that can impact the operation of the MWWTP and the environment. The cooperation in regard to pre-treatment of relatively more dangerous and polluted industrial wastewaters must be improved and the awareness raised in all parties.

Overall conclusions

Conclusions after the interviews with industrial organisations and water utilities in Latvia:

- Overall, most easily degradable pollutants are within the scope of water utilities, however, numerous possible hazardous or highly contaminated pollution sources are out of the scope of water utilities, especially in terms of industrial sector C20.
- In terms of food and beverage production sectors, the contracts regarding industrial wastewater discharge into MWWTPs and the pollution limits are case specific in all industrial sectors, which means that potential threats to the environment are known and addressed.
- Lists of pollutants set in the contracts are not case and industry specific, thus the industrial organisations and potential pollutants and risks are not evaluated sufficiently.
- In terms of industrial sectors producing more dangerous industrial wastewater, the cooperation, pollution limits, and extended parameter lists must be improved.
- Most of the investments in industrial wastewater pre-treatment were prompted by raising fines.
- The potential of nutrient rich sludge is unrealised, especially in food and beverage production industrial sectors.
- Small-scale organisations do not have contracts with water utilities regarding industrial wastewater discharge. Those industrial organisations that do not have the contracts with water utilities claim that they do not have industrial wastewater at their facilities either. The same applies even to industrial sector C20, which can produce hazardous substances and heavily polluted wastewater and impact MWWTPs even with discharging small wastewater volumes. Yet, these risks have not been properly analysed by water utilities.

3.2.4. Lithuania

During the assessment in Lithuania, 24 industrial organisations and 13 water utilities were interviewed. Some of the water utilities were interviewed even if the associated industrial organisation was not concerned to take part in the assessment. In total, 14 large-scale, seven medium-scale, and six small-scale organisations were interviewed, representing four industrial

sectors and subsectors, small to large.

Food and beverage production industrial sectors

In terms of food and beverage production industrial sectors, 34 interviews were carried out. The division of interviews by sector was:

- C10.1 - Processing and preserving of meat and production of meat products (seven industrial organisations and two water utilities);
- C10.5 - Manufacture of dairy products (six industrial organisations and four water utilities);
- C11 - Manufacture of beverages (10 industrial organisations and five water utilities).

Industrial wastewater contracts and permits

In terms of food and beverage production sectors, **most of the industrial organisations** (except for some small-scale organisations) **have contracts with water utilities** regarding industrial wastewater discharge. In those cases when there are no contracts with water utilities, the industrial organisations declare that they do not have any industrial wastewater. The contracts set the allowed discharge volumes of industrial wastewater and the allowed limits of pollutants. The volumes and concentrations in the contracts are case specific and based on the capabilities of the MWWTP. The wastewater volumes are in the range of 1-1058 m^3/d, depending on the size, type of production and specifics of the industrial organisation. Most contracts set the range of limit values for the seven standard water quality parameters: BOD_5 (345-2663 mg/L), COD (800-5326 mg/L), SS (350-3020 mg/L), pH (6.5-9.5), total phosphorus (TP) (3-21.6 mg/L), total nitrogen (TN) (12.6-104 mg/L) and grease (50-662 mg/L). In a number of contracts, the limiting ratio of COD/BOD_5 is required to be less than 3. Elsewhere, there were three examples where the maximum concentration limits of detergents is 2-10 mg/L. Several contracts set limit values for oil and synthetic substances, while one contract for an organization from the C10.5 industrial sector has an extensive list of 12 additional parameters (lead, nickel, mercury, tin, vanadium, arsenic, aluminium, cadmium, chromium (total and VI), zinc, copper).

The industrial organisation **must have** an integrated environmental **permit** that includes a chapter of wastewater, however, the limit values of pollutants in wastewater is the **responsibility of the MWWTP** and are not included in the permit if the wastewater is discharged into the municipal sewerage.

Industrial wastewater pre-treatment and sludge treatment technologies

The industrial organisations discharging industrial wastewater into municipal sewerage **did not apply sufficient pre-treatment technologies, with** only six cases of sedimentation tanks and no pre-treatment in the rest of the cases. In some cases, the most polluted wastewater is collected in tanks and transported.

None of the industrial organisations applied any sludge treatment technology; the sludge

was collected and transported.

Despite the high potential of sectors C10 and C11, **none** of the organisations interviewed conducted **nutrient recovery** from industrial wastewater or sludge. This indicates that the industrial organisations are either unaware of the wide scope of economic benefits or financially incapable to apply any technologies for nutrient recovery from wastewater.

Cooperation and incidents

Most of the interviews mentioned incidents regarding industrial wastewater pre-treatment and accidental discharge of polluted industrial wastewater into the municipal sewerage system. In most of the cases, the additional costs of wastewater discharge were covered by the offending industrial organisation. In a number of cases highly polluted industrial wastewater was discharged into municipal sewerage without any sanctions being imposed.

In some interviews water utilities reported incidents regarding highly polluted industrial wastewater discharge, while the associated industrial organisations reported none.

Overall, the cooperation between industrial organisations and water utilities could be improved by staging regular meetings and by evaluating the actual impact of industrial wastewater on the MWWTP processes. Also, the efficiency of both treatment at MWWTPs and pre-treatment at industrial organisations should be improved. Therefore, it can be assumed that cooperation on industrial wastewater discharge is very case specific and sensitive to the knowledge of both sides, as well as political and economic situation in the area.

Other industrial sectors

In terms of other industrial sectors, three interviews were carried out. The division of interviews by sector was:

- C25 - Manufacture of fabricated metal products (one industrial organisation and two water utilities).

Industrial wastewater contracts and permits

In terms of industrial sector C25, **all three industrial organisations have contracts** with water utilities regarding industrial wastewater discharge. Also, they are within the scope of an integrated permitting system, however, the chapter on wastewater states that the MWWTP has to evaluate the need for a contract regarding industrial wastewater discharge. The contracts set the allowed discharge volume of industrial wastewater and the allowed limits of pollutants. The volumes and concentrations in the contracts are case specific and based on the capabilities of the MWWTP. The wastewater volumes are in the range of 18-70 m^3/d, depending on the size, type of production and specifics of the industrial organisation. Each contract sets specific parameters, based on the type of production and possible pollution in the wastewater. Also, **the extended lists of 11 to 13 parameters** (BOD_5, COD, SS, pH, TP, TN, oil, aluminium, cadmium, chrome, tin, nickel, zinc, synthetic active superficial substances (anionic)) are included in contracts. The parameters that can be found

in lists can also be found in the lists of priority and hazardous substances, however, they are not strictly binding. It can be assumed that in most cases water utilities are aware of the potential pollutants that could be discharged into the MWWTP and the potential risks to the environment are minimised.

Industrial wastewater pre-treatment and sludge treatment technologies

All three organisations applied wastewater pre-treatment technologies. In all cases most of the pollutants were removed by applying primary solution regeneration technologies (mostly for metals), and in one case the chemical precipitation was applied to remove metals, before discharging the wastewater into the municipal sewerage. In one case an investment of EUR 200,000 had been made to equip the industrial wastewater pre-treatment plant with chemical precipitation and sludge treatment facilities.

O**ne industrial organisation applied sludge treatment technology,** where sludge was dewatered and deposited as hazardous waste. In other cases, there was no sludge produced at the industrial organisation, therefore no sludge treatment was required. **None** of the industrial organisations applied **nutrient recovery technologies**.

Cooperation and incidents

In all the cases there had been some **incidents** regarding industrial wastewater pre-treatment and accidental discharge of polluted industrial wastewater into the municipal sewerage system. In most of them, the additional costs of wastewater discharge were covered by the offending industrial organisation. There are also some cases when highly polluted industrial wastewater was discharged into municipal sewerage without any sanctions being imposed.

In some interviews water utilities reported incidents regarding highly polluted industrial wastewater discharge, while the associated industrial organisations reported none.

Overall, the cooperation between industrial organisations and water utilities could be improved by staging regular meetings and by evaluating the actual impact of industrial wastewater on the MWWTP processes. Also, the efficiency of both treatment at MWWTPs and pre-treatment at industrial organisations should be improved. Therefore, it can be assumed that cooperation on industrial wastewater discharge is very case specific and sensitive to the knowledge of both sides, as well as political and economic situation in the area.

Overall conclusions

Conclusions after the interviews with industrial organisations and water utilities in Lithuania:

- Overall, most of the easily degradable pollutants are within the scope of water utilities, however, numerous possible hazardous or highly contaminated pollution sources are out of the scope of water utilities, especially in terms of industrial sector C25.
- In terms of food and beverage production sectors, the contracts regarding industrial wastewater discharge into MWWTPs and the pollution limits are case specific, which

means that potential threats to the environment are relatively known and addressed.

- In terms of food and beverage production sectors, the cooperation between water utilities and industrial organisations is sufficient, yet, it might be due to the economic, political or legislative pressure.
- The lists of pollutants set in the contracts are not case and industry specific, thus the evaluation of industrial organisations, potential pollutants and risks in not sufficient.
- In terms of industrial sectors producing more dangerous industrial wastewater, the cooperation, pollution limits and extended parameter lists must be improved.

3.2.5. Poland

During the assessment in Poland, 16 industrial organisations but no water utilities were interviewed. In total, 12 large-scale, two medium-scale and two small-scale organisations were interviewed, representing three industrial sectors and subsectors. All these industrial organisations represented food and beverage production industrial organisations.

Food and beverage production industrial sectors

In terms of food and beverage production industrial sectors, 16 interviews were carried out. The division of interviews by sector was:

- C10.1 - Processing and preserving of meat and production of meat products (five industrial organisations);
- C10.5 - Manufacture of dairy products (nine industrial organisations);
- C11 - Manufacture of beverages (two industrial organisation).

Industrial wastewater contracts and permits

All of the industrial organisations (including small and medium-scale organisations) **had contracts with water utilities** regarding industrial wastewater discharge. The contracts set the allowed discharge volume of industrial wastewater and the allowed limits of pollutants. The volumes and concentrations in the contracts are case specific and based on the capabilities of the MWWTP. The wastewater volumes are in the range of 1-1700 m^3/d, depending on the size, type of production and specifics of the industrial organisation. Most of the contracts set the range of limit values for **six of the seven standard water quality parameters**: BOD_5 (570-1100 mg/L), COD (800-2000 mg/L), SS (320-800 mg/L), pH (6.35-9.5), TP (8.5-30 mg/L), TN (55-450 mg/L). Grease is not listed in any of the contracts. **However, all the contracts listed additional parameters** of ammonia (NH_4-N) (33-200 mg/L) and chlorine (200-1000 mg/L). In the contract of one industrial organisation (C10.5) even a more extended list of six parameters (chromium, zinc, nickel, tin, copper and total petroleum hydrocarbons) was included. The parameters that can be found in the lists can also be found in the lists of priority and hazardous substances, however, they are not strictly binding. It can be assumed that in most cases the water utilities are aware of the potential pollutants that could be discharged into the MWWTP and the potential risks to the environment are minimised.

Industrial organisations **must have** an integrated **environmental permit** that includes a chapter on wastewater, however, the limit values of pollutants in wastewater is the **responsibility of the MWWTP** and are not included in the permit if the wastewater is discharged into the municipal sewerage.

Industrial wastewater pre-treatment and sludge treatment technologies

In several industrial organisations industrial wastewater pre-treatment facilities have been installed. In terms of sectors C10.1 and C10.5, investments have been made to improve the industrial wastewater pre-treatment processes by the application of DAF systems (three cases) and biological treatment (four cases). However, in two cases only more robust technologies of equalisation tanks and pH correction were applied. Moreover, in five cases the industrial wastewater is discharged into the municipal sewerage without any pre-treatment at all. In terms of industrial sector C11, no industrial wastewater pre-treatment technologies were applied.

There were **two industrial organisations that had applied DAF and sludge thickening technology**. In all other cases the sludge was collected and transported. **None** of the industrial organisations applied **nutrient recovery technologies**.

Cooperation and incidents

Not many **incidents** regarding industrial wastewater treatment and discharge into the municipal sewerage system were mentioned in the interviews. In those several cases there had been exceedances of the limit values set in the permits or contracts. In most of the cases, the additional costs of wastewater discharge were covered by the offending industrial organisation.

Overall, the cooperation between industrial organisations and water utilities could be improved by staging regular meetings and by evaluating the actual impact of industrial wastewater on the MWWTP processes. Also, the efficiency of both treatment at MWWTPs and pre-treatment at industrial organisations should be improved. Therefore, it can be assumed that cooperation on industrial wastewater discharge is very case specific and sensitive to the knowledge of both sides, as well as political and economic situation in the area.

Overall conclusions

Conclusions after the interviews with industrial organisations and water utilities in Poland:

- Overall, most of the easily degradable pollutants are within the scope of water utilities.
- In terms of food and beverage production sectors, the contracts regarding industrial wastewater discharge into MWWTPs and the pollution limits are case specific in all industrial sectors, which means that potential threats to the environment are relatively known and addressed.
- In terms of food and beverage production sectors, the cooperation between water utilities and industrial organisation is taking place in sufficient manner, yet it might be due to economic, political or legislative pressure.

- The lists of pollutants set in the contracts are not case and industry specific, thus the evaluation of industrial organisations and potential pollutants and risks is not sufficient.

3.2.6. Russia (Kaliningrad region)

The methodology developed in terms of this project was not fully applied in the assessment and interviewing process in Russia, therefore the analysis is done in a more descriptive way.

The **most polluting industrial sector** in the Kaliningrad region was the **food industry C10** (meat, fish and dairy production), as well as enterprises producing vehicles and equipment of sector C29 (selected by experts). Experts have also identified other industries that might make a significant contribution to the discharge of industrial effluent into municipal wastewater collection and treatment systems, among them: equipment manufacturing (C27), confectionery production (C10) and production of other food products (C10), including beer (C11).

All industrial organisations that are discharging industrial wastewater into the municipal sewerage system **have contracts** with water utilities regarding industrial wastewater discharge. In most cases, the water utility operates and maintains both the municipal wastewater system and the MWWTP. However, in several municipalities, these functions are performed by separate entities. The contract for wastewater discharge is public and standardised; its form was approved by the decree of the Government of the Russian Federation. However, the information related to the volume and quality of wastewater is deemed confidential. The legislation of the Russian Federation stipulates the limit values for wastewater properties and concentrations of pollutants in wastewater that can be discharged without affecting the operation of the municipal sewerage system. It also specifies what substances are prohibited to be discharged into the municipal sewerage system.

According to the national legislation, **it is allowed to exceed limit values** and to set specific values for industrial wastewater discharge into municipal systems for the following wastewater parameters: **the seven standard water quality parameters** (suspended solids, BOD_5, COD, TN, TP, grease, pH) and the **extended list of parameters** (chlorine and chloramines, fat, oil, phenols (total), sulphides, sulphates, chlorides, aluminium, heavy metals, volatile organic compounds (VOCs), synthetic surfactants, polychlorinated biphenyls (PCBs)). The water utility sets the volume for wastewater discharged into its network by the industrial organization, based on the data provided by the enterprise, as well as the technical capacity of the water utility itself.

The main purpose of pre-treatment at food enterprises is to reduce COD, BOD_5, SS and grease/oil content. In this case, the wastewater treatment process includes grease traps, flotation, coagulation, and biological treatment. One of the meat production enterprises with a slaughterhouse uses blood and manure fermentation, which is then applied as agricultural fertilizer. Not all industrial organisations in terms of C10 have reached sufficient quality standards of industrial wastewater pre-treatment. It is a common practice that only mechanical wastewater technologies such as grease traps are applied for industrial wastewater pre-treatment. Thus, industrial organisations do not actually meet the requirements of the national legislation, and in case they exceed the limit values, **additional fees are imposed**. Motor vehicle and equipment production industry has other specific

wastewater parameters, e.g. SS, chlorides, oil products, iron, heavy metals and phenols. Membrane filters, flocculation, grease traps, alkalinity and acid neutralization are used to reduce the concentration of these substances.

In **none** of the industrial organisations in the Kaliningrad region **nutrient recovery** from industrial wastewater or sludge is conducted, implying that most of the industrial organisations are not aware of any technologies of nutrient recovery that might lead to potential economic benefits from wastewater.

None of the organisations confirmed that they applied any **sludge treatment** or thickening technologies. The sludge produced during industrial wastewater pre-treatment is usually is deployed to a landfill.

Data on financial costs of pre-treatment and its maintenance are unavailable.

3.3. Summary of the situation in the most problematic industrial sectors

To evaluate the overall situation in the BSR regarding the most problematic industrial sectors selected by experts discharging industrial wastewater into municipal wastewater collection and MWWTPs a comparison of data on the situation in five BSR countries was carried out. The statistical results may be questionable considering the differing national situations and possible deviations in the application of the methodology, however, they can provide an overview of the overall situation.

Contracts

During the interviewing process, it was found that **58%** of the interviewed industrial organisations (134 organisations, in total) **have contracts** with water utilities regarding industrial wastewater discharge into municipal systems (Figure 3.4). If the scope is limited to medium and large-scale organisations only (limiting the number of organisations in Latvia, Lithuania and Poland), **69%** of them **have contracts** and are within the scope of water utilities. The best situation regarding contracts was in Lithuania, where 88% of medium and large-scale organisations have contracts, while the lowest number of organisations with contracts was found in Estonia, where only 52% of them are within the scope of water utilities. Also, in terms of legislation in Russia, all industrial organisations are obliged to have contracts with water utilities, but the actual proportion is not known. However, it should be noted that only the interviewed organisations of the most problematic industrial sectors were assessed here, and the overall situation in the countries could differ if all industrial organisations were included in the assessment.

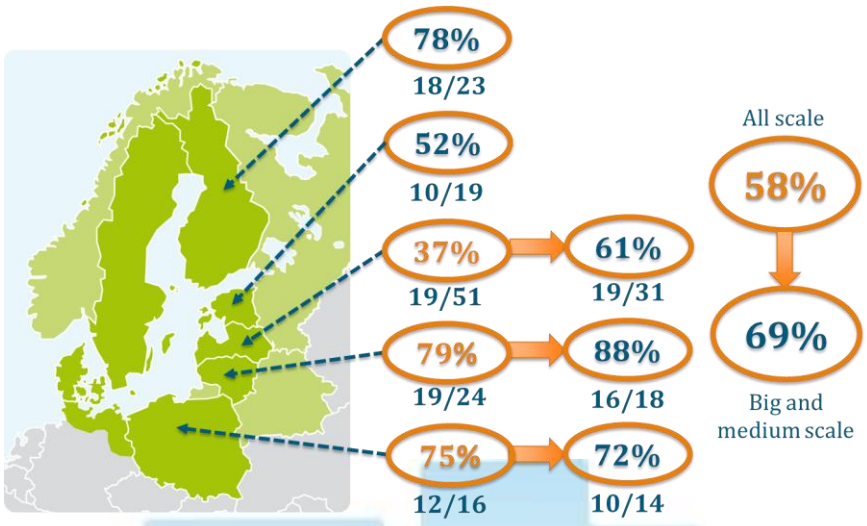

Figure 3.4. Industrial organisations with a contract regarding industrial wastewater discharge into municipal wastewater systems

Wastewater quality parameters

During the assessment process, it was found that the monitoring of industrial wastewater

discharges into municipal wastewater systems was approached differently (Figure 3.5). However, if there is a contract between the industrial organisation and water utility, the list of industrial wastewater parameters is set in it. The lists of parameters vary, although in most of the countries the limitations and monitoring of **the seven standard water quality parameters** (BOD_5, COD, SS, pH, total phosphorus (TP), total nitrogen (TN) and grease) are applied with **food and beverage** production industrial sectors (C10 and C11). However, there are a number of organisations in **Lithuania and Poland** which are subject to **more stringent requirements,** with extended lists of parameters set in their contracts. In terms of other industrial sectors, an individual approach to each contract and industrial organisation is applied, and in addition to the seven standard parameters, an **extended list of parameters** to be monitored is instituted, based on the product type and the technological processes declared by the industrial organisation. Also, in Russia, the extended lists of parameters must be applied. The only country where T7 limits are imposed on industrial organisations in other industrial sectors (not C10 and C11) is Latvia, meaning that numerous contaminants are out of the scope of water utilities. This finding is rather urgent and significant. Despite the fact that Latvian municipal and regional legislation provides for extended lists of parameters, they are not specified in the contracts between the industrial organisation and the water utility.

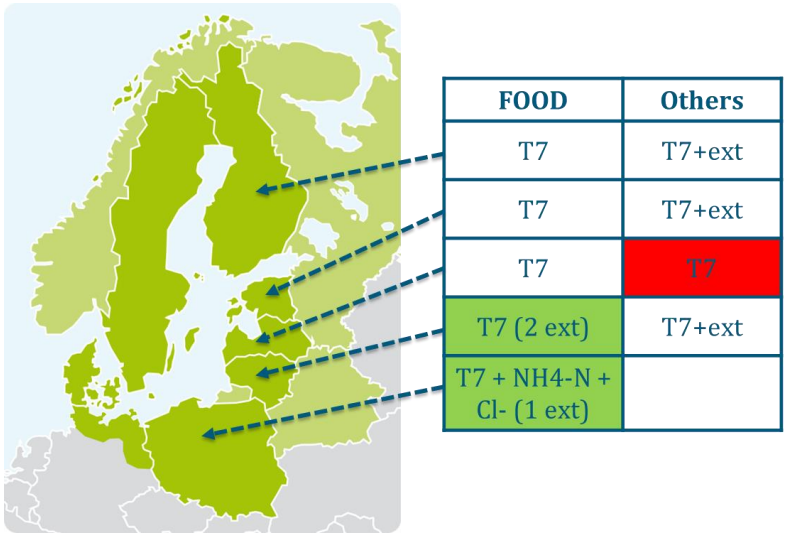

Figure 3.5. Industrial wastewater parameter limits and monitoring set in contracts (Food – industrial sectors C10 and C11, others – all other industry sectors of specific concern, T7 – typical 7 parameters, ext. – extended list of parameters)

In total, there are **33 different additional parameters** in the extended lists of parameters. In most cases, the parameters are based on past experience and the capacity of water utilities and MWWTPs, the knowledge of technologies applied and the possible contamination of industrial wastewater by the industrial organisation. In most instances, the contaminants that affect the

municipal wastewater collection, treatment, sludge production and management are addressed, however, there appears to be less attention applied to priority and hazardous substances. **Of the 42 priority or hazardous substances**, only **six (benzene, cadmium, lead, mercury, nickel, polyaromatic hydrocarbons) were specified** in any of the contracts in the BSR. If the compounds of polyaromatic hydrocarbons were identified in the contracts, the number of mentioned substances would notably rise. The results show that most often the most dangerous contaminants are not within the scope of the industrial organisation or water utilities. Yet, it should be noted that this assessment did not evaluate the possible occurrences of priority and hazardous substances at the interviewed organisations.

Incidents

There are various incidents regarding industrial wastewater pre-treatment and discharge into municipal wastewater systems, such as problems in pre-treatment facilities, fluctuations in wastewater pre-treatment efficiency, fluctuation of production volume and subsequent wastewater quantity and quality. In total, **38% of the interviewed industrial organisations** reported that there have been **incidents in their organisation** (Figure 3.6.). If the scope is limited to medium and large-scale organisations (limiting the number of organisations in Latvia, Lithuania and Poland), **48%** of them **have reported incidents**. There were also several cases where one of the interviewed parties (industrial organisation and water utility) replied that there had been incidents in the past, while the other interviewed party did not report these incidents. There can be various reasons for this discrepancy. The other side might not have been telling the truth or did not recall the incident. Overall, the situation is rather similar in all five countries that have submitted the interviews, but there is no detailed information on the situation in Russia (Kaliningrad).

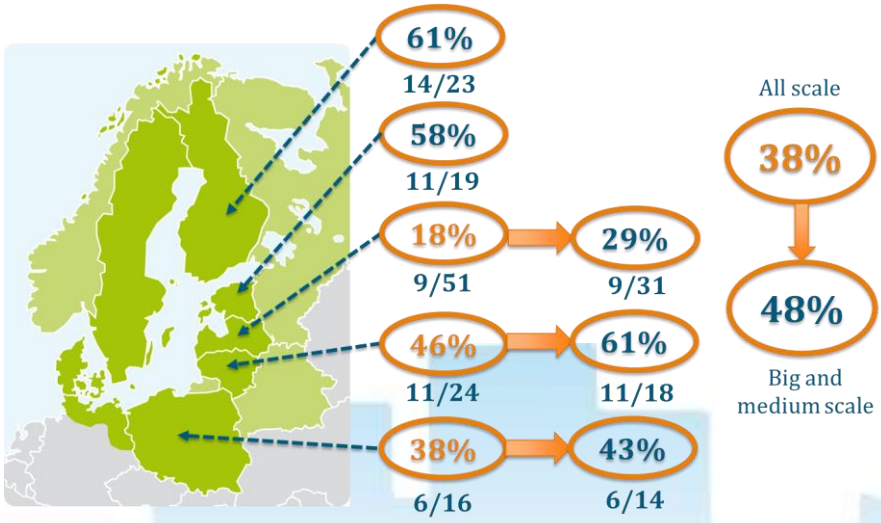

Figure 3.6. Reported incidents of industrial wastewater discharge showing contribution of large and medium-scale organisations

In most cases when there have been any incidents reported, the water utilities have imposed **additional fees for** industrial wastewater discharge on the offending industrial organisation. In some countries, the methodology for the calculation of additional costs is set in the legislation, however, the water utilities interpret the calculations on case-by-case basis. This assessment mentions **one case in which the Estonian Environmental Board temporarily closed down an** industrial organisation due to the discharge of highly polluted industrial wastewater into the municipal wastewater system.

Sludge treatment

In terms of interviews with industrial organisations, it was found that in most cases industrial organisations do not apply any sludge treatment technologies (Figure 3.7). However, **12%** (medium and large-scale) of industrial organisations have introduced **sludge treatment technologies**. The lowest number of industrial organisations applying sludge treatment was found in Latvia (3%) and Lithuania (6%), which is only one industrial organisation in each country. In most cases, sludge thickening by the filter press, gravitational thickening or centrifuge technologies were applied. **Overall,** industrial organisations **lack the knowledge or financial resources** to treat sludge and they are not aware that they are producing a potential source of energy or nutrients. Moreover, in many cases the sludge is transported to biogas powerplants which are not operated by the industrial organisation itself, thus providing potential economic benefits for other organisations. In Russia (Kaliningrad), the most common way of handling sludge is transporting it to landfills.

However, in many cases the amount of sludge generated in the pre-treatment process of industrial wastewater is relatively small, and any application of sludge treatment technologies would not be technically and economically feasible.

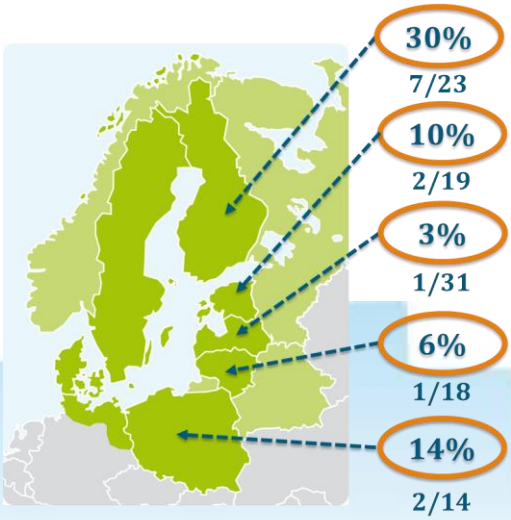

Figure 3.7. Level of sludge treatment technologies applied in industrial organisations

Nutrient recovery

In **total, three industrial organisations** were recognised that applied any **nutrient recovery technologies** to industrial wastewater at their facilities. These were two industrial organisations from the C10 industrial sector in Finland and one organisation from the C11 industrial sector in Latvia. One reason why companies do not apply nutrient recovery could be the lack of awareness of the potential economic benefits wastewater presents in this respect. However, it must be noted that the implementation of nutrient recovery technologies requires large investments at the construction period, and most industrial organisations in the Baltic States, Poland, and Russia do not have such an economic capacity for innovation.

Appendix

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
Interreg Baltic Sea Region

Appendix I

Industrial sectors as a potential source of industrial wastewater

No.	NACE code (КДЕС in Russia)	Categories and subcategories	Definition according to International Standard Industrial Classification (ISIC) of All Economic Activities, Rev.4	Are there any industrial companies in the country within the category Yes/No/NA	Number of organizations within the category with the corresponding turnover	Annual turnover in 2017 (Euro/year)	Do the organizations within the category discharge industrial wastewater into the municipal sewerage network (EXPERT OPINION)
3.1.1	C10	**Manufacture of food/feed products**	This division includes the processing of the products of agriculture, forestry, and fishing into food for humans or animals, and includes the production of various intermediate products that are not directly food products. The activity often generates associated products of greater or lesser value (e.g. hides from slaughtering or oilcake from oil production).				
3.1.1.1	C10.1	Processing and preserving of meat and production of meat products				0 - 100 000 100 000 - 500 000 >500 000	
3.1.1.2	C10.2	Processing and preserving of fish, crustaceans and molluscs				0 - 100 000 100 000 - 500 000 >500 000	
3.1.1.3	C10.3	Processing and preserving of fruit and vegetables				0 - 100 000 100 000 - 500 000 >500 000	
3.1.1.4	C10.4	Manufacture of vegetable and animal oils and fats				0 - 100 000 100 000 - 500 000 >500 000	
3.1.1.5	C10.5	Manufacture of dairy products				0 - 100 000 100 000 - 500 000 >500 000	
3.1.1.6	C10.6	Manufacture of grain mill products, starches and starch				0 - 100 000 100 000 - 500 000 >500 000	

		products					
3.1.1.7	C10.7	Manufacture of bakery and farinaceous products				0 - 100 000 100 000 - 500 000 >500 000	
3.1.1.8	C10.8	Manufacture of other food products				0 - 100 000 100 000 - 500 000 >500 000	
3.1.1.9	C10.9	Manufacture of prepared animal feeds				0 - 100 000 100 000 - 500 000 >500 000	
3.2.1	B (B05-09)	**Mining and quarrying**	This section includes the extraction of minerals occurring naturally as solids (coal and ores), liquids (petroleum) or gases (natural gas). Extraction can be achieved by different methods such as underground or surface mining, well operation, seabed mining etc.			0 - 100 000 100 000 - 500 000 >500 000	
3.2	C	**Manufacturing**	This section includes the physical or chemical transformation of materials, substances, or components into new products, although this cannot be used as the single universal criterion for defining manufacturing (see remark on processing of waste below). The materials, substances, or components transformed are raw materials that are products of agriculture, forestry, fishing, mining or quarrying as well as products of other manufacturing activities.				
3.2.2	C11	Manufacture of beverages	This division includes the manufacture of beverages, such as non-alcoholic beverages and mineral water, manufacture of alcoholic beverages mainly through fermentation, beer and wine, and the manufacture of distilled alcoholic beverages.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.3	C12	Manufacture of tobacco products	This division includes the processing of an agricultural product, tobacco, into a form suitable for final consumption.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.4	C13	Manufacture of textiles and wearing apparel	This division includes preparation and spinning of textile fibres as well as textile weaving, finishing of textiles and wearing apparel, manufacture of made-up textile articles, all tailoring (ready-to-wear or made-to-measure), in all materials (e.g. leather, fabric, knitted and crocheted fabrics etc.), of all items of clothing (e.g. outerwear, underwear for men, women or children; work, city or casual clothing etc.) and accessories.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.5	C15	Manufacture of leather and related products	This division includes dressing and dyeing of fur and the transformation of hides into leather by tanning or curing and fabricating the leather into products for final consumption. It also includes the manufacture of similar products from other materials (imitation leathers or leather substitutes), such as rubber footwear, textile luggage etc. The products made from leather substitutes are included here, since they are made in ways similar to those in which leather products are made			0 - 100 000 100 000 - 500 000 >500 000	

			(e.g. luggage) and are often produced in the same unit.				
3.2.6	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	This division includes the manufacture of wood products, such as lumber, plywood, veneers, wood containers, wood flooring, wood trusses, and prefabricated wood buildings. The production processes include sawing, planning, shaping, laminating, and assembling of wood products starting from logs that are cut into bolts, or lumber that may then be cut further, or shaped by lathes or other shaping tools. The lumber or other transformed wood shapes may also be subsequently planed or smoothed, and assembled into finished products, such as wood containers.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.7	C17	Manufacture of paper and paper products	This division includes the manufacture of pulp, paper and converted paper products. The manufacture of these products is grouped together because they constitute a series of vertically connected processes. More than one activity is often carried out in a single unit. There are essentially three activities: The manufacture of pulp involves separating the cellulose fibres from other impurities in wood or used paper. The manufacture of paper involves matting these fibres into a sheet. Converted paper products are made from paper and other materials by various cutting and shaping techniques, including coating and laminating activities. The paper articles may be printed (e.g. wallpaper, gift wrap etc.), as long as the printing of information is not the main purpose.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.8	C18	Printing and reproduction of recorded media	This division includes printing of products, such as newspapers, books, periodicals, business forms, greeting cards, and other materials, and associated support activities, such as bookbinding, plate-making services, and data imaging. The support activities included here are an integral part of the printing industry, and a product (a printing plate, a bound book, or a computer disk or file) that is an integral part of the printing industry is almost always provided by these operations.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.9	C19	Manufacture of coke and refined petroleum products	This division includes the transformation of crude petroleum and coal into usable products. The dominant process is petroleum refining, which involves the separation of crude petroleum into component products through such techniques as cracking and distillation. This division also includes the manufacture for own account of characteristic products (e.g. coke, butane, propane, petrol, kerosene, fuel oil etc.) as well as processing services (e.g. custom refining). This division includes the manufacture of gases such as ethane, propane and butane as products of petroleum refineries.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.10	C20	Manufacture of chemicals and chemical products	This division includes the transformation of organic and inorganic raw materials by a chemical process and the formation of products. It distinguishes the production of basic chemicals that constitute the first industry group from the production of intermediate and end products produced by further processing of			0 - 100 000 100 000 - 500 000 >500 000	

			basic chemicals that make up the remaining industry classes.				
3.2.11	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	This division includes the manufacture of basic pharmaceutical products and pharmaceutical preparations. This also includes the manufacture of medicinal chemicals and botanical products.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.12	C22	Manufacture of rubber and plastic products	This division includes the manufacture of rubber and plastic products.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.13	C23	Manufacture of other non-metallic mineral products	This division includes manufacturing activities related to a single substance of mineral origin. This division includes the manufacture of glass and glass products (e.g. flat glass, hollow glass, fibres, technical glassware etc.), ceramic products, tiles and baked clay products, and cement and plaster, from raw materials to finished articles. The manufacture of shaped and finished stone and other mineral products is also included in this division.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.14	C24	Manufacture of basic metals	This division includes the activities of smelting and/or refining ferrous and non-ferrous metals from ore, pig or scrap, using electrometallurgical and other process metallurgic techniques. This division also includes the manufacture of metal alloys and super-alloys by introducing other chemical elements to pure metals. The output of smelting and refining, usually in ingot form, is used in rolling, drawing and extruding operations to make products such as plate, sheet, strip, bars, rods, wire, tubes, pipes and hollow profiles, and in molten form to make castings and other basic metal products.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.15	C25	Manufacture of fabricated metal products, except machinery and equipment	This division includes the manufacture of pure metal products (such as parts, containers and structures), usually with a static, immovable function, as opposed to the following divisions 26-30, which cover the manufacture of combinations or assemblies of such metal products (sometimes with other materials) into more complex units that, unless they are purely electrical, electronic or optical, work with moving parts.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.16	C27 and C26	Manufacture and repairing of electrical equipment, computer, electronic and optical products	This division includes the manufacture of products that generate, distribute and use electrical power. Also included is the manufacture of electrical lighting, signalling equipment and electric household appliances. This division includes the manufacture of computers, computer peripherals, communications equipment, and similar electronic products, as well as the manufacture of components for such products. Production processes of this division are characterized by the design and use of integrated circuits and the application of highly specialized miniaturization technologies. This division includes the specialized repair of goods produced in the manufacturing sector with the aim to restore machinery,			0 - 100 000 100 000 - 500 000 >500 000	

			equipment and other products to working order. The provision of general or routine maintenance (i.e. servicing) on such products to ensure they work efficiently and to prevent breakdown and unnecessary repairs is included.				
3.2.17	C28	Manufacture and repairing of machinery and equipment	This division includes the manufacture of machinery and equipment that act independently on materials either mechanically or thermally or perform operations on materials (such as handling, spraying, weighing or packing), including their mechanical components that produce and apply force, and any specially manufactured primary parts. This includes the manufacture of fixed and mobile or hand-held devices, regardless of whether they are designed for industrial, building and civil engineering, agricultural or home use. The manufacture of special equipment for passenger or freight transport within demarcated premises also belongs within this division.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.18	C29	Manufacture of motor vehicles, trailers and semi-trailers and other transport equipment	This division includes the manufacture of motor vehicles for transporting passengers or freight. The manufacture of various parts and accessories, as well as the manufacture of trailers and semi-trailers, is included here. Transportation equipment such as ship building and boat manufacturing, the manufacture of railroad rolling stock and locomotives, air and spacecraft and the manufacture of parts thereof.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.19	C31	Manufacture of furniture	This division includes the manufacture of furniture and related products of any material except stone, concrete and ceramic. The processes used in the manufacture of furniture are standard methods of forming materials and assembling components, including cutting, moulding and laminating. The design of the article, for both aesthetic and functional qualities, is an important aspect of the production process.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.20	C32	Other manufacturing	This division includes the manufacture of a variety of goods not covered in other parts of the classification. Since this is a residual division, production processes, input materials and use of the produced goods can vary widely and usual criteria for grouping classes into divisions have not been applied here.			0 - 100 000 100 000 - 500 000 >500 000	
3.2.21	E38	Waste collection, treatment and disposal activities; materials recovery	This division includes the collection, treatment, and disposal of waste materials. This also includes local hauling of waste materials and the operation of materials recovery facilities (i.e. those that sort recoverable materials from a waste stream).			0 - 100 000 100 000 - 500 000 >500 000	

Appendix II

Questions to be included in interviews with national experts

No.	MAIN QUESTIONS (topics of the discussion with experts)	Supportive questions (topics should be addressed in discussion)
	National legislation	
2.1	How is the Council Directive concerning urban wastewater treatment 91/271/EEC article 11 implemented in national legislation?	
		Specify the title and number of the law, paragraph/article/point where implementations are done.
		Does the implemented legislation comply with HELCOM recommendations? Please describe.
		What are the institutions responsible for the adoption of international legislation?
		What are the institutions that issue the legislation on industrial wastewaters on the national level?
		What are the parameters (incl. nutrients, biogenic parameters (N, P compounds), hazardous substances and concentrations regulated by international legislation? Please describe.
		Are the municipal water utilities obligated to receive industrial wastewater if it is situated in the urban area? Please describe.
		Is there any penalty and fine system related by national legislation? Please describe.
		Does the implemented legislation fulfil the expectations and needs? Please describe.
	Local legislation	
2.2	Is there any additional municipal/local legislation regulating the industrial wastewater quality before discharge to municipal sewerage network?	
		What are the parameters (incl. nutrients, biogenic parameters (N, P compounds), hazardous substances) and concentrations regulated by municipality / local water companies?
		Is there any penalty and fine system regulated by municipality/water company? Please describe.
		Are there any contracts between industrial companies and water utilities regards industrial wastewater outflows municipal sewerage system? Please describe.
		Are the contracts about industrial wastewater discharge to municipal sewerage network confidential/classified? Please describe.
	Permitting authorities	
2.3	Is there any institution giving the permits of industrial wastewater treatment and emission?	
		What institutions are authorized to issue the permits of industrial wastewater treatment and emission?
		Are the permitting institutions independent from controlling institutions?
		How often should the permit be reviewed?
		Do the permitting authorities have power to evaluate the contracts between industrial companies and municipality/utilities regarding industrial wastewater?

	Controlling authorities	
2.4	Are there any institutions controlling and sampling the industrial wastewater outflows?	
		What are the authorized institutions that control the industrial wastewater outflows?
		Is there any national/local/municipal legislation on frequency of industrial wastewater outflow controls? Please describe.
		Is there any national/municipal/local protocol of industrial wastewater outflow control? Please describe.
		Do the controlling institutions have the rights to fine? Please describe.
	Data base	
2.5	Are there any institutions maintaining a data base on industrial wastewater outflows?	
		Are there any institutions maintaining a data base on industrial wastewater outflows? Please name them.
		Are there any regulations regarding data submission and collection on industrial wastewater treatment before discharge into municipal sewerage networks?
		Is there historical data on industrial wastewater collected at national level?
		If the answer to previous question is YES, please specify where the data can be found.
		Is there historical data on the parameters of industrial wastewater collected at municipal/local level?
		If the answer to previous question is YES, please specify where the data can be found.
		Is the data on industrial wastewater reliable?
		Specify where the data can be found.

2.6	What are the urgent issues in the area related to industrial wastewater before discharge into the municipal sewerage network?	
	1)	
	2)	
	3)	

2.7	What cooperation models are applied between the industry and municipal water utilities regarding industrial wastewater discharge?	
	1)	
	2)	
	3)	

Appendix III

Template of the interview with industrial organisations and water utilities

Introduction

The questions are aimed at acquiring information on industrial wastewater discharge into municipal sewerage systems and the pre-treatment technologies applied. The questions should be asked to industrial organisations within the industry sectors of specific concern in your country and the water utility that owns the municipal sewerage system into which industrial wastewater is discharged. The responses will be collected, processed and reported on an anonymous basis, and no specific names, addresses or information will be provided.

Overview

1.1. NACE code of the organisation:

1.2. Category of turnover: ☐ 0 – 100 000 EUR/year
☐ 500 000 – 100 000 EUR/year
☐ >500 000 EUR/year

1.3. The main production of the organisation:

1.4. Is there a contract on industrial wastewater discharge between the industrial organisation and water utilities? ☐ YES
☐ NO

1.5. If YES (1.4.), is it confidential? ☐ YES
☐ NO

1.6. If NO (1.5), what are the parameters and limit values of wastewater composition?

	Limit concentrations (mg/L) of discharged wastewater
COD (chemical oxygen demand)	
BOD_5 (biological oxygen demand)	
SS (suspended solids)	
pH	
Other parameters[1]	
Other parameters	
Other parameters	

1.7. If there are set limit values (1.6.), who sets them? ☐ Water utility within the contract
☐ Municipality
☐ Government

Industrial wastewater

1.8. The average daily volume of industrial wastewater (m^3/d):

1.9. Maximum daily volume of industrial wastewater (m^3/d):

[1] Other parameters, e.g. heavy metals, phosphorus, fats and oils, must be included if they are monitored or regulated by law or other local legislation.

1.10. Minimum daily volume of industrial wastewater (m^3/d):

1.11. Average daily volume of industrial wastewater discharged into the municipal sewerage system (m^3/d):

1.12. What is the composition of the industrial wastewater?

	Average yearly concentration (mg/L) of raw wastewater	Average yearly concentration (mg/L) of pre-treated wastewater
COD (chemical oxygen demand)		
BOD_5 (biological oxygen demand)		
SS (suspended solids)		
pH		
Other parameters[2]		
Other parameters		
Other parameters		

1.13. Have there been any incidents or exceedances of the limit values reported: ☐ YES ☐ NO

If YES, please describe (what, when, how, consequences, etc.):

Industrial wastewater pre-treatment

1.14. The industrial wastewater pre-treatment technology[3] applied in the organisation:

1.15. The fraction of the industrial wastewater which is pre-treated before discharge into the municipal sewerage system (%):

1.16. Does the applied technology include nutrient recycling solutions? ☐ YES ☐ NO

If YES, please describe (applied technology, amount of nutrients (t/d) recycled):

1.17. The amount of sludge produced within the industrial wastewater pre-treatment process (t/d):

1.18. Is there any sludge processing technology applied (thickening, etc.)? ☐ YES ☐ NO

1.19. What is the approximate investment in wastewater pre-treatment facilities and technologies (if available) (EUR):

What are the approximate costs of wastewater pre-treatment operation (if available) (EUR/m3):

[2] Other parameters, e.g. heavy metals, phosphorus, fats and oils, must be included if they are monitored or regulated by law or other local legislation.

[3] Membrane filtration, ion exchange, evaporation, brine concentration of crystallization, ultrafiltration, flocculation, oil or fat separation, skimming, activated sludge, tricking filter, alkali removal, acid removal, hardness removal, removal of heavy metals, sedimentation, coagulation, flotation, centrifugation, oxidation (please specify), disinfection (please specify), anaerobic bio-reactors, other technology (please specify)

Appendix IV

List of priority and hazardous substances

Priority Substances and Certain Other Pollutants according to Annex II of Directive 2008/105/EC	Identified as priority hazardous substance
Alachlor	
Anthracene	X
Atrazine	
Benzene*	
Brominated diphenyl ether	X
Pentabromodiphenyl ether	
Cadmium and its compounds*	X
Chloroalkanes	X
Chlorfenvinphos	
Chlorpyrifos	
1,2-Dichloroethane	
Dichloromethane	
Di(2-ethylhexyl) phthalate (DEHP)	
Diuron	
Endosulfan	X
Fluoranthene	
Hexachlorobenzene	X
Hexachlorobutadiene	X
Hexachlorocyclohexane	X
Isoproturon	
Lead and its compounds*	

Priority Substances and Certain Other Pollutants according to Annex II of Directive 2008/105/EC	Identified as priority hazardous substance
Mercury and its compounds*	X
Naphthalene	
Nickel and its compounds*	
Nonylphenols	X
(4-nonylphenol)	X
Octylphenols	
(4-(1,1',3,3'-tetramethylbutyl)-phenol)	
Pentachlorobenzene	X
Pentachlorophenol	
Polyaromatic hydrocarbons*	X
(Benzo(a)pyrene)	X
(Benzo(b)fluoranthene)	X
(Benzo(g,h,i)perylene)	X
(Benzo(k)fluoranthene)	X
(Indeno[1,2,3-cd]pyrene)	X
Simazine	
Tributyltin compounds	X
(Tributyltin-cation)	X
Trichlorobenzenes	
Trichloromethane (chloroform)	
Trifluralin	

Amended by Directive 88/347/EEC and 90/415/EEC	
Carbon-tetrachloride (1)	
Aldrin (1)	
Cyclodiene pesticides	
DDT total (1)(2)	
Dieldrin (1)	
Endrin (1)	
Isodrin (1)	
para-para-DDT (1)	
Tetrachloro-ethylene (1)	
Trichloro-ethylene (1)	

* mentioned in at least one contract or environmental permit of the interviewed organisations