HAZARDOUS SUBSTANCE REDUCTION POTENTIALS IN BALTIC CITIES

VERIFYING EMISSION REDUCTIONS FROM DIFFUSE SOURCES AND EVALUATING RESULTS

Interreg Baltic Sea Region
EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP
NONHAZCITY

Main Author:

Anne Lagerqvist, Chemical Centre, Environment and Health Administration, Stockholm, Sweden.

Contributors:

Ingrida Bremere, Baltic Environmental Forum Latvia, Riga, Latvia

Martyn Futter, Swedish University of Agricultural Science, Uppsala, Sweden

Arne Jamtrot, Chemicals Centre, Environment and Health Administration, City of Stockholm, Sweden

Hannamaria Yliruusi, Turku University of Applied Sciences, Turku, Finland

Design:

Katarina Johansson, Chemical Centre, Environment and Health Administration, Stockholm, Sweden.

Photos:

Larisa Ābelīte (page 10), Katarina Johansson (page 7, 14, 19, 21, 23 and 27), Anne Lagerqvist (cover and page 16), Sandra Oisalu (page 12 and 17), Maria Pettersson (page 8), University of Gdansk (page 4).

Figures:

Anne Lagerqvist (figure 1, page 25), Anne Lagerqvist and Katarina Joahnsson (figure 2, page 30)

CONTENTS

1. INTRODUCTION

1.1 The NonHazCity Project

The Baltic Sea environment assessment performed by The Baltic Marine Environment Protection Commission - Helsinki Commission (HELCOM) has shown that the load of hazardous substances (HS) to the marine environment is an issue of major concern. Despite a number of regulations and other measures for emission reduction, HS are still released from land-based sources to the aquatic environment. These releases occur through three main pathways: industrial wastewater, municipal wastewater and stormwater. Consumption-related diffuse s ources, i ncluding i ndoor d ust, l aundry wastewater, ingestion and excretion of pharmaceuticals, are more important sources for HS in waste water, compared to release from production-related point sources which nowadays are very few around the Baltic Sea (Gercken, et. al., 2018). The Interreg Baltic Sea Region Project "Innovative management solutions for minimizing emissions of hazardous substances from urban areas in the Baltic Sea Region" (NonHazCity, 2016-2019, www.nonhazcity.eu) aimed to demonstrate possibilities to reduce emissions of priority hazardous substances and other pollutants from small scale emitters.

HS in water samples

To achieve knowledge of HS presence, target substances of concern have been identified, prioritized and analysed (Gercken, et. al., 2018). The HS selected for analysis included pharmaceuticals, phthalates, alkylphenols, bisphenol A, highly fluorinated substances (PFAS) and toxic metals, all with known or suspected hazardous properties. The overall finding from the screening survey was that the analysed substance groups, including substances of very high concern (SVHC), were found in all types of water samples and in all pilot municipalities. It is reasonable to assume that the screening survey results in principle reflect the status of HS in other municipalities in the Baltic Sea catchment area since the partner municipalities are of different sizes and distributed throughout the Baltic Sea region.

HS in municipal samples

There were no significant differences in HS levels between smaller and larger municipalities, the analysed substance groups, including substances of very high concern (SVHC), were found in all types of water samples and in all pilot municipalities.

Analysis of water samples in Gdansk

HS in everyday articles

The presence of HS in consumption-related diffuse sources is confirmed by both the results from analysis of indoor dust described in section 2, below, as well as the analyses of articles and source tracking through substance flow analysis performed within the project (Giovanoulis, et.al. 2019) (Pettersson, Oldén, & Lagerqvist, 2018) (Gercken, et. al., 2018). Thus, the choices of the inhabitants and the municipal organisation are reflected in the efflux of HS from households, offices, schools, pre-schools and other municipal entities to waste water treatment plants (WWTP) where it is possible to follow time trends of introduction of new chemicals and phase-out of others (Wahlberg, 2016).

Ideally, HS and potential HS in articles and materials should be regulated globally, in order to reduce exposure and ease the burden of choice from consumers. While more stringent chemical legislation is needed, municipalities can also contribute to HS reduction by implementation of a Chemical Action Plan (CAP) or similar structural document that address local needs and challenges, strategical procurement of the municipality as well as awareness raising among inhabitants. As described in more detail in section 3.1 below, such CAPs are produced in the participant municipalities within the frame of NonHazCity.

Focus of this report

This report focuses on efforts in the municipal organisation and is a summary of the results obtained during pilot activities for HS reduction performed by the partners of NonHazCity.

1.2 Policy settings, awareness raising and HS reduction in municipalities

Municipalities have a number of options to develop appropriate strategies to phase out HS within their own operations. The municipal organisation often includes schools, pre-schools, care centres, traffic, construction, street and park management, among other commitments. These responsibilities imply that the purchasing strategy of the municipality can promote more informed and HS free choices. To achieve that, criteria on HS should be integrated into public procurement practices (as one part in "green public procurement", GPP) including market dialogues as well as follow up of compliance with set criteria and legislation. Furthermore, collaboration with university partners and NGOs can be fruitful and provide substantial support, as was the case for the partner municipalities during the NonHazCity project. In Stockholm, the presence of a competence centre in the form of the Chemical Centre, at the municipality's Environment and Health Administration, provides extensive possibilities for proactive work concerning HS reduction.

Municipalities have power to change the market:

- By being large customers and setting criteria in procurement, the market can be shifted toward HS free products and articles.
- Information on chemical content in articles will become more and more available when it is repeatedly required by large customers such as municipalities.
- Choosing eco-labelled chemical products, materials and articles from the already procured assortment can also shift the market.

CAPs beyond legislation

Since the chemicals legislation is constantly some steps behind the current presence, use and release of HS, other policy measures are necessary to ensure human and environmental health, please see section 1.4 and Annex 1 for a description of the legislation. Structured efforts including those presented in a CAP might serve as a blueprint for measures to reduce HS release through progressive actions taken within the municipality and its organisation. Within the NonHazCity project, the intention for the CAP (or similar document) was to both enforce current chemicals legislation as well as go beyond legislation.

Share experiences

One aim of the NonHazCity project was for municipalities to share experiences and suggestions for activities with the other partners in the project to accomplish progress within the different areas which comprise the scope of this publication. Another aim of the NonHazCity project was to share experiences outside the project partners' organisations. Other municipalities and organisations are thus free to use the NonHazCity material when planning for their work concerning management of chemical products, substitution of articles and materials at risk of containing HS, implementing GPP with chemical criteria in their organisation as well as when creating policy documents.

While this report focuses on pilot actions performed within the municipal organisations, the CAP is intended to include support and information concerning HS reduction activities to other stakeholders as well, e.g., enterprises and households located within the municipality (Alijošiutė-Paulauskienė et. al., 2019) (Fammler et. al., 2019). Reports from such actions are presented on the NonHazCity webpage, www.nonhazcity.eu, where other information materials and reports from the project can also be retrieved. Brief descriptions of the municipalities together with the other organisations are presented in section 1.5, below.

1.3 Hazardous substances, definition, emissions and presence

Hazardous substances can be flammable, explosive or acutely toxic but might also be harmful to the health of organisms and ecosystems in a less acute manner, i.e., effects are not directly visible but might manifest themselves a long time after exposure. Some substances are hazardous because of their persistence and their ability to accumulate in organisms to levels causing hazardous effects. Furthermore, some persistent and bioaccumulative substances may travel long distances thereby polluting not just areas near the emission sources but potentially around the world. Other substances are classed as hazardous due to their potential to introduce change in the genetic material, giving mutagenic and carcinogenic properties. Certain criteria related to persistence, bioaccumulation and toxicity (PBT) and/or carcinogenic, mutagenic and reproductive toxicity (CMR) must apply in order to classify a substance as hazardous for health and/or the environment.

Endocrine disrupting compunds

Endocrine disrupting compounds (EDC) are a heterogeneous group of hazardous substances which might have CMR effects by interfering with the organism's hormonal system. The list of known and potential EDCs is continually growing and includes, e.g., metals such as cadmium, different plastic additives and synthetic hormones. Furthermore, EDCs may or may not have PBT properties. Since EDCs disturb different parts of the hormone system of organisms, these substances not only pose a risk of giving CMR related effects but may also cause developmental abnormalities, obesity and negative effects on the immune system, among others. All EDCs are not classified as hazardous at the moment since criteria are lacking to assign EDC classification, it is therefore only the EDCs which are also classified as CMR that are considered hazardous in the conventional way of interpreting the term. Therefore, the term hazardous substances (HS) used within the NonHazCity project can be regarded to also include harmful substances which have not (yet) received a harmonized classification, and the same applies in this report.

HS presence in human and environmental samples

In other projects, sampling of human blood and breast milk have proven ubiquitous presence of HS and time trends can also be seen here (Gyllenhammar, Glynn, Fridén, & Cantillana, 2017), similar to the trends observed in WWTPs mentioned above. While unintended, this exposure to HS is ongoing because the chemical content of products, articles and materials has been inadequately controlled for decades. As a consequence, release from both production and use of products and articles have resulted in alarming levels of anthropogenic HS present in humans and the environment, even as far away as in animals in the Arctic region (Wilson, 2017). Many of these HS are long-lasting or even permanent and can cause irreversible harm due to their persistence and bioaccumulative properties (Wilson, 2017).

Some ways in which HS can be emitted from indoor sources:

- Through chemical products flushed down the drain when washing up and cleaning
- By excretion of metabolites of HS after passing through the bodies of humans.
- From cosmetic products or HS in dust deposited on humans and pets, which is washed off when showering
- Floor wiping of dust where HS have been deposited after being emitted from articles and materials in the indoor environment
- Laundry of textiles (clothes, curtains, etc.) both in the form of residual chemicals present in new articles as well as from HS containing dust deposited on the textiles.

Sources of HS in urban areas

There are a number of sources of HS emissions in urban areas. These include large point sources, WWTPs, and small scale emitters. The major types of urban wastewater, that deliver HS to the aquatic environment via WWTPs, include effluents from households, businesses, industry and hospitals as well as municipal entities. By using chemical products containing HS as well as everyday items which leak HS, offices and other municipal units constantly emit metals and organic pollutants including phthalates,

alkylphenols, highly fluorinated substances as well as pharmaceuticals to the municipal wastewater (Wahlberg, 2016) (Gercken, et. al., 2018). The HS from articles and materials which is constantly emitted to the indoor environment ends up in air and dust (Giovanoulis, et . al. 2019) (Larsson K. , 2018) (Wong, et al., 2017). Hazardous substances can thus be emitted via water from toilets, washing up, showering, floor-wiping and laundry. Since there is considerable HS content in indoor dust it is important that such dust is incinerated and not washed down the sewage system or deposited in landfills. If not incinerated, the HS present in the dust might spread and potentially reach the environment through the waste water or run off from landfills.

Release of HS from wastewater treatment plants

As a consequence of the load of HS from urban sources, WWTPs are significant release routes to receiving waters. One reason is that WWTPs are most often not specifically designed to eliminate HS. While some HS will be degraded in the WWTP, others are either emitted to receiving surface waters or remain in the sewage sludge. Hence sludge, when used e.g., for agricultural or other purposes, is a source of release of HS to the environment. To be able to use sludge for fertilization in agriculture is otherwise beneficial as it is dense in nutrients. Since WWTPs cannot treat all hazardous substances emitted from numerous urban sources to the sewage system, it is necessary to reduce the emissions at the source, i.e., households, municipal entities and small-scale enterprises, in order to reduce HS emissions to surface waters and content in sludge.

HS transport by stormwater

Stormwater is also a significant medium of urban HS transport. Pollutants in stormwater include those emitted from buildings and other constructions (parks, traffic signs, art, playgrounds, bridges etc) as well as vehicles and transportation infrastructure. In addition, HS settled on urban surface areas may be washed off by stormwater, enter combined sewer systems and be treated in a WWTP or enter receiving waters directly. Stormwater runoff will contain different kinds of HS depending on the type of urban surface on which precipitation falls, the properties of the material, its contents and tendency to emit its constituents.

1.4 Legislation and initiatives concerning regulation of hazardous substances

Regulatory framework for chemicals

Due to their adverse environmental and health impacts, many HS are policy regulated and their occurrence in the environment is monitored. The overall regulatory framework for chemicals in the EU includes the Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals (REACH, 2006/1907/EC) and the Regulation on classification, labelling and packaging of substances and mixtures (CLP, 2008/1272/EC). There are also specific regulations for some article and material groups, with examples being the Toy Safety Directive (TSD), the regulation on Food Contact Materials (FCM regulation) and the directive focusing on electronic equipment, RoHS.

Full material disclosure (FMD) needed

Disclosure of information on contents is needed for all products and articles in order to achieve transparent and functioning management of HS risks.

Limitations of the legislation and voluntary initiatives

Although covering a variety of substances and areas, many HS and potential HS are not yet considered in the legislation. Furthermore, the full content of articles and materials is not reported, a demand for information on contents is needed for all products and articles in order to achieve transparent and functioning management of HS risks.

Non-legislative measures also exist with the aim to reduce HS content of products, articles and materials, for example eco-labels and criteria in procurement. While the overall procurement procedure has its own regulation through the procurement directive (2014/24/EU), it is voluntary to include criteria on HS content exceeding the chemical legislation.

More to read

The framework of legislation together with non-legislative initiatives concerning chemicals and procurement is described in more detail in Annex 1 of this report. Moreover, there is comprehensive legislation on occupational safety and health in the OSH directive (Directive 89/391 EEC), which is explained further in the report "*Hazardous substance reduction potentials at local businesses.*" (Alijošiutė-Paulauskienė et.al. 2019).

Childcare articles which fulfil the demands in the legislation and beyond

1.5 The NonHazCity consortium

The NonHazCity consortium consisted of 17 project partners and 26 associated organisations. Out of the project partners there were seven municipalities, three universities, one water utilities company, one government institution, one institute and one NGO (with four branches). The associated organisations were, among others, the Finnish municipality City of Turku and the German municipalities Hamburg and Lübeck as well as some WWTPs and national public authorities in the different countries. A complete table of project partners and associated organisations is present in Annex 2.

The NGO, Baltic Environmental Forum, with branches in Germany, Estonia, Latvia and Lithuania, provided substantial support to the municipalities in the respective countries concerning the NonHazCity actions. Furthermore, the Turku University of Applied sciences, one of the university project partners, was performing NonHazCity actions and engaging the City of Turku in these while Gdańsk water utilities provided support to the municipality of Gdańsk.

As a joint project, funding was received from the Swedish Institute to include Eco-partnership (a Belarussian NGO) as associated partner, and through this, two Belarussian municipalities, Vileyka and Iuje were connected to the project. Although Belarus does not have a coastline, there are connections to the Baltic Sea through rivers. See Table 1 for more details concerning the municipalities.

Table 1. Specifications for the municipalities that are in the scope of this report. The bold line designates where the list of project partners ends, below the line are associated organisations which have participated to different extent in the NonHazCity actions described in this report.

Municipality	Size (inhabitants, rounded numbers)	Size (area, rounded numbers)	Chemical Action Plan
Gdańsk	465.000, 1 800 inh./km^2	260 km^2	Produced within NHC (planned for 2019-2025)
Kaunas	94.000, 60 inh./ km^2	1500 km^2	Produced within NHC (first phase 2019-2021)
Pärnu	51.500, 60 inh./km^2	860 km^2	Produced within NHC (planned for 2019-2025)
Riga	705.000, 2300 inh./km^2	310 km^2	Produced within NHC (planned for 2019-2024)
Šilalė	23.000, 20 inh./ km^2	1200 km^2	Produced within NHC (planned for 2019-2022)
Stockholm (lead partner)	950.000, 5.000 inh./km^2	190 km^2	Yes (2014-2019 and a new one in preparation)
Västerås	150.000, 158 inh./km^2	1 138 km^2	Yes (2015-2020)
Belarus (Ecopartnership): Iuje Vileyka	 23.000, 12 inh./ km^2 47.300, 20 inh./ km^2	 1800 km^2 2500 km^2	Awareness raising activities concerning HS were included into the plan for Territorial Development of Vileyka District.
Hamburg	1.830.000, 2400 inh./ km^2	755 km^2	-
Turku	190.000, 770 inh./km^2	250 km^2	Produced within NHC (planned for 2019-2023)

2. THREE TYPES OF REDUCTION MEASURES IN THE MUNICIPAL SETTING – STRATEGIES, CHALLENGES AND POSSIBILITIES

Based on the possibilities of HS reduction from sources within the municipalities described in this report, pilot actions were performed by the project partners within three different focus areas:

- Inventory and substitution of chemical products,
- Inventory and substitution of articles and materials
- Implementation of chemical criteria as a part of public procuremen

Challenges, experiences and possibilities gained from the pilot activities are described below. Good examples are included which can serve as a starting point and give advantages for other municipalities when planning similar actions.

Pre-schools in focus

In many cases, pre-school related purchase and procurement were prioritized within the participating municipalities. This prioritization is due to the fact that children are more sensitive to HS exposure compared to adults and that two of the municipalities, Stockholm and Västerås, were already working with HS reduction in pre-schools and had experiences to share which benefited pilot activities in the other partner municipalities. Many children spend a large part of their day at the pre-school and the environment at these institutions is therefore important when it comes to HS exposure from chemical products, articles and materials.

In this report, pre-school children are defined as being of the age one to six. The designation pre-school is used since there is often a curriculum already for the smallest children, although not being exhaustive at that age. The organizational specifics for these institutions differ between the municipalities and all different varieties (kindergartens, day-care centres etc.) are here grouped under one designation, pre-school.

Training concerning HS in Riga in 2017

Trainings for employees

Training concerning HS and the content in chemical products, articles and materials for municipal employees has been performed in all partner municipalities, to raise awareness among the employees within different entities. Among the target groups were pre-school staff, procurement staff, appointed local administrators of chemical management systems, users of a building material assessment system, and more. In order to receive feedback from the participants at the trainings, questionnaires were used to evaluate the event and assess if it yielded any long-term effect on the participants' daily routines. This approach has proved highly valuable and indicated that the trainings most often had the intended effect for the majority of the participants. The activities were further developed after receiving their opinions and suggestions.

Analysis of air, dust and articles

Evidence of HS occurrence is an effective tool when describing the problems associated with HS exposure. Such evidence can be gained by analysis of articles and materials and monitoring of presence and levels of HS in the indoor environment through analysis of air and dust. This was done in pre-schools in Stockholm before and after renovation and discarding of articles and materials according to the municipality's guidance document, respectively. The results show a reduction of dust levels of such HS that are present in old articles and materials after actions taken, while also indicating an increase in substances of emerging concern or those with a specific short term function such as preservatives present in paints (Giovanoulis, et.al. 2019) (Langer, Giovanoulis, Westberg, & Egelrud, 2018).

Prioritizing substances

Prioritization among substances to target was done in the municipalitiestogether with a list of properties taken into consideration for phase-out and risk reduction substances. The results from the previously performed analyses of water samples were used as a guidance and prioritizations done by national authorities were also taken into account. In Sweden, for example, the categorization for phase-out and risk reduction substances were based on guidance from the Chemicals Agency.

Phase out substances:	**Risk reduction substances:**
• Those with CMR, EDC PBT and vPvB properties	• Allergenic
• Ozone depleting substances	• High direct toxicity and toxic for environment
• Metals with highly hazardous properties	• Potential CMR, EDC, PBT, vPvB

2.1 Reduction of HS occurrence by inventory and substitution of chemical products

Safety data sheets

According to the REACH and CLP legislations, chemical products need to be provided with a safety data sheet (SDS) specifying content of the product. When the SDS is updated properly and contain the correct information, it provides the information necessary for identifying and substituting HS by exchange of chemical products.

Statistics of purchases

To work with substitution of chemical products and calculate HS reduction, statistics on purchase and/or use within the municipality is needed. Use or purchase statistics are vital in order to do an appropriate estimation of annual consumption and actual reduction, or reduction potential, which can be achieved through substitution. If not known by each unit, the information can be extracted from invoices, the online purchasing system or chemicals registry.

Chemicals registry

According to the EU OSH legislation, a chemicals registry is compulsory at a work place handling chemical products, it can be as an excel file, a list with SDS in a folder or, an online chemical management system. The latter is of course convenient since it automatically connects the correct SDS for each product and all necessary information is present in one place, it also gives the benefit of annual statistics and indicates where in the organisation prioritized HS are present. If an online system is not on place, the registries will be decentralised, and contact with different parts of the municipal organisation is needed to achieve statistics on use of chemical products for the whole municipality.

Experiences from Šilalė:

- The units of the municipality eagerly filled questionnaires concerning use of cleaning products.
- The majority of the staff reacted positively to the project activities.
- Difficult to change old habits and practices – it takes time.

Different levels of chemicals registry:

- List of chemical products together with SDS in a folder.
- Excel sheet with chemical products listed together with related information, links to SDS and annual consumption.
- Chemicals management system online tool, automatic connection to SDS, annual consumption and phase-out/risk reduction substance

Cleaning products

The main focus in the municipalities were cleaning products of different sorts; detergents, soaps, floor cleaning liquids, disinfectants etc. Examples of HS in these types of products are isothiozolinones, a type of preservatives which are very potent allergens, different types of surfactants, biocides such as triclosan or quaternary ammonium compounds as well as chelators such as EDTA or NTA. Substitution of cleaning products in pre-schools was performed in several of the partner municipalities. This approach was common in the NonHazCity project since it is fairly straight forward as a message, not many people opposes the statement "*the children's everyday environment should be free of hazardous chemical products"*. In some municipalities, other institutions than pre-schools were also approached including medical facilities, secondary schools, etc., on the same topic. A variation among the partner municipalities concerning the implementation of chemicals registries in pre-schools was noted during the project, as well as somewhat different rules and recommendations concerning the use of disinfectants and biocides.

Inventories were performed in the pre-schools, and other institutions, including collection of SDSs or ingredient lists that were then collated and scrutinised to find prioritized substances for reduction measures. A chemical management system, as described above, was another way of receiving information on content and use of chemical products within some of the municipalities. In many of the municipalities, it was noted that most of the pre-schools had the same chemical products, which makes it possible to scale the calculated reduction potential to city level for pre-schools without doing inventories at all of them, but spreading the information of substitution.

Cleaning products in a kindergarten in Pärnu

Experiences from Riga:

- Pre-schools were approached with information, trainings and inventory of their chemical products.
- Potential reduction in hazardous substance release, by choosing alternative products:

  150 kg of Triclosan,

  300 kg of Quarternary ammonium compounds and

  8 kg of Isothiozolinones, for all preschools together.

Potential challenges in the organisation

In some of the participating municipalities, there have been challenges to introduce change since the procured assortment is not yet subject to chemical criteria. Thus, change to HS free products during the contract period might not be allowed, if there aren't already such present, by chance, in the procured assortment. The mind-set in the organisation is also of great importance since if there is a negative view, e.g., that prices are higher for alternative, HS free products, this can hamper the progress of the actions. From experience, this view can be an oversimplification or simply not true.

Once one starts to communicate with different units within the municipality, these contacts which from the start can seem a bit strained can turn out to work very well or give information as to why there is resistance, which can be due to low levels of freedom at the workplace or because decisions and strategies are lacking. A chemicals registry can aid in the effort to explain the importance and nature of problems associated with use of HS containing products as well as provide a basis for priorities.

Despite these challenges, chemical product management, including substitution, is still easier than that of articles and materials, described in section 2.2, below. This is due to the presence of SDSs for chemical products while there is lack of information on chemical content, and emissions, for articles and materials. Furthermore, a general understanding exist concerning that chemical products can be hazardous while articles and materials are believed to be safe, the fact that they can contain and might leak HS is not well known.

Experiences from Gdansk:

- Fruitful collaboration with the Directorate of nurseries (where the smallest children spend their day, 1-3 year old)
- Alternatives are possible to find for most of the chemical products with HS content, yielding a reduction of at least 250 litres HS annually if implemented in all nurseries.
- Use of GPP might be considered in coming procurements due to the experiences of HS reduction at the nurseries.

Experiences from Belarus, Iuje and Vileyka municipalities:

- Assessment of HS awareness by questionnaires in the municipalities showed that while many consider HS a serious issue, there is still a lack of knowledge.
- A workshop on HS and water pollution was arranged in Iuje with participation from districts of Belarus, including Vileyka and Iuje municipalities.
- The schools from Vileyka and Iuje districts will be approached and provided with information materials to raise awareness and reduce products, articles and materials containing HS.
- Awareness raising activities concerning HS were included into the plan for Territorial Development of Vileyka District.

Experiences from Pärnu:

- Training for municipal pre-schools on hazardous substances were performed
- Inventory of chemical products was performed and advice for HS free pre-schools were delivered in all 23 municipal pre-schools
- Real interest in eco-labelled products was achieved at several pre-schools
- Successful and in-depth adaptation of a Swedish pre-school brochure into Estonian

Practical examples of chemical management systems

Stockholm has implemented an online chemicals registry during the NonHazCity project period. Most of the municipality's operative units are connected to the system and have registered their chemical products. It is now possible to receive statistics from the system and see where products containing the municipality's prioritized substances for phase out and risk reduction are present. Such products receive a label in the system, a red triangle for phase out content and a yellow triangle for risk reduction content. One full-time position has been dedicated to the procurement, refinement and implementation of the system, including training for city employees on how to register products in the system. It is estimated that this position is going to be needed for the coming years as implementation of substitution guidelines, integration with other municipality-wide systems and general management and training is ongoing. The number of staff hours needed is of course different depending on municipality size, Stockholm has around forty thousand employees in the municipal organisation. For a smaller municipality, a part time position is most probably enough to handle the chemicals management within the municipality.

Data from chemical management systems in Stockholm and Västerås were used to produce statistics and identify products for substitution. Two examples are, a swimming pool product containing nonylphenoletoxylates and a charcoal lighter fluid with hazardous properties. For the first case, the potential reduction of HS by substituting this product with one with the same function but without nonylphenoletoxilates, up to 2,4 kg of this hazardous substance would be avoided annually. For the second case, the exchange of the charcoal lighter fluid for barbecues containing volatile organic compounds with acute toxicity to environmentally labelled fire cubes consisting solely of saw dust and vegetable oil gave a potential reduction of around 66 litres HS, annually.

Experiences from Kaunas:

- Pre-schools use quite hazardous substances and almost no one within the organisation is concerned.
- Alternatives are possible to find for most of the products yielding a reduction of at least 100kg HS annually if implemented in all 30 pre-schools.
- There is a large potential to use green public procurement practices to avoid HS.

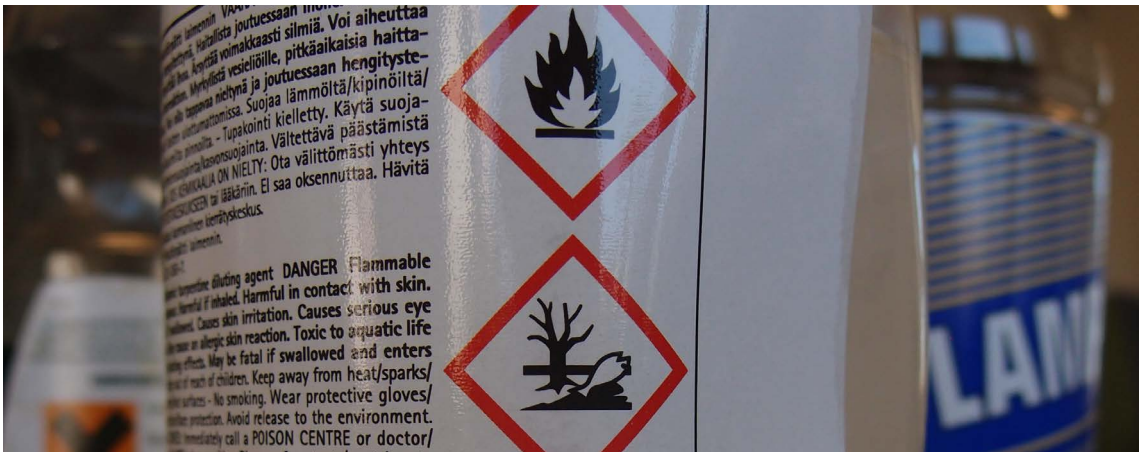

Table 2. HS reduction cases for chemical products, summary from the municipalities

Partner	Target	Result	Information obtained from	Challenges	Experiences
Gdańsk	Nurseries	Reduction of 16 kg of quarternary ammonium compounds.	Safety data sheets	Not possible to personally visit the nurseries to do inventory of products and articles (e.g. toys) used in nurseries due to the safety regulations.	This gave repercussions into the future procurement procedure of chemical products
Kaunas	Pre-schools	Potential reduction of 54 kg of quaternary ammonium compounds, 57kg ethoxylated alcohols and 0,6 kg of MCIT:MIT preservatives	Safety data sheets	Pre-schools use products containing HS and almost no one within the organisation is concerned.	Collaboration with BEF Lithuania facilitated the actions.
Pärnu	Pre-schools	Reduction of ca 4 kg of chelators EDTA and NTA, reduction of triclosan by 0,15kg	Safety data sheets	To achieve real interest and action from the municipality.	The chemical products in use at the pre-schools were already fairly well chosen, only a few reduction cases were possible.
Riga	Pre-schools	Reduction of 300 kg of quartenary ammonium compounds, 150 kg of triclosan and 8,4 kg of MIT preservative.	Safety data sheets	Low activity for implementation of new tasks, e.g., exchange of chemical products.	Collaboration with BEF Latvia facilitated the actions
Šilalė	Pre-schools	Potential reduction of 1 kg perfume substances, 0,02kg of MIT/CMIT/BIT preservatives, 0,2kg of quartenary ammonium compounds and 25 kg surfactants	Ingredients lists on the bottles/packages	Difficult to change old habits and practices. Price of HS free products is often feared to be higher.	Collaboration with BEF Lithuania facilitated the actions
Stockholm	The whole City	Potential reduction of 2,4kg of nonylphenol, among others.	Safety data sheets and chemical management system	To reach everyone in a municipality with close to 40.000 employees with information.	There were actually less chemical products which contained phase-out substances than previously believed. This might be due to the inventories preceding the registration, where old and no longer used chemicals might have been discarded.
Västerås	The whole City	Potential reduction of 33-66 litres of charcoal lightning fluid for barbecues.	Safety data sheets and chemical management system	To reach all employees that should be addressed with information in a larger municipality.	A lot of HS could be found at schools (chemistry labs).
Belarus Iuje Vileyka (associated org.)	Schools	Activities started but not finalized. Activities mostly involve awareness raising activities such as providing informaition for schools.	-	Increasing knowledge and implementing HS reduction actions.	Questionaires to municipality employees indicated lack of knowledge but understanding of the seriousness of the issue.

2.1.1 Conclusions concerning reduction of HS by substitution of chemical products

Substitution of chemical products containing HS to such free of HS can give instant effects as these products might be washed directly into the wastewater, for example when discarding water from cleaning of floors. Since chemical products are supplied together with a SDS where the contents is listed, the substitution procedure is facilitated, provided that the SDS is up to date and correct. For a municipality, another way of receiving HS free products is to choose those which are eco-labelled. As seen in Table 2, while some experiences were similar, the HS reduction was also on different levels and of different type in the partner municipalities.

Factors influencing the HS reduction potential in municipalities:

- The municipality size and population density
- The work previously done in the municipality
- The procured assortment
- The engagement of the employees
- Resources allocated
- Management support and political decisions
- Expertise present in the municipality
- Opportunities to use external consultants
- The availability of HS free alternatives, on the specific market.

2.2 Reduction of HS occurrence by inventory and substitution of articles and materials

Articles and materials are neither provided together with a safety data sheet, nor with a list of contents, and it is therefore hard to know which substances they contain. The only content information that need to be provided according to the legislation is concerning the ca 200 substances present on the candidate list for inclusion in the EU chemical legislation REACH (see Annex 1 for further description).

Much more HS in old articles

To get more information on chemical content in articles and materials, Stockholm Chemical Centre analysed items purchased from the municipality's contracted suppliers as well as old items from pre-schools within the city (Pettersson, Oldén, & Lagerqvist, 2018). The results can be used to derive an average HS content in old articles and materials, which in turn can be used to calculate HS reduction when substituting old articles and materials in general and per material type.

Old furniture foam was found to contain 1% of halogenated flame-retardants on average and old PVC plastic from 7-15 % of phthalates, on average, depending on product group. In general, old articles contained much more HS than new ones. As described for chemical products, above, statistics of purchase for the article or material group in focus for calculation of HS reduction is needed here too. Some assumptions will always be necessary but an estimate of amounts purchased annually, is vital. The results from the calculations are useful to illustrate the magnitude of HS in articles and materials as well as present the results of the efforts to politicians, employees and the general public and are presented in the project report "*Hazardous substance reduction through phase out of old articles and materials in pre-schools – calculations of actual reduction*" (Lagerqvist, 2018).

Analysis of old and new pre-school articles and material in Stockholm:

Old articles much more frequently contained HS and at higher levels compared to newly purchased items.

Worst cases for old material:

- Halogenated flame-retardants: 6% (mattress foam core)
- Phthalates: 42% (toy)

This lizzard contained 42 % phthalates

Training and advice to pre-schools staff

As described above, content information for articles and materials is lacking. This makes calculations on reduction of HS trough substitution of articles and materials more complicated than for chemical products. Thus, not all partner municipalities have chosen this opportunity for HS reduction calculations. While many are already giving advice within the organisation, often specifically targeted at pre-schools, it is not yet possible to quantify the results and make calculations on HS reduction from this activity. The advice given to the pre-schools included choices of kitchenware and utensils, food packaging, toys and creative material, furniture, mattresses, flooring and other interior building materials, together with suggestions for improvement. From experience, the pre-school staff is often positive towards receiving information and gaining knowledge about HS in articles and materials. Moreover, they need support in order to be able to sort out and dispose of the items containing the highest risks. Trainings, guidance documents, web-based information and educational materials provide easy access to expert advice and information specifically targeted for pre-school staff, are approaches that has been successful within the municipalities.

BEF Estonia team checking toys and mattrasses in a kindergarten in Pärnu

Challenges and opportunities

One challenge might be the allocation of time to take HS reduction measures. Naturally, the main task for the pre-school staff is to care for the children which means that other time has to be allocated to HS reduction strategies, for example during staff meetings. Another opportunity is integration into everyday activities, some pre-schools involved the children in sorting of toys and removing the old toys. Another important perspective is that it might be that not all of the discarded items need to be replaced with similar new ones (resulting in high costs). Many pre-schools have realised that there was a lot of old items being stored which they really did not need in their activities and that there was a benefit in reducing the overall load of stuff. Some items might still need to be replaced and care should then be taken to purchase the best available articles within the procured assortment.

It is important to indicate which items can be re-used without risk of spreading HS. Within NonHazCity, this type of information was given on different occasions, for example:

- Guidance to the "creative centre" in Västerås concerning reuse of old material.
- In Turku, in the form of a "recycling table" with everyday articles and products presented on a table at a training event, for participants to sort and discuss.
- A workshop "Chemical smart pre-school 2" given in Stockholm concerning reuse of old material while also including a lot of new articles and products to discuss and evaluate.

Chemical smart choices

One approach to guide municipal purchasing in the direction of HS free articles and materials is to use the online purchasing system, if such exist. In these systems, eco-labelled items and "chemical smart choices" can be highlighted and promoted or a "green shopping cart" can be compiled. One benefit of this approach is that it can be done already in the present assortment, and does not require waiting to set criteria in the next procurement procedure, which might be several years away. Whether or not the municipality has an online purchasing system, lists can be provided for the staff handling the purchases, comprising article numbers for the best choices within different article/material groups and/or categorized by contracted suppliers. These lists can be spread through the municipalities' internal web page or directly to the staff making the purchases. Purchasing guidelines have been produced in Stockholm and Västerås, the latter "Purchasing guide for pre-schools" is available in English at the NonHazCity webpage (Larsson, 2018).

Collaboration

Another approach is collaboration with municipality inspectors, if such exist, this gives an opportunity to receive a view as to how the work of HS reduction is functioning in the different units of the municipality. Questionnaires can be used when the inspectors perform their usual visits to, e.g., pre-schools. From these questionnaires, information can be gained concerning the actions performed according to the recommendations in the guidance on HS reduction provided for the pre-schools. This might be more applicable to a larger municipality, where it is hard for the HS experts to visit each and every pre-school.

One approach in Riga included advice given in the following areas:

- Kitchen utensils and food packaging, toys, furniture and mattresses.
- Each pre-school received a brochure "Hazardous substances free pre-school".
- A standard set of HS free articles and products suitable for pre-schools, and fitting within their budget, was prepared.

A workshop for pre-schools given in Stockholm

Phase out of HS by discarding old items

Together, Stockholm (Lagerqvist, 2018) and Västerås have phased out 2,5 – 11 tonnes of phtalates and 0,3 – 2,4 tonnes of chlorinated orgaophosphates by discarding old resting mattresses and old toys from the municipal pre-schools.

Assessment systems for HS content

Assessment systems are present in some countries for certain types of articles and materials. In Sweden, there is one such system for building materials (Byggvarubedömningen). Stockholm municipality has implemented this system and it is now in use for building activities within the city. The system grades building materials on three levels, avoid, accepted and recommended based on chemical content information provided by the supplier/producer. These types of systems are highly valuable and can provide a base for verification of GPP criteria.

Experiences in Västerås:

- Successful training of staff at all 143 pre-schools
- Exchange of 1500 old pre-school mattresses for HS free new ones.
- Phase out of HS using procurement and a chemical management system.
- Conflicts with other standards and goals:

  Fire safety regulations is believed to always require use of flame-retardants.

  Noise level requirements favours use of plastic. (School and pre-school canteens might prefer plastic glasses and plates, to decrease the noise level in the canteen area and avoid heavy lifts for the staff.)

  Re-use of old articles and materials are favoured in respect of sustainability.

2.2.1 Conclusions concerning reduction of HS by substitution of articles and materials

The substitution of articles and materials have a large potential of HS reduction but is hampered by:

- Lack of information on content both in old and new articles
- Lack of information in the supply chain
- Limitations in the current procured assortment in the municipality

2.3 Reduction of HS occurrence by implementation of chemical criteria in procurement

By setting chemical criteria in the procurement tenders of the municipality, HS content in products and articles purchased or used in services can be reduced. HS reduction can then be calculated on a yearly basis, to illustrate the benefit of application of GPP chemical criteria, provided that there are statistics for the annual purchases of the municipality as well as information on content of HS in different alternatives. While reduction of HS by implementation of GPP chemical criteria slightly overlaps with the previously described ways of reducing HS it also provides the foundation for substitution of chemical products, articles and materials.

Chemical Smart Procurement guidelines

For most of the municipalities, the NonHazCity activities within this area gives a potential of HS reduction in the future, but not at present. Even if public procurement is often stated to be a very important means for HS reduction (and many other issues), the implementation of GPP chemical criteria takes time, and thus it can be started during the three-year project period but will be finalized after the NonHazCity project ends. To promote the use of GPP chemical criteria, trainings to raise awareness among procurement staff were performed in many of the municipalities while others already had the leverage needed to start implementing GPP in municipal procurement procedures. In order to support the implementation of GPP chemical criteria in the municipalities, a set of guidelines called ”Chemical Smart Procurement”, was developed by one of the project partners, Turku University of Applied Science (TUAS), and a Skype training offered jointly by TUAS and Stockholm municipality. The Chemical Smart Procurement concept has four parts (Kontturi, Lankiniemi, & Hannamaria, 2018):

- General topics concerning GPP chemical criteria
- Pre-made criteria
- Environmental labels (Eco-labels)
- Market dialogue

Green shopping cart:

In Hamburg, a green shopping cart was created. This comprises articles with the best environmentally sound goods from the procured assortment. This does not necessarily cover chemical content but sustainability in general. Although not the main criteria at present, this approach can efficiently be used for HS reduction as well.

Detailed local guideline

More detailed guidelines defining local practical use of procurement criteria to achieve HS reduction when purchasing products and services in the specific municipality can be collected and spread throughout the municipal procurement organization. Such detailed guidelines might also contain a negative list of products that the municipality shall no longer purchase (e.g., coffee machines that use aluminum capsules, chlorinated cleaning agents, paints containing heavy metals etc.). In the long term, such detailed guidelines aim to ensure that specified and prioritized chemical products and articles containing HS are purchased less frequently, and the share of HS free products significantly increases.

Examples of eco-labels which can be used for verification of various chemical criteria

Pre-made criteria and eco labels

One option, which might make the procurement process a bit easier, is to use pre-made criteria from, e.g. The European Commission (EU GPP guidelines) or national authorities like the Swedish Agency for Public Procurement, which both publish pre-made chemical criteria within many article groups, in English. To make use of pre-made chemical criteria still requires knowledge on material composition and ability to judge where which criteria are applicable. For example, criteria on plasticizers are, most often, not applicable to wooden furniture. The use of pre-made criteria is described in more detail in the above mentioned guidance document for Chemical Smart Procurement, developed within the NonHazCity project (Kontturi, Lankiniemi, & Hannamaria, 2018). Another option is to use eco-labels as a proof of compliance with the set criteria for the product or article. However, while eco-labels are the easiest to use for verification, all other suitable evidence must also be accepted (for example SDSs for the product and/or its constituent list).

Information concerning availability of products and articles that are eco-labelled or otherwise fulfil GPP chemical criteria is vital since the procurement staff are sometimes worried that there is an inadequate supply of such products and articles. Thus, information need to be relayed both within the municipality organisation as well as to and from the supply chain.

Around 50.000 glasses are bought annually in Stockholm (2017-18):

Out of these, 13.000 were made of polycarbonate (made from the EDC bisphenol A) and 10.000 made from Tritan (bisphenol -free plasic) as well as 27.000 of real glass.

The intention of the municipality is to further phase out the bisphenol containing kitchen utensils.

Important to get started

Procurement schedules are often tight and the argument “we really need to do this specific procurement fast and safe” is sometimes used since GPP including chemical criteria is believed to be complicated. It is therefore important to start at a reasonable level for the specific municipality; a few well-directed criteria are enough to initiate the process that can then be developed further in the next procurement. The important thing is to get started somewhere and establish routines for setting criteria and follow up which can then be utilized in other procurement areas. These routines can include forms for questions to the contracted companies concering compliance with the set critera as well as

forms for documentation of the answers. In order to delimit the GPP efforts, prioritized areas of procurement can be established. It is quite of an undertaking to set criteria and start follow up on all contracts at the same time and prioritizations can be made by, e.g., identifying contracts with high risk, high volumes or those where the articles and products are used in sensitive applications.

REACH states that manufacturers and importers of articles are required to notify their commercial customers, including municipalities, of the presence of any Candidate List substance.

Since this requirement is not well known for many companies, municipalities can increase awareness by requesting SVHC information for procured articles and materials, or set criteria stating that such substances should not be present in procured articles.

Market dialogue

A market dialogue is often appreciated by suppliers since it clarifies the demands and criteria set by the municipality. Moreover, it gives an opportunity to systematize contacts and information delivery through the supply chain as well as raise awareness of HS in articles and materials. Both companies and the municipality will benefit from this approach. A so called Request For Information (RFI) can be sent prior to the market dialogue, where potential suppliers will be asked if and how certain criteria are fulfilled. To answer the RFI, companies need to make internal enquiries and also be in contact with other companies, in their supply chain. An information day including a dialogue with potential suppliers can then be arranged to further discuss the questions in the RFI and indicate that HS free articles and materials are requested and that this is a part of the municipality's strategic work. The answers from the market dialogue are highly valuable when setting the criteria and finalizing the tender.

Example of the benefit of a market dialogue from Turku:

Hypothetical calculation of potential halogenated flame-retardant reduction in office chairs, using statistics from Turku, by application of chemical criteria in tenders:

- Number of purchased chairs during 2017: 190
- Assumed cushion foam weight: 1,5 kg
- Amount of cushion foam per year: 285 kg
- Amount of halogenated flame-retardants (potential): 5-10 %
- Total potential annual reduction of 14 – 28 kg halogenated flame-retardants by use of GPP

The total potential annual reduction of HS would be 14-28kg, but, according to the replies to questionnaires by furniture companies, such flame-retardants are not added into their articles used by children or in offices and other public spaces. This illustrates the benefit of market dialogue, it was now evident that the companies were one step ahead, already able to provide HS free articles. This beneficial approach can then be transferred other article groups.

Involve a chemical expert

Furthermore, in order to achieve a transparent and efficient process, the municipality's chemical expert, if present, should to be involved in the whole procurement process. The ideal situation is to involve an expert already when planning the procurement in order for this person to take part in the market analysis and meetings with potential suppliers. Meeting the reference group within the municipality and participating in the preparation of the article/product specification are two further aspects in which the expert should be involved. To include criteria in a tender is a potentially time consuming process and information on the scope of the procurement; which articles and materials are to be procured etc., is essential to provide possibilities for a chemical expert to choose applicable criteria. To be effective, the chemical experts also need to receive the contracts following the finished procurements where criteria were provided. This is needed in order to be able to perform follow ups, which are most efficiently done together with the procurement unit staff.

Forum for chemical smart trade in Stockholm, as a part of market dialouges.

Another beneficial aspect from involving the chemical expert in the whole process is that experiences gained from setting chemical criteria in selected tenders and performing follow-ups can guide the implementation of criteria in forthcoming tenders. Furthermore, studies comprising analyses of old and new articles and materials, as the one mentioned above from Stockholm, might be used at the follow-up meetings with contracted companies and when attempting to estimate the amount of HS phased out by use of GPP chemical criteria (Pettersson, Oldén, & Lagerqvist, 2018) (Lagerqvist, 2018).

Using results from analyses:
Stockholm municipality has influenced one of the main mattress suppliers for pre-schools to adjust their product, resulting in no use of persistent substances (PFAS) in the surface coating of their product. The other commonly bought mattress was already free from these substances. This illustrates the benefit of including chemical analysis in the follow up of criteria as well as performing a dialogue with the suppliers.

Challenges and utilization of prior experiences

The experiences gained through making inventories of chemical products and articles, as described in the two sections above, can be used to scale up the HS reduction measures. The information from the inventories can be utilized when setting HS free assortments and choosing criteria for new procurements. By this strategy, the whole muncipality will have a chemcial smart assortment, provided that the procurement is centralized. If not centrally procured, the strategy can be spread to procurement staff within the municipality, although a decentralised procedure implies a challenge when it comes to assuring implementation. Another type of challenge is that the employees sometimes buy articles and products from outside the procured assortments. This practice does not follow the procurement legislation, impairs the possibilities to follow up on the municipality's purchases as well as to check on compliance with set criteria. It is thus necessary to know how useful the procured assortments are in order to ensure that the needs of the entities are satisfied and to avoid purchases outside the contracted assortments. This can be done through reference groups within the municipal organisation, by gathering of the users of chemical products, articles and materials from a certain contract and invite them to share their experiences, is something missing in the assortment, or is there a benefit in exchange of some article?

HS in a circular economy

A final aspect is how to fit the chemical requirements in relation to other sustainability areas, such as strengthening the circular economy. In order to achieve a HS free circular economy, information on content of articles and materials is vital. Municipalities should not buy articles and materials with unknown content if intending to adopt a circular model. If information is not present or there is HS content, the items have to be incinerated once they are out of use, in order not to risk further spread of HS through the circular model.

2.3.1 Conclusions concerning implementation of GPP chemical criteria in municipalities

Prioritized areas for GPP chemical criteria can be one or more of the following:

- Kitchen utensils
- Toys and creative material
- Office supplies
- Paper products and printing services
- IT equipment
- Textiles and furniture
- Cleaning services and chemical products
- Building and renovation materials
- Medical supplies
- Vehicles and transportation

Green public procurement is often addressed as an efficient control means to reduce the amount of HS exposure to humans and environment. This can be achieved by applying criteria on chemical content together with other sustainability criteria. This further indicates the need of choice of a few concise criteria which are also possible to follow up on, with clear verification available, for example eco-labels. Pre-made criteria, eco-label criteria and priority substance lists can all aid in the process by focusing the work and providing a good base for the decision on which criteria to use. Reduction of HS through application of GPP chemical criteria is of course a great benefit but implementation of GPP procedures might involve challenges within the municipal organisation, in terms of political decisions together with allocation of time and resources.

Furthermore, development of trust between sustainability experts and procurement staff is needed together with increased awareness and knowledge about HS content in products and articles. This can be delivered in the form of training of procurement staff concerning GPP measures to reduce HS presence, and the background for this. The cycle of efficient procurement and GPP is illustrated in Figure 1.

Sustainability guidelines for procurement are needed on different topics and there is need to work together to reach the goals:

- hazardous substance reduction
- carbon neutrality and energy efficiency
- economic sustainability
- circular economy
- ethical and social aspects

Thus, reduction of emissions of HS through GPP chemical criteria was found to critically depend on the organizational and procedural framework conditions both outside and within the municipality and implementation is frequently hindered by:

- Lack of legislation on information of chemical contents in articles and materials (FMD)
- Insufficient dialogue with suppliers
- Lack of information transfer in supply chains
- Lack of staff capacity/resources
- Lack of chemical expertise at the procurement units
- Insufficient dialogue and information relay within the municipality
- Deviation from the guidance on use of the chemical criteria is too easily justified.

Common misunderstandings related to GPP chemical criteria:

- The price of alternative, HS-free products and articles is too high. [This is usually not the case for larger contracts, but can occur depending on article segment.]
- The availability of HS-free products and articles is low. [It is actually high in many segments, for example cleaning products.]
- HS are needed for certain functions, i.e. chemical flame-retardants are needed to fulfil safety requirements. [This can be done by instead choosing materials which have inherent flame-retardant capacity without adding HS.]

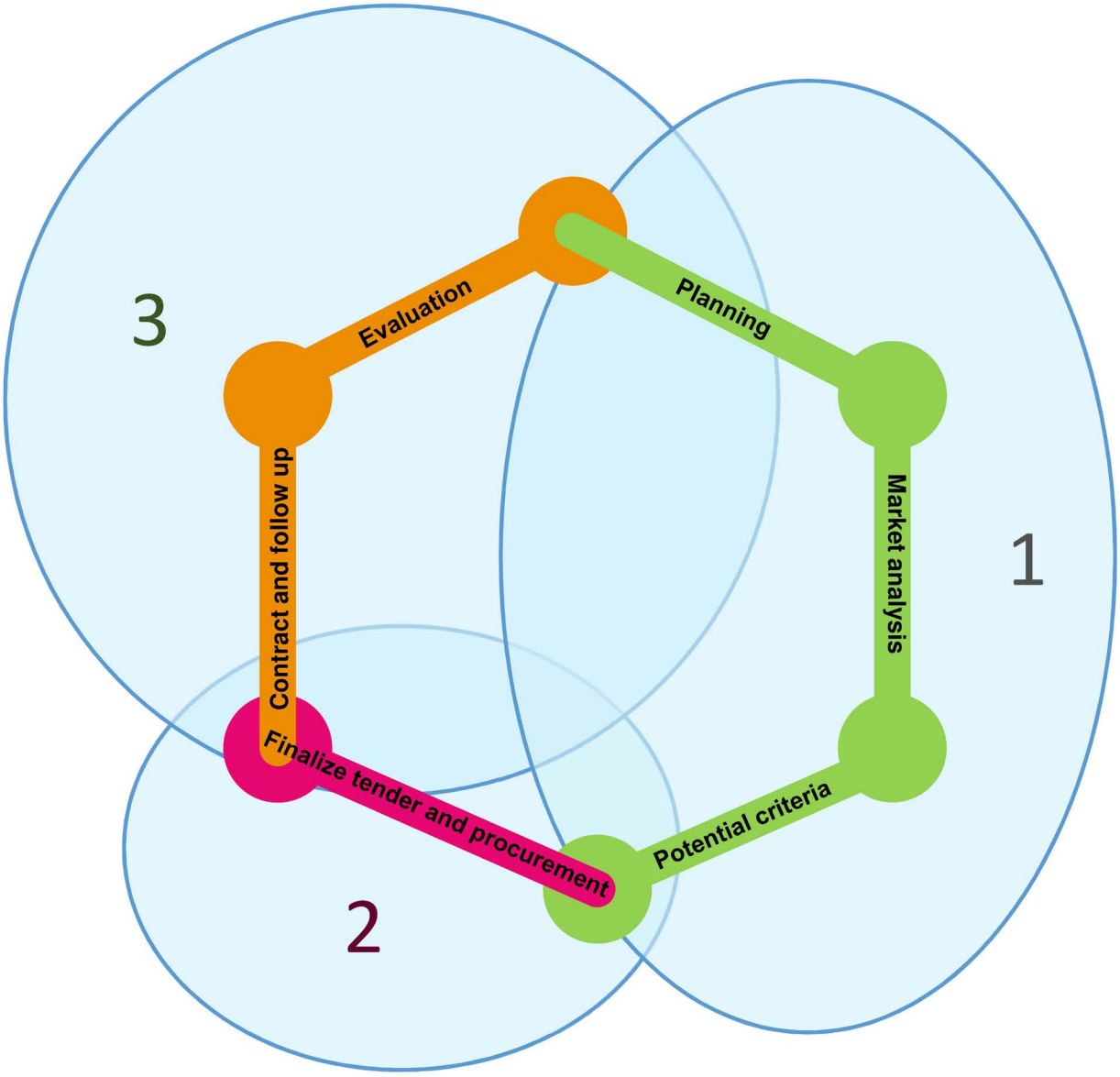

Figure 1. The cycle of acquisition

The procurement process is not linear; it is a circular process that can be partitioned into three main phases:

1. Planning and market analysis. In order to set relevant criteria as well as specifying assortment and function for the items to be procured, market investigation/dialogues with potential suppliers as well as contact with the end users are beneficial actions. Experience gained from previous contracts should also be taken into account (from phase 3).

2. Finalization of criteria and publication of tender. Use of the information gained in the other phases to adjust the choice of criteria in order to assure relevance, transparency and applicability. Evaluation of offers, which might include verification of chemical criteria depending on how the criteria were set.

3. Contract signing and verification. Assurance that the company to be contracted has the necessary verification to show compliance with the set criteria, if this was not done during the evaluation of offers. During recurrent (annual) follow-up meetings, ensure compliance either by verification on paper including SDS for chemical products and environmental labels or analysis of chemical content for a random set of articles/materials from the procured assortment. Docu-

Some voices concerning the challenges with HS reduction by GPP:

”The criteria were set according to the market capabilities, but then they were excluded from the tender because of the believed hassle they would infer.”

”The criteria were set and the chemical specialist informed the procurement staff about which types of materials that should be avoided in the article specification. Still, the material to be avoided was specified for some articles.”

”GPP is too voluntary; the procurement unit does not want to do anything above legislative levels.”

”Even if it is understood at trainings and information events, the practical application of GPP is not prioritized due to fear of receiving no offers.”

3. LONG TERM PLANNING IN THE MUNICIPALITY

The focus of the NonHazCity project activities in the municipalities has been slightly different among the partners; while Stockholm and Västerås already have CAPs, focus for the other municipalities has been on CAP development. Hence, Stockholm and Västerås has continued to work according to their plans but extending or adding new actions within the framework of the NonHazCity project. The activities are therefore, on occasion, of another type or at another level than for the other project partners.

3.1 Establishment of Chemical Action Plans (CAPs) in partner municipalities

The overall aim of the NonHazCity project is to develop CAPs based on the experiences from both the activities within the municipal organisation as well as those directed at enterprises and private households, performed during the project period. The results from the two latter activities are described in other reports (Alijošiutė-Paulauskienė et. al., 2019) (Fammler et. al., 2019). Based on the experiences from the NonHazCity activities, the CAP should contain long term strategies and set actions to be carried out also after the NonHazCity project has finished. The individual action plans will be written in the national languages of the participating municipalities with a summary in English, everything will subsequently be presented at the NonHazCity webpage: www.nonhazcity.eu

Updated versions in Sweden

In Stockholm and Västerås, the experiences from the project will be incorporated in updated versions of the existing CAPs. Stockholm’s current plan is valid from 2014-2019 and a draft for a new plan is being prepared, with the aim to be politically accepted during 2019, and implementation starting in 2020. The experiences from the activities performed within the NonHazCity project feed into the development of the new plan. Furthermore, Stockholm’s work according to the existing CAP has been evaluated thoroughly within the NonHazCity project period. The evaluation, including questionnaires to stakeholders within the city as well as workshops and internal discussions, showed that 51% of the actions are fulfilled and a large part of the ones stated as not fulfilled are of continuous character which do not finish within the time frame of the first CAP (Lindström & Jonsson, 2018). The Västerås CAP (2015-2020) is a part of the municipality’s central development plan and is newer than Stockholm’s, thus, there will not be a new plan during the project period. Although, the experiences gained from the actions performed in the NonHazCity project will feed into the development of the new plan, after the project period.

Different ways to incorporate of the CAP into municipal routines

Efficient incorporation of the CAP into municipality routines can differ depending on the local structure and organisation. Hence, a variety of solutions are available and will be used within the NonHazCity projec, these are described below.

The Baltic Sea Challenge Action Plan will serve as a foundation for Turku, actions on reduction of hazardous substances and chemical smart procurement will be included there. It is positive to get the issue of HS and GPP chemical criteria into this Baltic Sea Challenge Action Plan, since it comprises shared work between Turku and Helsinki. In this way, Helsinki, although not a partner municipality, can benefit from the results and experiences gained by the City of Turku within the NonHazCity project. In Šilalė and Kaunas, the CAP will be incorporated as a part in the development plans or other similar structural documents while in Riga and Gdańsk, the plan will stand on its own, beside other action plans, like in Stockholm. In Pärnu municipality, the CAP will be added to the Pärnu City Waste Plan, which will be updated 2019. The waste plan is part of "Pärnu City Development Plan until 2025".

Blueprint for actions on HS release reduction
Structured efforts described in a politically accepted CAP will serve as a blueprint for measures to reduce HS release through progressive actions taken within the municipality organisation.

3.2 Long term goals and implementation of Chemical Action Plans into municipal operations

Political acceptance of the CAP, whether incorporated in another municipal plan or as a stand-alone document, is vital for effective implementation. Moreover, a framework surrounding the efforts needs to be in place in order to ensure maximum efficiency of the actions to reduce HS release from the municipality as well as reducing HS content in new products, articles and materials purchased. The municipality need back up from legislation but can also take measures ahead of the legislation, when needed, in order to protect the environment and inhabitants from HS exposure and effects. A success story is achieved when there is political acceptance, resources allocated to the work and efficient communication within the municipality.

Replication of HS awareness raising pilot activities

After completing pilot activities for HS reduction within the NonHazCity project, it is now possible to design concrete activities for entities within the municipality, to include in the CAP. One important activity concerns educational events for employees responsible for purchases. The first steps might be targeted at chemical products for educational, medical and social care institutions as well as procurement procedures for entities responsible for renovation, construction and cleaning work in municipal institutions. To support these efforts, strategies regarding GPP chemical criteria should be present in the CAP.

Furthermore, the potential for HS reduction also lie outside the municipal organisation, within other professional areas such as those of enterprises active within the region. These enterprises might be small scale emitters and each one might not use that much of HS containing products, articles and materials, but as a group, they are an important source of HS. Actions in the CAP including a dialogue with companies can therefore provide possibilities to reduce HS release from these emitters.

Example of chemical smart toys

Information campaign in Stockholm winter 2017

Information campaigns

Lastly, awareness raising information to inhabitants might prove an efficient mean to reduce HS release to the wastewater from households. Information campaigns, as a part of the actions stated in the CAP, can be directed to different inhabitant groups (e.g., parents of small children, teenagers etc.) with information specific for the activities and needs for that group. It can also have different focus areas, such as out-door activities, creative activities and household cleaning supplies. The information can include strategies to reduce HS release by choosing HS free chemical and cosmetic products as well as HS free articles, this is not only effective to reduce exposure to the environment but will also have a reduction potential for the exposure of the individual inhabitant.

The sum of HS reduction

Each of the individual activities might not seem to yield much of a reduction of HS release on its own, but, adding up the reduction achieved for all the mentioned actions in total has the potential to give a large number, up to about several hundreds of kilos or even tonnes on an annual basis. The magnitude comes through reduction at many small sources and continuous work in the direction of HS release reduction through the actions included in the CAP.

A large sum of HS reduction
In total for all participating municipalities, thousands of kilograms of HS were discarded and the calculations show potential for future reductions in all municipalities.

4. CONCLUSIONS

The actions performed in the municipalities, described in this report, show a wide variety of opportunities to reduce HS load and release within municipal organisations.

4.1 Conclusions related to municipality actions

The activities concerning good housekeeping of chemical products and substitution of those containing HS is a straight forward action to ensure reduction of HS release to waste water.

The activities including chemical analyses provide evidence that exchange of old articles and materials hold a great potential for reducing the presence of HS. This can be performed in, for example, pre-schools, thus protecting children from harm by reducing their exposure to long term legislated substances with hormonal disruptive effects, CMR and PBT properties.

Utilization of the power of GPP chemical criteria moves the market in the direction of a healthy future by stating that we, as municipalities do not want to purchase chemical products, articles and materials which contain known HS or potential emerging HS. Implementation of GPP chemical criteria can yield

reduction of known HS through application of pre-made criteria and use of eco-labels for verification. Furthermore, substances of emerging concern such as FTOHs, a type of PFAS used in textiles surface treatment and not yet regulated, and similar cases, can also be the subject of GPP criteria formulated by the municipality.

Statistics for reduction of HS release

The reduction of HS by the municipality actions can be calculated based on annual consumption of a certain chemical product or article, as described for the pilot actions in the chapters above. While this is a very clear way of illustrating the potential of different activities, since it is usually easier to understand numbers than statements of HS reduction in general, it also has its challenges.

It can be hard to get statistics of purchase as well as information on content of articles even if criteria were used in the procurement tender. For chemical products and other products with a list of ingredients, this might be easier, although the amount used annually in the municipality might not be readily available. Measurements of HS reduction can also be made by other means, such as continuous monitoring of HS in WWTPs. Based on annual water flow, these measurements can be scaled to an estimation of an annual load of specific HS in the WWTP. This can then be compared on a year by year basis to see if there is an upward or downward trend in HS levels.

Insights required for implementation of HS reduction activities and future actions

• Diffuse emissions from both old and new articles and materials used indoors in, e.g., households, pre-schools and offices are important sources for many hazardous substances (bisphenols, phthalates, PFAS).

• Measures targeting diffuse upstream sources in the urban setting must be used more widely in the effort to reduce emissions of HS into the Baltic Sea.

• Better monitoring of legacy and emerging pollutants at all levels (local, regional, national and international) is needed to move effectively towards a HS free environment.

• Reduction of HS require knowledge on chemical content as well as legislation on transparency and information in the supply chain for articles and materials. This is also vital for a circular economy, re-use of articles and materials require labels of content with detailed material declarations including chemical content. To facilitate the process, these labels/material declarations can be distributed in digital form.

Success factors
A success story of HS reduction can be achieved when there is political acceptance, clear evidence and legislation, resources allocated and efficient communication within the municipality.

4.2 Conclusions related to policy making and wider perspectives

There is considerable need of support in the procurement processes of municipalities, including follow up on set criteria during contract periods. Challenges concerning implementation have been reported from all the participating municipalities relating to the fact that many good words, documents, guidelines etc. are shared, but there is too little action in applying GPP chemical criteria. Everyone might agree that GPP chemical criteria is an effective way to reduce HS occurrence but when it comes to real, practical action, this is not as evident.

Potentially counteracting goals

Another issue is when different sustainability goals counteract each other. One example of this is that re-use of articles and materials might mean that HS are recirculated through use of old articles, for example second hand furniture and toys with content of flame-retardants and phthalates hazardous to human health and environment. This has to be taken into account when prioritizing decisions on municipal purchases. For example, to phase out old toys from a pre-school might be a worthwhile way to spend money even if the articles are not completely worn out yet, especially if the soft and flexible toys present in the pre-school are older than the current chemical regulation on toys (in force 2013).

Full material disclosure for a HS free future

For the future, harmful substances have to be avoided already in production to ensure possibility of efficient material recycling and reuse. This, together with legislation demanding clear information on content of products, articles and materials is vital to ensure a HS free future. The lack of legislation concerning full material disclosure including chemical content of articles is an obstacle, for which the individual municipality has less influence. This should ideally be incorporated as a part in the general legislation on articles, for example through the EU chemical legislation, REACH, or the Product Safety Directive.

Nudging by including personal aspects

One experience was that the approach during trainings should not only concern the professional side but also some personal aspects, showing how to avoid hazardous substances in everyday life.

People are more inclined to learn if the topic also concerns them on a personal level, which hazardous substances in articles and products certainly do.

The stairs of procurement

To conclude, implementation of GPP chemical criteria and other measures to reduce HS presence and emissions from the municipality require political acceptance, resources allocated to the work, evidence of HS occurrence and legislation together with efficient communication within the municipality. The parameters needed for efficient GPP with chemical criteria in public organisations such as municipalities are illustrated in Figure 2, in the form of a staircase to full implementation and function of GPP.

Figure 2. The stairs of procurement. The different steps of procurement process necessities to ensure progress in the use of GPP chemical criteria within a municipality. Within the NonHazCity project, answers to some of the first challenges were delivered: The guide for chemical smart procurement, purchasing guidelines, acceptance and implementation of CAP activities in the municipalities, measurements of HS in water, indoor dust and articles etc, while the supply chain information is still lacking and in need of initiatives from other ends, i.e., legislative measures.

5. REFERENCES

Alijošiutė-Paulauskienė, A., Fammler, H., Futter, M., Gercken, J., Jamtrot, A., Jegelevičius, G., Lagerqvist, A. (2019). Hazardous substance reduction potentials at local businesses. NonHazCity report.

Gercken, J., Caban, M., Pettersson, M., Wickman, T., Futter, M., & Ahrens, L. (2018). Hazardous Substance Occurrence in Baltic Sea Pilot Municipalities. NonHazCity report.

Giovanoulis, G., Lagerqvist, A., Anh Nguyen, M., Arwidsson, M., Langer, S., & Westergren, R. (2019). Reduction of harmful chemicals in Swedish preschool dust. Manuscript in preparation.

Gyllenhammar, I., Glynn, A., Fridén, U., & Cantillana, T. (2017). Levels of persistent halogenated organic pollutants (POP) in mother's milk from first-time mothers in Uppsala, Sweden: results from year 2015 and 2016, and temporal trends for the time period 1996-2016. Uppsala: National Food Agency, Sweden.

Kontturi, K., Lankiniemi, S., & Hannamaria, Y. (2018). Guide for Chemical Smart Public Procurement. Course Material from Turku University of Applied Sciences 117. Turku: Turku University of Applied Sciences.

Fammler, H., Futter, M., Jamtrot, A., Klein, K., Krekeler, M., Lagerqvist, A., Widderich, F. (2019) Hazardous substance reduction potentials in private households. NonHazCity report.

Lagerqvist, A. (2018). Hazardous substance reduction through phase out of old articles and materials in pre-schools – calculations of actual reduction. Stockholm: Chemical Centre, Environment and Health administration, City of Stockholm. NonHazCity report.

Langer, S., Giovanoulis, G., Westberg, E., & Egelrud, L. (2018). Kemikaliesmarta åtgärder i förskola: Kemikaliebelastning i förskolans innemiljö – Hamngården etapp 2 (efter ombyggnaden). Stockholm: IVL Svenska miljöinstitutet.

Larsson. (2018). Purchasing guide for pre-schools. Västerås: City of Västerås.

Larsson, K. (2018). Characterizing Chemical Exposure – Focus on Children´s Environment. Solna: Thesis for doctoral degree (Ph.D.), Karolinska Institutet.

Lindström, J., & Jonsson, A. (2018). Utvärdering av Stockholms stads kemikalieplan 2014-2019 - för ett giftfritt Stockholm 2030. Stockholm: WSP/Stockholms stad.

Pettersson, M., Oldén, M., & Lagerqvist, A. (2018). Hazardous substances in articles and materials. Analysis of phthalates and alternative plasticisers, flame retardants, chlorinated paraffins, highly fluorinated substances and formamide in old and new pre-school items. Stockholm: Chemical Centre, Department of Environmental Analysis, City of Stockholm. NonHazCity report.

Wahlberg, C. (2016). Organiska miljöföroreningar i avloppsvatten och slam från Henriksdal och Bromma - undersökningar 2014 och 2015. Stockholm: Stockholm Vatten och Avfall, SVOA.

Wilson, S. (2017). AMAP Assessment 2016: Chemicals of Emerging Arctic Concern. Oslo: Arctic Monitoring and Assessment Programme (AMAP).

Wong, F., Suzuki, G., Michinaka, C., Yuan, B., Takigami, H., & De Wit, C. (2017). Dioxin-like activities, halogenated flame retardants, organophosphate esters and chlorinated paraffins in dust from Australia, the United Kingdom, Canada, Sweden and China. Chemosphere, pp. 1248-1256.

ANNEX 1
LEGISLATION AND NON-LEGISLATIVE INITIATIVES IN CONNECTION TO HS REDUCTION POSSIBILITIES

The European chemicals legislation, REACH and CLP

The overall regulatory framework for chemicals in the EU includes the Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals (REACH, 2006/1907/EC) and the Regulation on classification, labelling and packaging of substances and mixtures (CLP, 2008/1272/EC). The latter covers rules on chemical products including the statement of contents in percentages on the safety data sheet (SDS) and labelling of hazards in accordance with the globally harmonised standards for chemical products (GHS).

While imported items are not subject to the all the rules in REACH, some apply for all items sold on the European market, whether or not produced outside EU. There are specific bans and regulations on content of certain chemicals in articles in the restriction list (Appendix XVII) while the authorisation list (Appendix XIV) gives specific HS a sunset date when use should cease, and authorisation for use is needed.

Substances of very high concern (SVHC) are identified in the Candidate List which is published by The European Chemical Agency (ECHA) in accordance with Article 59(10) of the REACH Regulation. This list includes PBT and vPvB substances as well as CMR substances in accordance with substance classifications from the CLP Regulation. Substances with equivalent level of concern for humans and the environment, like EDCs can also be included in the Candidate List. The included substances candidate for increased regulation. Hence, once a substance is added to the Candidate List, REACH imposes immediate obligations on manufacturers and importers to declare the substances if present in an article. Article 33(1) of the REACH Regulation states that manufacturers and importers of articles are required to notify their commercial customers (including municipalities) of the presence of any Candidate List substance in their articles exceeding 0.1% by weight and provide instructions on safe use of the product. Since this requirement is not well known for many companies, municipalities can increase awareness by requesting this information for procured articles and materials. For non-commercial customers, companies need to provide the information once the customer makes a request, with a notification period of 45 days. The Candidate List is by no means exhaustive, the process to include substances on the list is lengthy and costly, which makes the process of including substances on the list inefficient.

Legislation concerning specific articles or matrices

Several regulations are specifically directed at certain article groups such as toys, food contact items and cosmetic products, including criteria on chemical content.

The toy safety directive (2009/48/EC) includes criteria both for specific chemicals such as 19 elements including lead, aluminium, cadmium and tin, some chlorinated organophosphates, formamide, isothiozolinones and bisphenol A, as well as general restrictions for all CMR-classified substances.

For food contact items, e.g., containers and food wrap, there are restrictions both for presence of HS, as well as to how much of certain substances that are allowed to transfer from the material to the food it contains (regulation (EC) No 1935/2004). For cosmetics, there are regulations concerning the content of a large number of substances as well as how the ingredients should be listed on the packaging (regulation (EC) No 1223/2009).

Other relevant directives include the Water Framework Directive, Marine Strategy Framework Directive and the Urban Wastewater Treatment Directive. These are described in more detail in the previously mentioned report ”Hazardous Substance Occurrence in Baltic Sea Pilot Municipalities” produced within the project [ref].

Non-legislative initiatives

In addition to legislation, there are several non-legislative initiatives for HS reduction, such as The Baltic Sea Action Plan (BSAP) of the Helsinki Convention (Convention on the Protection of the Marine

Environment of the Baltic Sea Area). This plan aims to restore good environmental status of the Baltic marine environment by 2021. Hazardous substances are one of the four topic areas addressed by the BSAP beside biodiversity, eutrophication and marine activities.

Another initiative is HELCOM which has set a priority list of HS of special concern for the Baltic marine environment. As part of the HELCOM CORESET project, some HS have been selected as core indicators for the assessment of the chemical status of the Baltic Sea. An assessment of the status of the Baltic Sea made in 2010 (using data from 1999-2007), indicated that all open sea areas were affected by HS contamination.

There are other lists than the Candidate List described above, for example the Substitute It Now (SIN) list that uses the same criteria for SVHC as the Candidate List but does not require the same lengthy process for inclusion. Hence, the SIN-list comprises 913 substances while the Candidate List only has 191 substances (as of June 2018). The SIN-list is not connected to any legislation but several big companies and organisations use this list to be proactive. At present, some substance groups are insufficiently regulated, for example highly fluorinated compounds of which many are very persistent and bioaccumulative, only a few out of several thousand are regulated.

A present, the right concerning knowledge of the contents of articles is limited to less than 1% of the potential contents, since around 200 substances are present on the candidate list and just above 20.000 substances are registered for use in production within the EU, under REACH. To achieve transparent supply chains with information on full content also in articles and materials, there is thus need of change in the legislation. Furthermore, information on chemical content is also vital in the verification of chemical criteria present in procurement tenders of the municipality.

Legislation on public procurement

Directive 2014/24/EU on public procurement regulates the purchase procedures of public authorities. The directive indicates that sustainability criteria (including environmental and health promoting chemical criteria) can be used when applicable. This is stated in various paragraphs, for example as in §41 of the directive:

"Nothing in this Directive should prevent the imposition or enforcement of measures necessary to protect public policy, public morality, public security, **health, human and animal life, the preservation of plant life or other environmental measures, in particular with a view to sustainable development**"

Despite these paragraphs, GPP is not prioritized in all EU member states. Since the public procurement directive regulates the whole procurement process to a high degree, the chemical criteria are sometimes not prioritized as compilation of the tender, the article specification and ensuring that rules on procedure, transparency and equal treatment of potential contractors take up most of the allocated time. There might also be uncertainties concerning how chemical criteria will affect the available product range, what competition that exist for more environmentally friendly alternatives and how this will affect the evaluation procedure. Due to these factors, it is important to emphasize that allocation of resources within the municipality to include GPP criteria is vital, which is described in more detail in section 1.7, below.

Non-legislative initiatives in connection to public procurement

Eco-labels might be utilised when implementing GPP, these can serve as a prerequisite for setting criteria as well as serve as verification for the criteria when performing follow up, there is even an opening in the new public procurement directive to demand environmentally labelled products (Kontturi, Lankiniemi, & Hannamaria, 2018).

Eco-labels set their own criteria beyond legislation and the supplier of an article to be labelled needs to conform to these criteria, both by signing a letter of intent and showing the necessary verification to a third party certification agency (in most cases, not all eco-labels require third party involvement).

Another way of ensuring purchase and use of healthy products, articles and materials is to encourage the municipal purchasers to choose those which are eco-labelled within the already procured assortment. This can be done by automatic indication with eco-label symbols in electronic purchasing systems or catalogues.

ANNEX 2
PROJECT PARTNERS AND ASSOCIATED ORGANISATIONS IN THE NONHAZCITY PROJECT

Project Partners, as listed for the project

Partner number	NonHazCity Partners	Country	Organisation type
PP1	Municipality of Stockholm (lead partner)	Sweden	Municipality
PP2	City of Västerås	Sweden	Municipality
PP3	Swedish University of Agricultural Sciences (SLU)	Sweden	University
PP4	Turku University of Applied Sciences (TUAS)	Finland	University
PP5*	Pärnu City Government	Estonia	Municipality
PP7*	Baltic Environmental Forum (BEF) Estonia	Estonia	NGO
PP8	Riga city	Latvia	Municipality
PP9	Baltic Environmental Forum (BEF) Latvia	Latvia	NGO
PP10	University of Gdańsk	Gdańsk	University
PP11	Municipality of Gdańsk	Gdańsk	Municipality
PP12	Gdańsk Water Utilities Ltd.	Gdańsk	Infrastructure and public service provider
PP13	Baltic Environmental Forum (BEF) Lithuania	Lithuania	NGO
PP14	Lithuanian Environmental Protection Department, Ministry of Environment	Lithuania	National public authority
PP15	Institute of Applied Ecology	Germany	Institute
PP16	Baltic Environmental Forum (BEF) Germany	Germany	NGO
PP17	Kaunas District Municipality	Lithuania	Municipality
PP18	Municipality of Šilalė district	Lithuania	Municipality

* PP6 (Pärnu Water) was changed to associated organisation (AO26) during the implementation phase of the NonHazCity project.

Associated organisations as listed for the project

Number	NonHazCity Associated Organisations	Country	Organisation type
AO1	EUROCITIES	Sweden	International organisation
AO2	Baltic Development Forum	Denmark	International organisation
AO3	Swedish Agency for Marine and Water Management	Sweden	Sectoral Agency
AO4	Swedish Chemicals Agency	Sweden	Sectoral Agency
AO5	Stockholm water	Sweden	Infrastructure and public service provider
AO6	Ministry of Environmental protection and regional development of the Republic of Latvia	Latvia	National public authority
AO7	State Environmental Service of the Republic of Latvia	Latvia	National public authority
AO8	Finnish Safety and Chemicals Agency (Tukes)	Finland	National public authority
AO9	City of Turku	Finland	Local public authority
AO10	Environmental Board of the Republic of Estonia	Estonia	National public authority
AO11	Saint Petersburg State University of Aerospace Instrumentation	Russia	Higher education and research institution
AO12	IPO “Ecopartnership”	Belarus	Interest groups including NGOs
PP14	Lithuanian Environmental Protection Department, Ministry of Environment	Lithuania	National public authority
PP15	Institute of Applied Ecology	Germany	Institute
PP16	Baltic Environmental Forum (BEF) Germany	Germany	NGO
PP17	Kaunas District Municipality	Lithuania	Municipality
PP18	Municipality of Šilalė district	Lithuania	Municipality
AO19	Turku Waterworks	Finland	Infrastructure and public service provider
AO20	University of Rostock	Germany	Higher education and research institution
AO21	Agency for the Environment, Nature protection and Geology in Mecklenburg-Pomerania	Germany	Regional public authority
AO22	The City of Lübeck’s municipal waste management company	Germany	Infrastructure and public service provider
AO23	Hamburg Public Sewage Company	Germany	Infrastructure and public service provider
AO24	Kaunas University of Applied Science	Lithuania	Higher education and research institution
AO25	Kaunas City Municipal administration	Lithuania	Local public authority
AO26	Pärnu Water	Estonia	Infrastructure and public service provider

ABOUT THE PROJECT

The project “Innovative Management Solutions for Minimizing emissions of hazardous substances from urban areas in the Baltic Sea Region” (NonHazCity) is financed by the European regional development fund within the Interreg Baltic Sea Region program, from March 2016 to February 2019. The project involves 18 partners from Sweden, Finland, Estonia, Latvia, Lithuania, Poland and Germany and 23 associated partners.

NonHazCity wants to demonstrate possibilities of municipalities and WWTPs to reduce emissions of priority hazardous substances (HS) from small scale emitters in urban areas that cannot be reached by traditional enforcement techniques. Substances of concern will be identified and prioritised, sources tracked and ranked, individual HS Source Maps and Chemicals Action Plans developed by each partner municipality.

Municipal entities will implement own substance reduction measures at their premises. Private small scale businesses will pilot substitution actions and improve their assortment. Inhabitants will be shown their HS emission share and test the use of less HS in every-days household management to help to protect the Baltic Sea environment but also their own health.

If you are interested to follow the project this newsletter will be produced about twice a year. It is also possible to read about activities at the project website www.nonhazcity.eu and at partner websites.

IMPRINT

© City of Stockholm, Environmental department, December 2018

Fleminggatan 4, Box 8136, 104 20 Stockholm, Stockholm

www.stockholm.se

Contact: Anne Lagerqvist anne.lagerqvist@stockholm.se

This brochure was developed and printed in the NonHazCity project, with financial support of the INTERREG programme of the European Union. The contents of this brochure solely reflect the views of the authors and do by no means represent the view of the European Commission.

www.nonhazcity.eu