Ministry of Environment and Food
The Danish Environmental Protection Agency

# Survey and strategy for sustainable use of biocides

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Survey and strategy for sustainable use of biocides

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# Preface

**Background and objectives**

The current project was initiated by the Danish Environmental Protection Agency (Danish EPA) with the overall aim to provide a survey and a strategy on sustainable use of biocides including technical alternatives to biocides. Sustainable use of biocides means that biocides should only be used where deemed necessary and if possible replaced by technical alternatives, but also substituting hazardous biocides with less harmful alternatives and reducing the use of biocide products where possible.

The strategy should include proposals for a minimisation of the risk of impacts of biocidal products to be carried out at national Danish and at EU level. The challenges that the SMEs may have under the biocidal products regulation are considered as well the strongholds of Danish industry in terms of expertise and potential for innovation within the biocides area.

The main purpose of the biocidal products regulation (BPR) (European Parliament and the Council 2012) is to "harmonise the rules on the making available on the market and the use of biocidal products, whilst ensuring a high level of protection of both human and animal health and the environment" (BPR Art. 1). Under Article 17 of the BPR, which sets out the general principles concerning the authorisation of biocidal products, biocidal products are to be used in compliance with the terms and conditions of the authorisation. 'Proper use' shall involve the rational application of a combination of physical, biological, chemical or other measures, so the use of biocidal products is limited to the minimum necessary and appropriate precautionary steps are taken. Member States are also to take the necessary measures to provide the public with appropriate information about the benefits and risks associated with biocidal products and ways of minimising their use.

The Article 18 of the BPR: 'Measures geared to the sustainable use of biocidal products', requires that the Commission by 18 July 2015 presents a report on initiatives in support of sustainable use of biocides.

The BPR includes in several places measures supporting sustainable use of biocides within the EU:

- Exclusion criteria for the most hazardous biocidal active substances, prohibiting them from being approved and entering the market (BPR, Art. 5).
- Certain hazardous active substances can be candidates for substitution and can only be approved for a limited period and re-assessment is required before a possible renewal of the approval (BPR Art. 10).
- Authorisation of biocidal products containing candidates for substitution must include a comparative assessment in order to avoid the approval of hazardous biocidal products where less hazardous products are available (BPR, Art. 23).
- The BPR also introduces the simplified procedure where biocidal products that contain specific low risk active substances have a faster and less costly way to the market (BPR, Art. 25-28).

The background for this study is that the Danish Environmental Protection Agency (Danish EPA) wants to influence the work at EU level and at the same time promote the strength that Danish industry may have in terms of innovative solutions in this area.

More specifically the Danish EPA has requested an overview of existing solutions and tools for sustainable use of biocides, and a proposal for a Danish strategy within the area. The strategy should include suggestions for Danish initiatives at EU level as well as initiatives at a national level. The Danish EPA aims to involve the relevant Danish enterprises in the discussion of possible incentives for development of innovative solutions on sustainable biocide use.

## Objectives of the study

1. Provide an overview of existing solutions and tools for sustainable use of biocides in Denmark and abroad.
2. Identify whether additional measures are needed in order to reduce the risk from the use of biocidal products.
3. Provide models for development of concepts that can stimulate the innovation of sustainable biocide use and the development of more sustainable biocides and alternatives to biocide use. The activity also includes development of a strategy on how Denmark could influence the work at EU level considering specific Danish interests.

In order to focus the available resources a number of product types for the following uses are not included in the work:

* PT 15, avicides

* PT 17, piscicides

* PT 20, other vertebrates

* PT 22, embalming fluids

## Definitions and terminology

"Sustainable use" is a concept that considers the use of a biocidal product, considers the overall risks by its use, and aims at the overall least impact on human health and the environment. It considers the three pillars of sustainability (economic, social, and risk to human health and the environment) when deciding how to achieve the desired objective of controlling harmful organisms or of materials preservation, etc. Sustainable use thus goes beyond acceptable risk to seek for further risk reductions that can be achieved while ensuring effective action against the target organisms.

Evaluating the sustainability of a biocide use should ideally take a holistic view on the implications and consider the whole life cycle of the biocidal product and its intended function. However, it has not been the purpose of the current study to analyse the sustainability of specific technical solutions or products. Instead, the focus has been on identifying available ideas and initiatives that could support industry in developing more sustainable biocide use.

In this context, sustainable use of biocides is interpreted broadly, and it considers and prioritises physical/ technical alternatives, better production equipment and other solutions not involving use of biocidal products. Thus, sustainable use of biocides means that biocides should only be used where deemed necessary, and if possible, replaced by physical alternatives or less hazardous products.

The approach to sustainable use of biocides will be different for different product types. Biocides are a very diverse group of substances with different target organisms and applications. Terms as 'Best Practice' and 'Sustainable Use' therefore need to be considered for the individual product type although there are similarities among the measures that can be taken. It is the aim in this report to address 'Sustainable Use' at a general level covering biocides as such, but also to give specific

recommendations focusing on individual product types that are specifically relevant on the Danish market.

The report uses a terminology in the process of identifying concepts that can be used in a Danish strategy in this area. The survey in Chapter 1 focuses on identifying solutions and tools for sustainable use of biocides. Solutions and tools could cover specific technical/ physical measures that can replace or reduce use of biocidal products, development of best practices and guidelines, or regulatory initiatives supporting use of less harmful biocidal products.

### The process

The survey has been undertaken by DHI in cooperation with Milieu LTD from October 2014 to August 2015. The project participants were:

- Jens Tørsløv, DHI, project manager
- Josephine Armstrong, Milieu
- Michael Fink, DHI
- Dorte Rasmussen, DHI
- Torben Madsen, DHI, quality supervisor

The work has been followed by an advisory group from the Danish Environmental Protection Agency:

- Rikke Gleerup Ovesen , Project Manager
- Sonja Canger,  Head of Division
- Jørgen Larsen

Stakeholders from industry and knowledge centres were invited to a workshop in Copenhagen on 28 January 2015 at the Danish EPA. The participants included SME producers and suppliers of biocides within Disinfectants and Preservatives (Biocide Main group 1 and 2). It was the aim of the meeting to present and discuss issues, solutions and tools with relevance for sustainable use of biocides. The participants list and workshop agenda are included in Annex 1.

# Summary and conclusions

The current project was initiated by the Danish Environmental Protection Agency (Danish EPA) with the overall aim to provide a survey and strategy on sustainable use of biocides including technical alternatives to biocides. Sustainable use of biocides means that biocides should only be used where deemed necessary and if possible replaced by technical alternatives. Sustainable use also, however, includes substituting of hazardous biocides with less harmful alternatives and reducing the use of biocides where feasible.

The report includes an overview of identified solutions and tools for sustainable use of biocides, a discussion of their relevance, and a proposal for a Danish strategy containing initiatives at a national level as well as at EU level. The discussion of the relevance of the identified solution takes into consideration the position of the SMEs and the strongholds Danish enterprises may have within technological innovation.

In order to include initiatives on specific groups of biocides, a rough priority setting was made based on the hazard of the individual product types and the active substances used. This included a simple ranking based on the number of active substances within a product type that fall under the exclusion criteria of Article 5 of the BPR, or corresponds to the conditions specified in Article 10(1) (a), (b) or (d) of the BPR, and are thus considered candidates for substitution. The product types that are based on this hazard screening were identified as having a priority include:

- PT 2: Disinfectants and algaecides
- PT 8: Wood preservatives
- PT 14: Rodenticides
- PT 18: Insecticides
- PT 21: Antifouling products

The relevance of the identified solutions is discussed considering the possibilities of introducing technical alternatives as well as other initiatives that can contribute to reducing the overall risk to humans and the environment such as guidance, training, certification and restrictions of sales. The solutions are discussed in terms of efficacy and the relevance for SMEs within the biocide supply chain as well as the role Danish industry could play. The prioritised product types are discussed separately with the aim of identifying relevant and specific measures at product type level.

Technical means for reducing or avoiding use of biocides were discussed at the Danish stakeholder workshop held in January 2015. A number of possible solutions were identified and others are suggested in reports from EU Member States and the Commission. Among the relevant technical solutions are:

- A cross sector approach within industry on using hygienic design as a way of avoiding or reducing the use of biocides. The experiences gained within the food industry could be broadened to other areas where disinfectants are used in process industry or in the health care sector.
- Packaging systems ensuring single dose release, e.g. for disinfectants and insecticides, to avoid unintended over-dosing of biocides
- Advanced traps for rodents as a supplement or alternative to rodenticides.
- Design of constructions in order to reduce the need for wood preservation.

There is a need for product type specific best practice documents that integrate solutions for sustainable use and provide basis for training schemes for professionals. Ideally such documents should be developed at EU level, e.g. by industry associations, and used as a basis for guidance development at national level targeting the different professional user groups. In Denmark, the National Centre for Infection Control has developed an "Integrated Pest Management (IPM)" -like approach on the use of disinfectants in Danish hospitals. The ideas in this guidance could be used more broadly and would be relevant e.g. for PT 14: Rodenticides, and PT 18: Insecticides.

In Denmark, certification of professional users of rodenticides is mandatory and voluntary certification schemes for equipment used in food industry are in place. In France certification schemes are in preparation for disinfectants (veterinary area, food production), wood preservatives and insecticides. Certification could be relevant in sectors where a high level of control is needed, e.g. use of disinfectants in health care. At the Danish stakeholder workshop it was mentioned, however, that certification of personnel or equipment can be costly for the SMEs and could be seen as a barrier for entering (or staying on) the market.

In areas where a risk to humans or the environment has been identified restrictions could be used, e.g. restricting insecticides in spray cans for domestic use. Moreover, restrictions limiting sale of insecticides to specific (certified) retailers could be a way to ensure better instruction of private users.

Economic instruments can include measures for regulating the biocide market in the direction of more sustainable products introduced through the national charge and fee regulation. Adjustment of fees and charges could create incentives to stimulate development of more sustainable biocidal products.

Monitoring of sales and use of biocides have been recommended as a measure to create better data as a basis for priority setting of initiatives on sustainable use. This may require a legal initiative at member state level in order to make it mandatory for authorisation holders to report the volumes and types of biocides sold on a yearly basis.

The recommendation of initiatives to be included in a Danish strategy on sustainable use of biocides includes initiatives at a national and EU level. The national initiatives include:

- Broadening of the principles of hygienic design used within the food sector as a way to introduce technical solutions for sustainable use of biocides in process industry and health care. This could be facilitated through partnerships between industry, end-users and technological service centres.
- Encourage packaging solutions that prevent over-dosing of disinfectants, rodenticides and insecticides intended for use by consumers and professionals.
- Introduction of certification schemes for professionals and equipment where suitable to obtain adherence to best practise of use of disinfectants.
- Focus on design of construction as a measure for sustainable use of wood preservatives that minimises the need for wood preservatives. Furthermore, selection of materials and techniques, e.g. fillers/sealants, can ensure longer service life of wood constructions in buildings.
- Certification schemes for equipment could be a relevant solution at industrial installations for preservation of wood.
- It is recommended to support the further development of technical alternatives to rodenticides as well as guidance/ instruction of the private user.
- Restriction of the sale of insecticides to private users to take place at certified retailers.
- Insecticides in spray cans may entail a risk to the non-professional user and a restriction of use by consumers could be considered.

- It is recommended to establish legal provision at national level requiring yearly reporting from producers on the sales and use of biocides. Furthermore environmental monitoring may be used in specific cases to evaluate risk and follow efficiency of implemented risk mitigation measures.
- Information on sustainable use of biocides should be communicated to professional users through codes of best practice and guidance and to the general public by general information and instructions by purchase and on leaflets in the package.

Suggested initiatives at EU level includes:

- Development of best practise documents on sustainable use of biocidal products within product types and uses that are not yet covered. The main actors are the relevant European Industry Associations that have the necessary technical knowledge and network for communication.
- In order to support monitoring of sales and use at national level, it is proposed that the European Commission and ECHA investigate the possibility of extending the R4BP so it can serve as an EU-wide tool for the collection of data on the use of biocidal products.

# Sammenfatning og konklusion

Det aktuelle projekt blev igangsat af den danske Miljøstyrelse med det formål at få et overblik over initiativer vedrørende bæredygtig anvendelse af biocider og for at etablere en dansk strategi på området. Bæredygtig anvendelse indebærer, at biocider kun anvendes, hvor det er nødvendigt, og om muligt erstattes af tekniske alternativer. Bæredygtig anvendelse omfatter dog også substitution af farlige biocider med mindre farlige og minimering af anvendelsen, hvor det er muligt.

Rapporten indeholder en oversigt over mulige løsninger og værktøjer til bæredygtig anvendelse af biocider, og et forslag til en strategi omfattende initiativer på nationalt og EU niveau. I diskussionen af initiativernes relevans ses på hensynet til Små og Mellemstore Virksomheders (SMV) behov, og specifikke danske styrkepositioner inden for udvikling af innovative løsninger.

For at fokusere på specifikke biocidprodukttyper blev der lavet en grov rangordning blandt biocidprodukttyperne baseret på farligheden af de brugte aktivstoffer. Dette indebar en simpel prioritering baseret på antallet af aktivstoffer inden for en produkttype, der er omfattet af Artikel 5, eller svarer til kriterierne specificeret i Artikel 10(1) (a), (b) eller (d) af biocidreguleringen. De 5 produkttyper, som kom ud med den højeste frekvens af farlige indholdsstoffer, var:

- PT 2: Desinfektions- og algemidler
- PT 8: Træbeskyttelsesmidler
- PT 14: Rodenticider
- PT 18: Insekticider
- PT 21: Antifoulingmidler

Relevansen af de identificerede løsninger diskuteres i rapporten ud fra muligheder for at etablere tekniske alternativer eller andre løsninger, der kan reducere risikoen for mennesker og miljø, fx vejledning, undervisning, certificering og restriktion af salg. De prioriterede produkttyper diskuteres desuden separat for at identificere initiativer, der er specifikke for de enkelte prioriterede produkttyper.

Den danske stakeholder workshop, som blev afholdt i januar 2015, diskuterede de tekniske muligheder for at reducere eller undgå anvendelse af biocider. Der blev identificeret en række tekniske muligheder, som diskuteres sammen med andre løsninger om bæredygtig biocidanvendelse fra andre EU medlemsstater eller Kommissionen.

Eksempler på relevante tekniske løsninger er:

- Etablering af samarbejde på tværs af industrisektorer, der muliggør udveksling af erfaringer vedrørende hygiejnisk design. De erfaringer, som er opnået i fødevareindustrien kan formentlig anvendes som inspiration i sektorer, der også anvender desinfektionsmidler fx. procesindustri og sundhedssektoren.
- Doseringssystemer, der er integreret i emballage, og som sikrer korrekt dosering af fx desinfektionsmidler og insekticider til privat og professionel anvendelse.
- Avancerede fældesystemer, der kan anvendes som et supplement eller alternativ til rottemidler.
- Design af bygninger hvorved behovet for træbeskyttelsesmidler reduceres.

Der er behov for ”best practice” dokumenter og vejledninger, som integrerer principper for bæredygtig anvendelse, og som kan anvendes som basis for uddannelse af professionelle brugere. Sådanne dokumenter udvikles bedst med deltagelse af de relevante europæiske brancheorganisationer, og kan herefter bruges som grundlag for udarbejdelse af specifikke vejledninger, tilpasset de forskellige brugergrupper og på nationalt sprog.

I Danmark har Statens Serum Institut udarbejdet en vejledning om anvendelse af desinfektionsmidler i hospitaler efter principper, der svarer til EU's principper om integreret bekæmpelse af skadegørere. Ideerne i denne vejledning kunne med fordel anvendes inden for andre områder fx rottebekæmpelse og kontrol af insekter.

I Danmark eksisterer en certificeringsordning for skadedyrsbekæmpere, og der er en frivillig ordning for certificering af udstyr til fødevareproduktion. I Frankrig er certificeringsordninger for desinfektionsmidler, træbeskyttelse og insekticider under overvejelse. Certificering kan være relevant navnlig i sektorer, hvor der stilles høje krav til kvalitet, fx i sundhedssektoren. Ved den danske stakeholder workshop blev det imidlertid påpeget, at SMVer ofte ser en certificering som en barriere i forhold til markedet.

Inden for områder, hvor der er identificeret risiko for mennesker eller miljø, kan en restriktion være nødvendig, fx et forbud mod salg af insekticider på spray. En begrænsning af salget af insekticider til private til kun at foregå hos særligt certificerede forhandlere være en måde at sikre bedre information om sikker og bæredygtig anvendelse.

Økonomiske virkemidler som den nationale afgiftsregulering af biocider er et instrument, som kan anvendes til at påvirke markedet i en mere bæredygtig retning. Det kan fx ske ved at differentiere afgiften, så den favoriserer produkter med mindre skadelige aktivstoffer.

Det anbefales at etablere monitering af salg og anvendelse af biocider med henblik på at etablere et bedre grundlag for at prioritere indsatsen for bæredygtig anvendelse. Det vil kræve lovhjemmel at gøre det obligatorisk for biocidleverandører at indrapportere deres salg på årligt basis.

Rapporten giver en række anbefalinger til en dansk national strategi på området. Initiativerne på nationalt niveau omfatter:

- Brug af de opnåede erfaringer med hygiejnisk design i fødevaresektoren til at inspirere tilsvarende initiativer inden for andre sektorer fx procesindustri og sundhedssektoren. I praksis kan dette faciliteres gennem partnerskaber mellem industri, slutbrugere og teknologiske serviceinstitutter.
- Udvikling af emballagetyper til desinfektionsmidler, rodenticider og insekticider, der sikrer korrekt dosering ved brug.
- Certificering af professionelle brugere og udstyr som et middel til at indføre ”best practise” inden for desinfektionsmidler.
- Udvikling af designløsninger, der minimerer behovet for træbeskyttelsesmidler foruden valg af materialer og løsninger, som understøtter en tilstrækkeligt lang levetid af trækonstruktioner i byggeri.
- Certificering af udstyr til industriel træbeskyttelse.
- Videreudvikling af tekniske alternativer til rodenticider, foruden vejledning af den private bruger.
- Begrænsning af salg af insekticider til private til udelukkende at foregå fra certificerede forhandlere.
- Den private forbruger løber en risiko ved brug af insekticider på spraybeholdere. Et forbud mod privat anvendelse af spraybeholdere til dette formål kan overvejes.

- Det anbefales at etablere lovhjemmel til at kræve årlig indrapportere af salg af biocider fra forhandlere.
- Information om bæredygtig anvendelse af biocidprodukter bør ske til professionelle ved tekniske vejledninger og til private brugere ved generel oplysning og ved instruktion ved køb og på produktet

De foreslåede initiativer på EU niveau omfatter:

- Opfordring til de relevante europæiske industrisammenslutninger til at fortsætte udviklingen af "best practise" dokumenter indeholdende vejledning i bæredygtig anvendelse af biocider.
- Undersøge mulighederne for at udvide R4BP databasen hos ECHA til at omfatte et værktøj til opsamling af årligt indrapporterede data vedrørende salg og anvendelse af biocider fra alle medlemsstater.

# 1. Overview on existing solutions and tools for sustainable use of biocides

Chapter 1 provides an overview and summary of the existing solutions and initiatives for sustainable use of biocides presented in reports at Member State and European level. A specific section presents initiatives suggested from Danish side via members of the Biocides Panel and other stakeholders. In addition, the Chapter includes a summary of the main findings from the stakeholder workshop held in Copenhagen on 28 January 2015 as a part of the present project.

## 1.1 Summary of the survey on of solution and tools in the European Union

### 1.1.1 Assessment of different options to address risks from the use phase of biocides. 2009

The study on the '*Assessment of different options to address risks from the use phase of biocides*' (COWI, 2009), carried out in 2008, aimed to identify the appropriate measures and legal instruments to ensure the sustainable use of biocidal products. This study, therefore, evaluated possible solutions to control and/or reduce the risks associated with the use of biocides and assessed the approaches to their implementation at the EU level. The study identified the available data on the risks posed by the use of biocides, the possible measures to reduce the risks, and the environmental, social and economic impacts of the identified risk reduction measures. Data and information on the use of biocides and associated risks were however limited and difficult to identify. Therefore, the study was largely based on a questionnaire prepared by the European Commission in 2008 and the responses received from competent authorities in the Member States. The questionnaire included seven categories of questions covering training and certification of users, inspection of application equipment, monitoring and reporting, general data on the use of biocidal products, restrictions of the use of biocidal products, transposition of integrated pest management (IPM) principles, and additional measures to reduce risk. The study also considered the conclusions from an expert workshop held in Brussels on 23 April 2008 that looked at the suitability of additional measures.

The study concluded that there was a considerable lack of knowledge about biocides in use in the EU, the only information available being a survey of production/import figures from the ECB (European Chemicals Bureau, DG JRC) and a study undertaken in Denmark on the biocides market.

The assessments of toxicity and exposures were carried out on a product type-by-product type basis. Quantitative data on exposures and hazard properties were generally lacking, and thus, qualitative descriptions of the main emission situations and exposure pathways were applied to characterise the areas within each product type (PT), where impacts resulting from the use of biocides were most likely to occur.

The study identified the following technical options and associated supporting measures to reduce the risks from the use of biocides:

**TABLE 1-1 TECHNICAL OPTIONS AND ASSOCIATED SUPPORTING MEASURES TO REDUCE THE RISKS FROM THE USE OF BIOCIDES (COWI 2009)**

| Approach | Technical options | Measures |
|---|---|---|
| **Reduce the quantities to optimal levels** | Optimise the dosage | Restrict the application to certified users including applications of harmonised use conditions.<br>Certify application equipment.<br>Promote development of application equipment.<br>Implement taxes/levies on selected biocides. |
| | Prevent growth of organisms | Promote development of materials and building techniques that prevent the growth of undesired organisms.<br>Promote substitute materials. |
| | Apply non-biocidal techniques | Promote non-biocidal control, "Integrated Pest Management". |
| | Avoid using biocides where prevention is not essential | Restrict sales (e.g. no sale from open storage shelves).<br>Implement taxes/levies on selected biocides.<br>Information/awareness raising campaigns. |
| **Reduce hazardousness** | Technical improvements | The use of less hazardous biocides in biocidal products is already covered by the authorisation procedures under the BPD. |
| | Imported articles/materials | Evaluation of substances and subsequent authorisation of biocidal products used in treated articles/materials.<br>Labelling requirements for biocides-treated articles/ materials. |
| | Use of less hazardous biocides for less demanding applications | Promotion of less hazardous biocides for less demanding applications.<br>Prohibition of the use of certain biocides in certain conditions or areas.<br>Information/awareness raising campaigns. |
| **Reduce the releases and exposures by application** | Use of appropriate application techniques and equipment | Restrict the application of specific biocides to certified users.<br>Training and certification of professional users.<br>Certification of equipment.<br>Promote development of improved application and protection equipment.<br>Awareness raising campaigns on the application of biocides, especially for private users.<br>Prohibit the use of aerial spraying. |
| | Use appropriate personal protection equipment | Restrict the application of specific biocides to certified users.<br>Training and certification of professional users.<br>Information/awareness raising campaigns on the application of biocides. |
| **Reduce the long-term releases and exposures during the service of biocide-containing materials and articles** | Reduce the release rate of biocides from products and articles | Limit values for release rates of biocides from materials and articles (e.g. release rates of biocides from preserved wood). |
| | Prevent inappropriate use of | Awareness raising campaigns on the use of |

| Approach | Technical options | Measures |
|---|---|---|
| | biocide treated materials/articles e.g. indoor use of preserved wood. | biocide treated products. |
| **Prevent the development of resistance** | Change between different biocides | Training and certification of professional users. |
| | Prevent using biocides at sub-lethal levels | Training and certification of professional users. |

The study further assessed three of the identified measures: (i) training and certification of professional users; (ii) certification and inspection of application equipment; and (iii) long-term good practice and prevention.

1) Training and certification of professional users – the study found that training and/or certification schemes exist in many Member States, in particular for wood preservatives, disinfectants, insecticides and rodenticides, and that there was a need for a minimum level of good practice harmonisation with regard to training requirements across the EU for these product types. Training and certification could consist of the following elements that may be implemented at different levels for different product types:
*Harmonised Good Practice (GP) reference documents and standards*. Such reference documents and standards may serve as the basis for training schemes, reference documents for authorisation and basis for developing requirements and provisions. The development may take inspiration from the system that is in place to develop Reference Documents on Best Available Technique (BREF) in the context of the Industrial Emission Directive (European Parliament and the Council 2010). Separate documents would be needed for each product type and in some cases even at a more disaggregated level.
*Harmonised training schemes and requirements* could involve mandatory training of professionals in the pest control industry and similar industries, whereas a voluntary approach could apply to professionals where the use of biocides is a minor part of the activities. Training schemes would be based on the GP reference documents, and harmonisation is predominantly relevant in connection with certification/authorisation systems.
*Harmonised certification systems* co-exist today in many Member States and in most cases so that the authorisation systems concern only the professional users providing the pest control as a service or as pest controllers in public areas. The biocides may still be used by non-professionals or professionals undertaking pest control in their own premises (e.g. farmers). Authorisation provisions could include among other things provisions as regards education and documented training and require pest control to be undertaken in accordance with specified guidelines. Some systems only require authorisation and training for the persons in charge of the pest control, whereas in others, professional competence should be demonstrated for every technician through examination and certification.

2) Certification and inspection of application equipment – the study found that, based on the lessons learned from plant protection products, certification of application equipment could be an appropriate measure, especially in cases where there is a high probability that inadequate application equipment results in over-dosage, high human exposure or high releases to the environment. A certification system could include essential requirements for all new equipment (these requirements may be established through an amendment of the Machinery Directive) and the establishment of necessary conditions for certification, the setting up of a register of certified equipment and for the marketing of new application equipment. The system may be combined with a system for inspection/ test of the equipment already in use. Specific requirements could also apply on a voluntary basis, defined in a compliance standard to be developed by standardisation bodies. As the equipment is very diverse, specific requirements would need to be developed for each type of equipment. The study therefore indicated that the development of requirements could first focus on disinfection agent-dosing apparatus (e.g. for disinfection in cooling systems). Certification of

equipment may also be relevant for equipment used for the injection of biocides into materials, continuous dosing systems and for spraying equipment.

3) Long-term good practice and prevention - the study assessed integrated pest management (IPM) used for plant protection as one of the measures for long-term good practice and prevention. It was noted that many of the IPM principles may be applicable for biocidal products, and since biocides are used in urban environments, the range of options for reducing the use of biocides by non-biocide prevention and control methods are much wider than for plant protection products. It also noted that following the questionnaire sent to the Member States by the Commission in 2008, the responses received suggested that IPM principles could at least be applied to specific product types such as rodenticides, insecticides, repellents and attractants, and also potentially wood preservatives and antifouling products. IPM measures may however be relevant for a wider range of product types in the long-term. Many of the IPM principles could be integrated in good practice documents and training schemes for certified users.

In order to implement the above three measures, the following five options were assessed:

- Option 1: No action
- Option 2: Extension of the scope of the Pesticide Thematic Strategy and Framework Directive to pest control biocides at this stage
- Option 3: Extension of the scope of the Pesticide Thematic Strategy and Framework Directive to all types of biocides at a later stage
- Option 4: Incorporation of the use phase in the scope of the Biocide Directive 98/8/EC
- Option 5: Development of a specific legislative instrument on the use of biocides

The study concluded that in order to achieve legal simplicity and legal certainty, option 3, to extend the scope of the Pesticide Thematic Strategy and Framework Directive to all types of biocides at a later stage, was the preferred option. In addition, a combined Framework Directive could initially include pest control biocides, where sufficient knowledge is available, as proposed in option 2. Finally, it was noted that, irrespective of the legislative instrument used, the actual implementation of each of the three measures would require further monitoring of the actual use of biocidal products.

By this stage, there had been an ongoing debate about the best ways to address the use phase of biocides including the various regulatory options. A 2008 study (*Assessing the Impact of the Revision of Directive 98/8/EC concerning the Placing of Biocidal Products on the Market*) (RPA, 2008) considered three options to address the use phase of biocides:

- Biocides could be included in a future revision of the Directive on Sustainable Use of Pesticides
- Directive 98/8/EC could include provisions on the use phase of biocides.
- An independent framework on the use phase of biocides could be created.

During the revision of the Directive 98/8/EC (BPD) concerning the placing of biocidal products on the market, therefore, calls were made for the proposed regulation on biocidal products to cover the use phase of biocidal products. However, as with the BPD, the focus remained on the authorisation of biocidal products, and while Regulation 528/2012 (BPR) concerning the making available on the market and use of biocidal products does include a few provisions addressing the use phase, it does not regulate the use phase systematically. This definition of “use” focuses on the product and the steps leading up to its application. This is in accordance with the aim of the BPR, which is to address the risk (acceptable/non-acceptable) for a biocidal substance, based on the product (properties and toxicity) and its application (exposure). The BPR thus places the major obligation on the person placing the biocidal product on the market, and not on the actual user.

During discussions leading up to the adoption of the BPR, calls were made for a framework directive on the use phase of biocidal products which should include provisions for National Action Plans, integrated pest management, risk reduction measures and the promotion of alternatives. However, by way of compromise, Article 18 of the BPR was included, which requires the Commission to provide a report on how the BPR contributes to the sustainable use of biocidal products, and if appropriate, to submit a proposal for the adoption of legislation on the sustainable use of biocidal products.

### 1.1.2 Study towards the Development and Dissemination of Best Practice on Sustainable Use of Biocidal Products. 2010

The '*Study towards the development and dissemination of best practice on sustainable use of biocidal products*' (Milieu, 2010) followed up on the options described in Section 2.1.1. This study addressed the risks from the use phase of biocides and aimed to identify existing best practices developed by the competent authorities of Member States or by industry (stakeholders) for the 23 biocidal product types in the BPD in order to ensure sustainable use of biocidal products. To this end, the study reviewed the approaches towards best practices for the use of biocidal products developed at the Member State level, the best practices that had been developed and promoted by industry, and the ways in which the concept of best practices could be adapted and used at the Community level.

Based on an analysis of the information gathered, including current actions to promote best practices at EU level as well as the activities reviewed in other sectors, the study identified a set of possible policy options for the European Commission to consider in terms of how the concept of best practices could be adapted and used at the Community level. In total, 14 options were proposed, 12 of which did not require changes to EU legislation. The options were categorised in terms of the main stages in the development and promotion of best practice documents: development, dissemination (including training) and monitoring/evaluation and an estimate of the costs of the options was also developed.

TABLE 1-2 IDENTIFIED OPTIONS FOR SUSTAINABLE USE OF BIOCIDES AND BENEFITS (MILIEU 2010)

| Option | Benefits |
|---|---|
| **Options to strengthen the development of best practice (without legislative changes)** | |
| **Option 1: EU-funded background research (per project per year)** | Increased knowledge of the impacts of biocides on target organisms, the environment and human health;<br>A basis to prioritise any further action; and<br>Provision of the knowledge required to improve best practice on sustainable use of biocides use. |
| **Option 2: EU-level procurement process to develop guidelines** | Increased availability of best practice; and<br>Standardisation and harmonisation of best practice across EU. |
| **Option 3: National best practice transferred to EU-level** | Making existing best practice guidance more widely available, by translating it into a range of EU languages; and<br>Encouraging harmonisation of best practice across EU. |
| **Option 4: Best practice developed by stakeholders through standardisation process** | Wider availability of best practice guidance, via the communication networks of CEN and national standards authorities; and<br>Standardised best practice across EU. |
| **Option 5: Addressing biocides within the BREFs under IPPC** | Integration of biocides best practice into EU wide guidance for major industrial operations (i.e. all relevant guidance in one place);<br>Enhanced focus on best practice use of biocides by enforcement authorities; and<br>Standardised best practice across EU. |
| **Dissemination** | |
| **Option 6: EU public** | Greater public and industry awareness of biocides and the issues (human and |

| Option | Benefits |
|---|---|
| **information campaign** | environment health, safety and sustainability) that surround their use;<br>Greater stakeholder awareness of best practice guidance;<br>Greater stakeholder awareness of how to obtain best practice guidance; and<br>Provision of information/educational tools for use by other organisations (videos or interactive media developed to support the information campaign could be used by industry for training purposes). |
| **Option 7: EU-wide website** | Greater public and industrial EU-wide access to information on biocides and the issues (health (human and environment), safety and sustainability) that surround their use; and<br>EU-wide source of best practice guidance. |
| **Option 8: National website** | Greater public and industrial awareness of biocides and the issues (human and environmental health, safety and sustainability) that surround their use;<br>Local use patterns and legislative variations will be covered (not for web sites that simply translate an EU-wide web site (Option 7));<br>Guidance will be available in users' own national language; and<br>Greater availability of best practice guidance in general. |
| **Option 9: Helpdesks to provide information on best practices** | Could provide users of biocides with an easy point of access to information on best practices in the sustainable use of biocides;<br>Could provide more in-depth and focused information than the web site;<br>An EU-level help desk could provide consistent guidance on best practices across Member States (perhaps developed under Options 3 and 4);<br>National help desks could provide explanations of local use patterns, industry structures, training availability and legislative requirements;<br>On a national help desk, guidance would be available in users' own national language; and<br>National help desks could provide user specific guidance and respond to user concerns or problems. |
| **Links to policy structure** | |
| **Option 10: Include biocides in the NAPs for the sustainable use of pesticides** | Involvement of a wide range of national stakeholders ;<br>The existing consultative and other structures developed for pesticide use would provide a 'ready-made' set of structures for biocides; and<br>NAPs could provide a strong mechanism for encouraging the adoption of best practice in industry and among professionals and raising awareness among the public. |
| **Option 11: Create a working group to support sustainable use** | Support for the standardisation of best practice across the EU<br>Support for the dissemination and use of best practices across the EU;<br>Support for the provision of best practice guidance from other options (e.g. by providing a forum for reviews of new best practice guidelines for EU level, such as those developed under Option 2 or reviewing plans for an EU web site (Option 7));<br>Support for the consideration of other options, beyond best practices, for promoting sustainable use; and<br>Would provide a forum for bringing forward sustainable use at EU level. |
| **Option 12: Use information gathered during the biocidal product authorisation process** | Makes use of information which is being generated anyway, under the authorisation process, to feed into the development of best practice guidance. |
| **Policy options that involve legislative changes: Dissemination** | |
| **Option 13: Training and certification** | Potential cost savings through reduced use of biocides; and<br>Reduced risks of damage to the environment or health. |
| **Policy options that involve legislative changes: Monitoring** | |
| **Option 14: Reporting on the use of biocides** | Could identify areas where the use of biocides may pose the highest risks and thus the best opportunities for the promotion of sustainable use. |

### 1.1.3 Efficiency and practicability of risk mitigation measures for biocidal products with focus on disinfectants.

The German Federal Environment Agency initiated two research projects covering risk mitigation measures for biocidal products. In the first project, "*Efficiency and Practicability of Risk Mitigation Measures for Biocidal Products - Wood Preservatives and Insecticides"* (Gartiser, S. and Jäger, I, 2011) the efficiency and practicability of risk mitigation measures (RMM) proposed by authorities, industry, and associations for biocidal products were analysed with a specific focus on wood preservatives and insecticides. Experience at that stage had shown that the Rapporteur Member States had not always followed the same approach to RMM for a given risk to the environment during the evaluation of the active substance. As a result, full consideration of whether specific measures were required to reduce a possible risk to the environment was left to the national authorisation of the product and mutual recognition. It was recognised that a broader strategy for the sustainable use of biocides was required in order to increase the practicability of RMM. The aim of the project was therefore to identify appropriate solutions for avoidance or reduction of identified risks of wood preservatives and insecticides and to compile RMM required for an EU-wide harmonised assessment of biocidal products. In this context, product type specific RMM guidance documents were developed and discussed among competent authorities.

In a follow-up project on the "*Efficiency and Practicability of Risk Mitigation Measures for Biocidal Products with focus on disinfectant"* (Gartiser, S. and Jäger, I, 2013), carried out between 2010 and 2012, product types 1 to 5 were analysed with the aim of identifying appropriate solutions for avoidance or reduction of identified risks of disinfectants and to compile RMM required for an EU-wide harmonised assessment of biocidal products. Again, specific RMM guidance documents were developed for each of the product types and discussed among competent authorities. Both projects focused on the mitigation of environmental risks during the use phase of biocides.

Several data sources were analysed, including Emission Scenario Documents (ESD) published by the European Commission, which provided an overview of the most relevant uses of disinfectants, the Inclusion Directive describing RMM for Hydrochloric acid (PT 2), which was the only active substance included in Annex I of the BPD by that stage, the draft Competent Authority Reports (CAR) for other disinfectants being discussed at that stage, literature and research studies, and the relevant safety data sheets (SDS) and product leaflets.

The evaluation of product documents showed that few RMM were recommended, and those that were, were of a general nature, such as detailed dosage recommendations, the area of application or the use of equipment supporting safer application, which rather describe the conditions of use. For example, for PT 1 (disinfectants for human hygiene), only general RMM such as "dilute with plenty of water" or "do not allow entering sewers/surface or ground water" had been proposed in technical leaflets for those biocidal products. Other RMM referred to specific product designs such as ready-to-use products, which also permitted simple and reliable dosing. From the analyses, it became clear that there were different elements of risk mitigation to be taken into account, which refer to different addressees (formulator, user, authorities) and areas (area of use, on-site treatment, municipal STP, environmental compartment).
As part of the project, a European workshop on "Efficiency and practicability of risk mitigation measures (RMM) for biocidal products" was held at the German Federal Environment Agency in February 2011. One point which emerged from the workshop was that a distinction should be made between basic or general RMM (e.g. BAT, IPM) that could lead to a sustainable use of biocidal products and specific RMM (e.g. top-coat on wood preservatives) to be included in risk assessment. RMM should be harmonised as far as possible on a European level in order to facilitate the European market and mutual recognition of authorisations, although it was noted that flexibility is also required in order to reflect each national situation. It was also noted that the harmonisation of RMM could be supported by establishing standard RMM phrases, although some require a more detailed specification. Existing approaches for the harmonisation of RMM phrases under the CLP

Regulation, REACH, the IPPC Directive, safety precautions concerning plant protection products, and national RMM-phrases for biocidal products, were therefore analysed.

The aim was to harmonise the approaches adopted at that time for the assessment of biocidal active substances and products and to facilitate mutual recognition of product authorisations. The only agreed guidance document on RMM for biocides elaborated at EU level referred to the use of rodenticides. This guidance document was used to structure a first proposal for guidance on concrete RMM for the use of disinfectants, which would form the basis of discussion among Competent Authorities. Due to the diverse nature of PT 1 to 5, separate draft guidance documents on environmental RMM were developed for each of these product types, which included both general RMM (best practices, BAT, good housekeeping and general hygiene requirements) and specific RMM (risk-based and thus derived from the environmental risk assessment).

In addition to the draft guidance documents, the study made a number of conclusions and recommendations, which included the following:

- No concerns for the environment had been identified for most of the active substances evaluated by that stage. However, only a few active substances of PT 1 to 5 had been evaluated, and the assessment of cumulative exposure was often missing.
- Biological treatment in municipal or on-site sewage treatment plants is the most common RMM for the protection of surface water, and most disinfectants are designed to be inactivated in municipal biological sewage treatment plants.
- Many disinfectants also contain detergents and other substances that may be of higher environmental concern than the active substances themselves, and such auxiliary substances should be specifically considered in the risk assessment during product authorisation.
- The formation of disinfection by-products under the use conditions should be considered in the assessment of all biocidal products with oxidising active substances.
- The selection of RMM should consider realistic options, which reflect best practices and require some surveillance by authorities. However, only few data on efficiency of a certain RMM are available. Surveillance and enforcement of RMM are therefore highly important.
- Some RMM might also be appropriate if the risk quotient shows a level of concern and/or cumulative environmental exposure resulting from the use of different biocidal products with the same active substance (from the same product type or different product types) is expected.
- RMM on labels of products for non-professional use should only be considered as recommendations. If these RMM are too complex and difficult to achieve, the specific uses should not be authorised if the RMM are needed to obtain a PEC/PNEC ratio below 1.
- Further research is required into emissions and no emission scenarios from treated articles attributed to PT 2, since currently, little information is available, and RMM proposed for treated articles mainly cover the end of use part of the life cycle.

#### 1.1.4 Reducing negative impacts of biocide use on the environment – Towards efficient EU legislation. 2014.

The German Federal Environment Agency initiated two research projects covering the use phase of biocidal products. In the first project, the study on "*Thematic Strategy on Sustainable Use of Plant Protection Products – Prospects and Requirements for Transferring Proposals for Plant Protection Products to Biocides*", the prospects and requirements for transferring measures proposed in Directive 2009/128/EC on the sustainable use of pesticides to the biocide area were analysed (European Parliament and the Council 2009). The study focused on wood preservatives (PT 8), insecticides (PT 18) and antifouling agents (PT 21) (Gartiser, S. et al., 2012). Sustainable use of biocides addresses the three pillars: social, environmental and economics. A systematic analysis of the instruments described in the Thematic Strategy and Directive 2009/128/EC indicated that

the structure can be transferred to the biocide area. This concerns e.g. education and training, requirements for sale, the establishment of awareness raising programmes, control of the machinery for biocide application, the development of best practice standards based on integrated pest management principles, and the collection of statistics on biocide consumption. The analysis revealed that some of the instruments of Directive 2009/128/EC could be transferred to the biocides area when considering biocide specific characteristics. Unlike plant protection products, the intended use of some biocides is to be directly applied in water bodies or indoors. For some product types, emissions during the service life of biocides (e.g. through leaching) are more relevant than during the application phase.

In a follow-up project, "Reduction of environmental risks from the use of biocides: Environmental sound use of disinfectants, masonry preservatives, and rodenticides" the prospects for transferring measures in the Thematic Strategy are currently being analysed, and the analysis has been expanded to cover in particular disinfectants (PT 2 and 3), masonry preservatives (PT 10) and rodenticides (PT14) (Umweltbundesamt 2015)). In this context, a European workshop on 'Reducing negative impacts of biocide use on the environment – Towards efficient EU legislation' took place in March 2014 in Berlin, to present the results and discuss UBA's approach towards appropriate EU legislation in a broader context with other Member States. Around 50 experts from Competent Authorities, the European Commission, user associations of biocides, industry representatives and NGOs participated in the workshop.

The occurrence of biocides in environmental media indicates that the environmental release and impact of certain biocides may have been underestimated and/ or have been used unintendedly. Almost all participants agreed that guidance for the sustainable use of biocidal products would have to be specific for product types or specific uses. It was also recognised that there is an important need for environmental monitoring and cross-linking with product authorisation as well as for more data on use and sales. There was general agreement on the need for proper training and education programmes for professional users at least for certain product types, but it remained open whether training should be mandatory or not. The same applies for developing and implementing both general and product type specific best practices. Sales requirements can be regulated nationally if public use is prohibited. There is an option for the registration of biocides sellers, users and sales for those products not allowed for public use as in Belgium. Registration of sales seems to be a tool to get an overview on frequency of use and amounts. Prohibition of self-service is important for some product types. There was partial agreement regarding the approval and maintenance of the equipment, but the applications for which the equipment should be assessed should be specified. There is the possibility to define specified conditions/suitability of machinery for the intended application within the product authorisation.
There was a general agreement that sensitive areas should be protected, but the question left open whether such uses should be restricted within product authorisation or whether there is a need for a separate Directive on sustainable use of biocides. There are examples such as treated articles for which no product authorisation exist. There is a need to distinguish between public areas and nature and water protection sites. For public areas the enforcement of correct use is important (duty of control of certain pests), for protection sites the minimisation or restriction of use. One example for minimisation is the prohibition of antifouling agents in freshwater in Finland.

### 1.1.5 Joint position of VCI and VCH on the Sustainable use of biocidal products. 2014

In May 2014, the VCI (German chemical industry association) and VCH (German association of chemical trade and distribution) issued a joint position statement on the sustainable use of biocidal products (VCI 2014).

It was commented that while use-related analogies can be drawn between sustainable use of insecticides or rodenticides and plant protection products, this is usually not possible for other

product types, in particular disinfectants, which are likely to constitute by far the largest share of authorised biocidal products. As a result, a different basis is required for defining "sustainable use" of disinfectants.

Due to the wide range of biocidal products, with different forms of application and three different categories of user, VCI and VCH are of the view that it is not possible to develop just one set of measures for the sustainable use of all biocidal products, and that measures from plant protection products, even if adapted to biocidal products, cannot be transferred. Potential measures for the sustainable use of biocidal products therefore need to be examined on a case-by-case basis, specific to the use, product type and active substance. Subject to this, VCI and VCH support the following proposals for general measures:

1. The development of "best practices" and guidance (product type specific wherever possible);

2. Providing information on "best practices" and safe use and disposal in order to raise awareness among users. VCI and VCH are critical of introducing or integrating criteria in new or existing eco-labels and/or quality marks.

3. Education and training of staff and trainees in undertakings and of professional users;

4. Requirements for sales of biocidal products for professional and industrial uses – The need for rules or special conditions for sales or marketing of products needs to be examined on a case-by-case, product specific, basis. While a qualification of industrial and professional users can be a suitable measure for minimising incorrect use, this needs to be examined using a product type specific approach.

5. Assessment of use - For certain products an authorisation can be granted exclusively for professional and/or industrial use, based on a scientific risk assessment, taking into account exposure and benefit.

6. Monitoring of appropriate use of biocidal products - Monitoring can be a useful instrument for an inventory of the current situation and to identify action areas. However, monitoring only of consumption volumes of biocidal products is not constructive.

7. Measures for certain product types after their use phase - Legal provisions are in place to regulate the disposal of both biocidal products after their use phase and of their packaging, which means that certain product residues and their packaging need to be declared and disposed of properly.

#### 1.1.6 'Biocides – Proposal for a concerted European approach towards a sustainable use', December 2014

Following the research projects undertaken over the past few years by the German Federal Environment Agency (UBA), the UBA issued a position paper in December 2014, entitled 'Biocides – Proposal for a concerted European approach towards a sustainable use' (Umveltbundesamt 2014). The position paper sets out the conclusions that the UBA has drawn from the previous research projects as well as the overall discussion of the sustainable use of biocides, for consideration by the European Commission when preparing its report to the European Parliament and the Council under Article 18 of the BPR.

The proposal calls for a number of regulatory actions on the sustainable use of biocides, namely inclusion of biocides in Directive 2009/128/EC on the sustainable use of pesticides (European Parliament and the Council 2009a) or alternatively the creation of a separate legal framework for

the sustainable use of biocides, and the inclusion of biocides in Regulation (EC) 1185/2009 concerning statistics on pesticides (European Parliament and the Council 2009b). In addition, the proposal suggests that amendment of the Drinking Water Directive (Directive 98/83/EC) (The European Council 1998) to include biocides within the definition of "pesticide" and inclusion of biocides under the Sewage Sludge Directive (86/278/EEC) (The European Council 1986), could also promote the sustainable use of biocides. In addition, the proposal calls for additional measures on an EU-wide environmental monitoring programmes, the consideration of non-chemical alternatives to biocides, and changes to the regulation of biocides in treated articles that do not have a primary biocidal function.

With regard to best practice and use of alternatives, the position paper states that users of biocidal products should be provided with advice in order to help them make the most effective use of biocidal products, to use the minimum necessary, and where the use of a biocide is necessary, to use the biocidal product in a sustainable way. For non-industrial applications, advice could be provided through product types specific Codes of Practice, which are legally binding, and compliance with which is covered in training and further education. For industrial applications, such advice could be provided through the development of BREFs. Obligatory training and certification schemes for professional users and distributors of biocidal products should be established, and general information provided to non-professional users. On requirements for sales, the position paper states that the point of sale should be used to provide information and advice to users in order to minimise misuse and unnecessary application and therefore self-service and internet sales of certain products should be prohibited. Other goals are identified also in relation to the use of equipment for the application of biocides, prohibition or restriction of certain modes of application and a reduction of the use of biocides in sensitive areas, data collection, environmental monitoring and surveillance.

Finally, the position paper identifies a number of possible actions that could be taken at the national level in Germany whilst measures at the European level are further discussed. These cover both regulatory measures, including for example the introduction of national legislation on Codes of Best Practice, mandatory training on the use of certain biocidal products, requirements for sales, an independent advisory service, environmental monitoring, and equipment requirements, as well as non-regulatory measures.

#### 1.1.7 Analysis of Measures Geared to the Sustainable Use of Biocides, ongoing

Over the past year, Milieu Ltd and Hydrotox have completed an *"Analysis of measures geared to the sustainable use of biocidal products"* for the European Commission. The overall objective of the study was to provide the European Commission with information on how the application of the BPR contributes to the sustainable use of biocides, to feed into the Commission's report to the European Parliament and the Council, which is to be provided in autumn 2015 under Article 18 of the BPR. This shall include information on the need to introduce additional measures, in particular for professional users, to reduce the risks posed to human and animal health and the environment by biocidal products.

The various tasks cover each of the specific elements that are to be included in the report to the European Parliament and the Council under Article 18(a) to (e) of the BPR:

- Provide an overview of the promotion of best practices as a means of reducing the use of biocidal products to a minimum – Article 18(a);
- Identify whether need for additional provisions regulating professional users;
- Investigate and make recommendations for the most effective approaches for monitoring the use of biocidal products – Article 18(b);
- Specify the risks posed by the use of biocidal products in specific areas and whether additional measures are required to address those risks – Article 18(d); and

- Examine the relevance of integrated pest management principles for biocidal products and the role that improved performance of the equipment used for applying biocidal products could play in sustainable use – Article 18(c) and (e).

The study also provides an analysis of the tools that could be used to stimulate innovation and the development of new products to decrease the environmental and human health impact of biocidal products, based on the following tasks:

- Investigate the possibility to attribute an eco-label to biocidal products;
- Provide an overview of voluntary schemes that are used to highlight those products and uses that have a better environmental and human health profile, and suggest other approaches or tools; and
- Analyse whether it is appropriate to revise Article 72 of the BPR on advertising.

As part of the study, questionnaires were sent to Member State officials, industry associations and NGOs during the first half of 2014. Based on the responses received from stakeholders and further analysis, the report draws together the information on the various aspects set out in Article 18 of the BPR and makes recommendations as to further measures to be adopted.

On monitoring, the report concludes that as a first step, Member States should request that data on the annual amounts of biocidal products placed on the market are made available by authorisation holders, as provided for under Article 68(1) BPR. Thereafter, the Commission should investigate with ECHA the possibility of extending the R4BP in order that it serves as an EU-wide tool for the collection of data. An appropriate mechanism such as making the reporting of data a condition of certification where mandatory training and certification is introduced, is required in order to impose a reporting requirement on professional users. Mechanisms to collect information on use by the general public should also be considered once further products for general use are authorised.

With regard to whether there is a need for additional measures to reduce the risks of biocidal products and to address the risks of biocidal products in specific areas, the report concludes that the risks are already appropriately addressed through use restrictions set in the conditions of approval of the active substance or authorisation of the biocidal product and any remaining exposure risk arises as a result of poor application of existing available control measures.

The key measures to reduce the risks from the use of biocidal products concern the provision of training and certification. Whilst it is not considered appropriate to simply extend the scope of the Sustainable Use Directive to biocidal products, its provisions on training and certification are of particular importance to the sustainable use of biocidal products. As it is evident that varying levels of training and certification are already provided to those involved in the application of biocidal products, the report recommends that training should be harmonised at EU level, by introducing a requirement for all professional users and distributors of biocidal products to have access to appropriate training and have established certification systems and setting out the areas that this should cover for biocidal products. A phased approach to the introduction of training requirements for all professional users should be adopted according to product type.

The report also recommends that the principles of integrated pest management ('IPM') should be adapted to specific biocidal product types as part of the development of best practices for that product type and thereafter incorporated within a training scheme and certification for biocidal products. Further steps could also be taken to encourage the dissemination of best practice by making compliance with guidance/ best practice documentation a condition of authorisation, including reference to the relevant guidance/ best practice documents on the label and instructions for use of the product, or including adherence to guidance/ best practice documentation within best available techniques reference documents ('BREFs') and/or voluntary standards. Where there is a

need to develop further guidance/ best practice for individual product types, the Commission should look to establish specific working groups for the industry sectors concerned, or support industry initiatives on this and should also support initiatives taken at Member State level to develop strategies on the sustainable use of biocides which incorporate best practices.

With regard to information and awareness-raising, the report recommends a number of measures to ensure that information is reaching the end-user, including that the Commission considers establishing a website, which acts as a database of all available guidance and other information on the sustainable use of biocidal products, that further awareness raising campaigns are carried out at EU and national levels and that a variety of means including information websites, quick response codes, mobile phone applications and in-store leaflets are used to inform the general consumer.

On tools to stimulate innovation and the development of new products, the report concludes that biocidal products are not suitable for an eco-label, as eco-label criteria should only be considered for alternatives to biocides. Schemes other than an eco-label that highlight the environmental and public health profile of biocidal products were also considered not to be suitable for biocidal products. Finally, with regard to the advertising restrictions set out in Article 72 BPR, the report proposes that the BPR could be amended to include an exemption to the advertising restrictions for those products authorised under the simplified authorisation procedure.

The final report was submitted to the European Commission in April 2015, and the European Commission is currently preparing its report to the European Parliament and the Council.

### 1.1.8 Overview of existing solutions and tools for sustainable use of biocides discussed in Europe

The section 1.1 summarises a series of reports and activities at European level aiming to identify measures for sustainable use of biocides. As a general observation the diversity in terms of hazard and use conditions among the product types covered by the BPR requires an individual assessment of what is 'sustainable use'. Sustainable use is a broad concept considering economic, social effects as well as possible impacts in terms of risks to human health and the environment. It is very likely that these factors will change from one product type to another. Nevertheless, a number of common solutions and tools are observed that could be used as instruments in efforts towards sustainable use of biocides in general. These general measures include:

- Training of professionals using biocidal products
- Awareness raising among non-professional users (i.e. the general public)
- Development of guidelines on Best Practice (product types specific)
- Transposition of integrated pest management (IPM) principles to the biocides area
- Certification of professional users
- Improvement, standardisation and certification of equipment
- Economic instruments such as fees and taxes
- Monitoring of sales and environmental exposure levels

More specific solutions and tools are directed at specific product types and are related to the use conditions for individual biocidal products and thus aim at reducing the risks to humans and the environment by use of:

- Restriction of sale, e.g. sale only to certified users
- Improved design of application equipment (e.g. enforced via certification)
- Prohibition of use in certain (sensitive) areas/ situations.
- Limit values for release of biocides from materials
- Labelling of materials releasing biocides

## 1.2 Summary of the survey on existing tools and initiatives in Denmark

The Danish EPA has taken initiative to form a panel of experts and stakeholders within the biocide area - the Biocides Panel. The panel includes industry representatives, e.g. importers, formulators, and downstream users as well as NGOs and governmental stakeholders in the field of biocides. The panel has been in place since 2013 and has the aim to discuss the biocidal products regulation, how it affects the Danish stakeholders as well as future initiatives from the Danish EPA. Permanent members of the biocidal panel are presented on the website: http://mst.dk/service/om-miljoestyrelsen/opgaver,-maal-og-resultater/raad-naevn-og-udvalg/biocidpanelet/. The following information and views have been collected from members of the biocides panel and the Danish EPA. Additional information has been gathered from stakeholders present at the information meetings on BPR held in 2013 by the Danish EPA and from the two published surveys on biocidal products in Denmark (Danish EPA, 2001 and 2012a).

### 1.2.1 Existing Danish initiatives on sustainable use and user profiles

Support of sustainable use of biocidal products is described only within a few Danish use sectors of biocidal products. Sustainable use is often not the main objective of industry initiatives, but is a part of the overall plan to reduce the use of the most hazardous products.

#### 1.2.1.1 Main Group 1: Disinfectants

The group of disinfectants of PT 1 (Human hygiene) consists of liquid skin disinfectant products and antibacterial soaps. Professionals in the healthcare sector use the products. Within recent years, there has been an increase in the demand of disinfectants from the consumers due to outbreaks like the bird flu and swine flu. The Danish “Council for improved hygiene” (Danish: Rådet for Bedre Hygiejne) was formed in 2008 and has successfully raised the general awareness on hygienic issues in Denmark. The group of disinfectants and algaecides of PT 2 (Disinfectants and algaecides not intended for direct application to humans or animals) covers a large group of products for surface disinfection used by professionals.

TABLE 1-3 MAIN GROUP 1: DISINFECTANTS: BIOCIDE PRODUCTS, USE AREAS AND FREQUENTLY USED ACTIVE SUBSTANCES

| Type of biocidal product | Use area | Professional user | Frequent active substances in products |
|---|---|---|---|
| Liquid skin disinfectant<br>Antibacterial soap<br>PT 1 | Public and private hospitals<br>Private medical clinics<br>Private dental clinics<br>Nursing homes<br>Day care institutions<br>Food processing industry<br>Food handling areas<br>Research labs.<br>Pharmaceutical industries | Nurse<br>Medical doctor<br>Other healthcare workers<br>Dentist<br>Dentist assistant<br>Worker at day care institutions<br>Cleaning personnel<br>Worker in food industry<br>Canteen worker<br>Worker in restaurants, cafés etc. | Ethanol,<br>Propan-2-ol,<br>Chlorhexidine-digluconate,<br>Triclosan,<br>Didecyldimethyl-ammonium chloride(DDAC) |
| Surface disinfection<br>Liquid surface disinfectant<br>Concentrate<br>Ready to use product<br>Disinfecting wipes<br>Disinfection of swimming pool water<br>Pet hygiene products<br>Algaecides<br>PT 2, 3, 4 | Public and private hospitals<br>Private medical clinics<br>Private dental clinics<br>Nursing homes<br>Day care institutions<br>Veterinary area<br>Skin and hair of pet animals<br>Food processing industry<br>Food handling areas<br>Consumer use | Nurse<br>Medical doctor<br>Other healthcare workers<br>Dentist<br>Dentist assistant<br>Worker at day care institutions<br>Veterinary doctor<br>Veterinary assistant<br>Cleaning personnel<br>Worker in food industry<br>Canteen worker<br>Worker in restaurants, cafés, etc. | Alkyl (C12-16) dimethylbenzyl ammonium chloride (ADBAC/BKC),<br>Sodium hypochlorite,<br>Didecyldimethylammonium chloride(DDAC),<br>Ethanol,<br>Peracetic acid<br>Hydrogenperoxide,<br>Glutaraldehyde,<br>Iodine,<br>L-(+)-lactic acid;<br>N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine (Diamine)<br>Nonanoic acid |
| Disinfection of drinking water<br>PT 5 | Waterworks | Waterwork operater | Sodium hypochlorite |

**Sustainable use of disinfectants promoted by the National Center for Infection Control**

The National Center for Infection Control (CEI) has an advisory function to the Danish Health care system including hospitals, primary health care and authorities. CEI makes national guidelines for infection control and prevention in collaboration with Danish infection control experts and partners. CEI also offers voluntary assessment of commercial disinfection products intended for the Danish health care sector. The assessment includes efficacy and toxicology, and an opinion is published on the CEI website. Although CEI has no mandate to authorise disinfection products on

the Danish market, a positive opinion of CEI is key for new products, and hospitals are likely to reject products that have not passed the evaluation by CEI.

In 2013, CEI published a note of consensus on how to use disinfection products in the Danish healthcare sector in the most rational manner (Statens Seruminstitut 2014).

TABLE 1-4 NATIONAL CENTER FOR INFECTION CONTROL, NOTE OF CONSENSUS

| Note of consensus |
|---|
| • Choose disinfection by heat when possible<br>• Only use chemical disinfection, when necessary and cleaning is not sufficient<br>• Only use disinfection products that comply with Danish and European law<br>• Primarily use disinfection products with documented efficacy tests (EN standards)<br>• Choose method of disinfection and disinfection product in cooperation with infection hygiene professionals<br>• Choose chemical disinfection product with least possible negative impact on worker health<br>• Choose chemical disinfection product with least possible negative impact on the environment<br>• Limit the use of certain biocidal active substances that are known to select for antimicrobial resistance |

Many of the bullets align with the Danish EPA's definition of sustainable use of biocidal products. In the future, more disinfection products will be approved at EU level and the position of CEI might be challenged. The Danish EPA could consider if the charter on sustainable use of disinfectant products in the Danish healthcare sector could provide a basis for certification of professionals and be a model for integrating of sustainable use of biocides also outside the healthcare sector.

#### 1.2.1.2 Main Group 2: Preservatives

The group of preservatives consists of wood preservative products, in-can preservatives and other preservatives of film, fibres, construction material, cooling water and metal working fluids. Most professional users are in contact with articles that have been treated with these preservatives.

TABLE 1-5 MAIN GROUP 2: PRESERVATIVES: BIOCIDE PRODUCTS, USE AREAS AND FREQUENTLY USED ACTIVE SUBSTANCES

| Type of biocidal product | Use area | Professional user | Frequent active substances in products |
|---|---|---|---|
| In-can<br>Used to treat mostly water based manufactured goods<br>PT 6 | Indoor and outdoor water based paints for masonry and wood, water based inks, water based and non-water based adhesives, acrylic sealants, water containing cleaning material | Painter<br>Cleaning personnel<br>Construction worker | CMIT,<br>IPBC,<br>BIT,<br>MIT,<br>CMIT/MIT,<br>Bronopol,<br>Formaldehyde,<br>Propan-2-ol |
| Film preservatives for preservation of coatings and films by preventing | Paints, plastics, sealants, wall adhesives, binders, | Painter<br>Construction worker | IPBC,<br>Propiconazol,<br>Terbutryn, |

| Type of biocidal product | Use area | Professional user | Frequent active substances in products |
|---|---|---|---|
| microbial growth at treated surface<br>PT 7 | papers, art works- especially against fungi | | OIT,<br>BIT,<br>Bronopol |
| Wood preservatives<br>PT 8 | Vacuum preservation of doors and windows<br>Pressure preservation of exterior wood | Painter<br>Construction worker<br>Masonry | IPBC,<br>Propiconazol,<br>Tebuconazol,<br>Permethrin,<br>Cypermethrin,<br>Disodium octaborate tetrahydrate,<br>Basic Copper carbonate |
| Preservatives used to treat fibre, leather, rubber and polymerized materials<br>PT 9 | Outdoor: Tents, sunblinds, parasols, sails, waterproof clothing<br>For wearing against odour: T-shirts, socks, sports clothing, etc.<br>Tanning of leather<br>Liquid latex raw material,<br>Finished rubber products,<br>Insulation material of fibre material like paper, cellulose and wool. | Clothing producers<br>Outdoor textile producers<br>Tanners<br>Construction worker | Reaction mass of titanium dioxide and silver chloride;<br>IPBC;<br>DCOIT;<br>BIT |
| Construction material preservation, against algae and microbes<br>PT 10 | Outdoor masonry<br>Outdoor construction material- except wood | Construction workers | Alkyl (C12-16) dimethylbenzyl ammonium chloride (ADBAC/BKC (C12-16)),<br>Didecyldimethylammonium chloride(DDAC)<br>BIT,<br>OIT, |
| Liquid cooling systems<br>PT 11 | Cooling, heating or processing systems,<br>Power plants,<br>Food processing,<br>Pharmaceutical industry, | Industrial workers | BIT,<br>MIT,<br>OIT,<br>Sodium hypochlorite,<br>Didecyldimethyla |

| Type of biocidal product | Use area | Professional user | Frequent active substances in products |
|---|---|---|---|
| | District heating systems | | mmonium chloride(DDAC) , Alkyl (C12-16) dimethylbenzyl ammonium chloride (ADBAC/BKC (C12-16)), CMIT/MIT |
| Slimicides PT12 | Paper production | Worker in paper mill | ADBAC, DDAC Sodium hypochlorite, MIT, CMIT/MIT |
| Working or cutting fluids PT13 | Closed or semi-open systems | Industrial worker Metal worker Glass worker | IPBC MIT, CMIT, OIT, Pyridine-2-thiol 1-oxide, sodium salt (Sodium pyrithione) |

**Sustainable use of wood preservatives, constructive wood protection**

The concept of "constructive wood protection" describes possible physical measures to keep the wood in buildings exposed as little as possible to climatic and biological influences. A good design can reduce need for wood preservatives by shielding the wood as much as possible against degradation from the sun and soaking. Constructive wood protection ensures that the wood is kept dry to avoid attach from fungi and insects and takes into account the wood shrinkage and expansion by moisture variations, to minimise cracks and ensure tight joints.

The concept is supported by The Danish Wood Initiative[1] (Danish: Træ Er Miljø) and by Træinformation (formerly: Træbranchens Oplysningsråd)[2] and it aligns with sustainable use by making the conditions for microbial growth as difficult as possible and by reducing the need for biocidal wood preservatives.

#### 1.2.1.3 Main Group 3 and 4: Pest control and antifouling

The group of pest control products is dominated by rodenticides, insecticides and repellents. Only an authorised professional is allowed to control rats in Denmark. In order to become authorised, a person has to pass the authorisation course in rat control organised by the Nature Agency. The aim of the course is to demonstrate that the attendee possesses the necessary knowledge of rats and rat control. Only persons that can prove at least 6 months of employment at a municipal technical

[1] Association of Danish Woodworking and Furniture Industries, Danish Environmental Protection Agency, Danish Nature Agency, Danish Forest Association, Danish Sawmilling Industries Organisation, Danish Timber Trade Federation, Danish Timber Information, Wood, Industry and Building Workers Union in Denmark and the Danish Timber & Building Merchants' Trade Organisation

[2] Organisation that represents more than 900 member companies and organisations within the timber trade and construction sectors.

administration, in the sewerage or wastewater industry; or at least 3 months professional experience of mouse and/or rat control are allowed to participate in the authorisation course. The training of professionals for rat control is supporting sustainable use ensuring correct use of the applied method and rodenticide product. There is a specific focus on rodenticides because observations of anti-coagulants in predators indicate that the substances resides in the food chain. Moreover, development of resistance of the target organisms to anti-coagulants is a well-known problem.

**TABLE 1-6 MAIN GROUP 3 AND 4 PEST CONTROL AND ANTIFOULING: BIOCIDE PRODUCTS, USE AREAS AND FREQUENTLY USED ACTIVE SUBSTANCES**

| Type of biocidal product | Use area | Professional user | Preferred active substances in products |
|---|---|---|---|
| Rodenticides<br>PT 14 | Public buildings<br>Farm facilities<br>Animal housing<br>Industry facilities<br>Private homes | Trained professional user for control of rats | Bromadiolone, Difenacoum, Coumatetralyl, Flocoumafen, Alphachloralose, Aluminium phosphide releasing phosphine, Carbon dioxide |
| Insecticides<br>PT 18 | Stables<br>Private homes<br>Kitchens<br>Restaurants | Pest controller | Permethrin, PBO, Pyrethrin I+II, Deltamethrin, Imidacloprid, Esbiothrin, Spinosad |
| Repellents<br>PT 19 | Textiles, carpets<br>Human skin<br>Animal skin | Farm worker | Icaridin, Mixture of cis- and trans-p-menthane-3,8 diol (Citriodiol), Esbiothrin, |
| Antifouling<br>PT 21 | Vessels <25 m<br>Vessels >25 m<br>Aquaculture equipment | Shipyard worker<br>Fishermen | Dicopper oxide, Copper pyrithione, Tolylfluanid, Zineb, Zinc pyrithione, Cybutryne, DCOIT, Copper thiocyanate |

### 1.2.2 Previous and existing R&D projects with elements of sustainable use

The Danish EPA is supporting various research and development projects that support either research of more sustainable pest control methods or development of more sustainable biocidal products.

The research projects are managed by Danish universities or Danish research organisations with the aim to secure a solid scientific foundation for administration of legislation and action plans in the biocidal area. The projects are funded by the Danish EPA's Pesticide Research Programme - http://mst.dk/virksomhed-myndighed/bekaempelsesmidler/tilskudsordninger/stoette-til-forskning-i-bekaempelsesmidler/ansoegningsrunde-2015 - and cover a range of product types.

The development projects are driven by innovative companies in partnership with technological service institutes or universities with the aim to mature innovative products with a green and sustainable profile for the commercial market. The projects are funded by the Danish Eco-Innovation programme (MUDP - http://ecoinnovation.dk/mudp-indsats-og-resultater/finansiering-og-tilskud/information-om-mudp/). Danish SMEs with innovative ideas for new and more sustainable biocidal products or solutions are found in the latter pool of projects. The projects cover a wide range of product types.

TABLE 1-7 R&D PROJECTS WITH ELEMENTS OF SUSTAINABLE USE

| Title of project | Content of project/ Industry partner | Source of funding | PT |
|---|---|---|---|
| Insecticide residues in private homes | Test methods for assessing the persistency of the active ingredient, when biocides are used for control of insects such as bedbugs, cockroaches etc. in Danish private housing. | Chemicals initiatives 2014-17 (Danish Government) | 18 |
| Transport and photo transformation of biocides in building material | Description of parameters influencing the release and emission | Pesticide Research Program | 7, 10 |
| Biocides- risk factors and resistance | Modelling of risk factors in relation to the use of disinfection products containing biocidal active substances | Pesticide Research Programme | 2,4 |
| Routes of exposure and toxicity of pyrethroids bound to particles in freshwater | | Pesticide Research Programme | 18, 19 |
| Dispersion of anticoagulant rodenticides and modelling of risk of exposure for predators | | Pesticide Research Programme | 14 |
| Development of less hazardous impregnation products for textiles, Green-Tex, Skandinavisk Textil ApS, F. Engel, Hummel international A/S | | MUDP | 9 |
| Development of test standard for disinfection wipes | Protocol for optimization of active substance content and choice of wipe cloth material related to efficacy; WetWipe A/S | MUDP | 2, 3, 4 |
| Verification of disinfection technology | Verification of function and efficacy of photolysis oxidation disinfection with the FLO-D module; Jimco A/S | MUDP | 2, 4 |
| Projects within development of sustainable wood preservation methods and products, Kallesøe A/S, DTI and others | | MUDP | 8 |
| Projects within development of sustainable antifouling paints, EnPro ApS, DHI and others | | MUDP | 21 |

SME biocides producers co-fund their development activities through MUDP, which also includes cooperation with larger companies and technological service institutes. Thus, the list of applicants to the MUDP programme include Danish enterprises within the biocides area that are interested in development and innovation within the area.

### 1.2.3 Possible future initiatives in Denmark on sustainable use of biocidal products

Through the Biocides Panel and other Danish stakeholders in the biocides area, the Danish EPA has collected ideas for solutions and tools that can promote sustainable use of biocides in Denmark. The ideas are summarised in the following table.

TABLE 1-8 POSSIBLE ININTIATIVES BASED ON RECOMMENDATIONS FROM THE BIOCIDE PANEL AND OTHER DANISH STAKEHOLDERS

| Stage | Possible initiatives to support sustainable use of biocidal products in Denmark | Comments |
|---|---|---|
| **Production phase** | | |
| | Shift production to less harmful biocidal products | Substitution of biocidal active substance with biocidal actives with more favourable hazard profile and equal or better efficacy. This also includes feasibility and socio-economic analysis. |
| | Reduce the need for treatment with biocidal products at use site by optimizing design of treated surface or product | Antifouling paint with physical properties against fouling organisms leading to a decrease of the use of biocidal products. It should antifouling be mentioned that R&D projects have been carried out with the aim to reduce the use of biocides in antifouling paint, e.g. (Danish EPA, 2012b).<br><br>Optimised construction of window facades that need minimum of protection<br><br>Development of material for isolation that is free from preservatives<br><br>Optimize design of sewage systems in order to decrease dissemination of rats |
| | Introduce the principle of IPM (Integrated pest management) | Consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimise risks to human health and the environment (FAO).<br>IPM includes:<br>• Increased measures to prevent the manifestation of pest organisms e.g. by not attracting rodents to the site of food production.<br>• Increased use of physical solutions like traps.<br>• Increased monitoring of pest organisms in order to facilitate the most accurate treatment and management.<br>• Increased use of alternative pest control |
| | Reduce the use of preservation with biocides by changing or optimizing production methods | Development of sustainable ways of manufacturing goods like paints, fibres, polymerized materials and construction material with the minimum need for preservation with biocides |
| | Best practice documents for | Development of best practice documents for the |

| Stage | Possible initiatives to support sustainable use of biocidal products in Denmark | Comments |
|---|---|---|
| | producers and professional users | production phase of certain biocidal products and for the use phase of the professional user. |
| | Securing use of best practice documents | Voluntary agreements with industry stakeholders and stakeholder organisations |
| **Placing on the market** | | |
| | Information to user about alternative products and the harmful effect of existing products | Reducing the consumption of biocidal products and shift consumption to less harmful products. Information disseminated through targeted campaigns at place of sale or distribution |
| | Focus the users attention to the information on the label | Highlight which kind of information is available on the label and how it can be used in order to support sustainable use. Awareness campaigns at the place of sale or distribution. |
| | Best practice documents on resistance | Information and practice focused on how to handle or minimise resistance or cross resistance related to the use of biocidal products. This is especially relevant for PT 14 Rodenticides and PT1-5 Disinfection |
| | Training and education of sales personnel | Strengthen the sales personnel on guiding and giving advice to customers on choice of most sustainable biocidal product |
| | List biocidal products based on sustainable criterion | Danish EPA would list all biocidal products on the market in Denmark based on the hazardous properties of the product and rank the products on a sustainability index. |
| | Industry charge | Structure national industry charge on the production and sale of biocidal products based on the level of negative impact.<br>Increase national fee for certain product types like wood preservatives (PT 8) and impregnated wood (treated article). |
| | Register sale and use | Implement a register for the sale of biocidal products at individual private user level. Introduce a quota system for each user in order to restrict the individual sale and use of biocidal products. |
| | Specific information on alternative options to reduce pests | Address both professional and private users providing information on non-biocidal (e.g. physical) methods to control or destroy unwanted organisms. |
| **Use phase** | | |
| | Authorisation and education of professionals | Extend the use of authorisation /certification schemes to other areas of biocides use than the existing authorisation scheme of professional rat control and fumigation of silos and against moles |

| Stage | Possible initiatives to support sustainable use of biocidal products in Denmark | Comments |
|---|---|---|
| | Certification of equipment | Certification of equipment designed to release or facilitate the release of biocidal products in order to secure that the equipment is regularly controlled for its correct use in order to minimise spillage or over-dosing of biocidal products. |
| | Authorisation and education of private users | Develop short courses for the private user covering correct use and disposal. Certification of private users may reduce the use of biocidal products, promote alternative solutions or create an incentive for professional assistance. |
| | Limit the use of biocidal products to professional users | For certain biocidal products, private use would be prohibited. |
| | Specific limitations targeted to protect sensitive groups within the population | Restrict the professional and private use of biocidal products in order to protect vulnerable groups like pregnant women or children. |

### 1.3 Workshop on sustainable use of biocides 28 January 2015

A stakeholder workshop took place in Copenhagen on 28 January 2015 at the Danish EPA. The participants included SME producers and suppliers of biocides within Disinfectants and Preservatives (Main group 1 and 2). It was the aim of the meeting to present and discuss issues, solutions and tools with relevance for sustainable use of biocides.

The most important observations from the workshop included:

- Sustainable use of biocides calls for a global view: the efficacy of the treatment, benefits of using biocides (e.g. shelf life/ service life), alternatives as well as possible risks to humans and the environment should be considered. In addition, sustainability should be seen in a life cycle perspective and consider possible related implications like consumption of resources and materials.

- A reduced use of biocides is not a goal per se. In some cases, increased use may be beneficial because microbial growth and infections can be avoided. Use of biocides needs to be balanced against hygienic and other requirements.

- Hygienic design and technical alternatives can reduce the need for biocides significantly. Design of products, production systems and constructions as well as selection of materials should be seen as an integrated element in sustainable use of biocides.

- The end users have an interest in solutions that are effective but require less biocides. Retail companies, hospitals and the health care sector, the food sector and construction companies are therefore important players in development of technical solutions.

- Cooperation among industry across sectors with the aim to increase knowledge sharing was identified as a way to stimulate innovation. The authorities would play an important role by supporting such initiatives and Technological Service Institutes could facilitate the cooperation.

- The cost of data, fees and the complex regulation was confirmed to be a barrier for the SME in the development of new and more sustainable biocidal products. It was discussed that cooperation among SMEs and sharing of the burden could reduce this barrier.

# 2. Priority setting of biocidal product types

The overview of possible solutions and tools for sustainable use of biocides presented in Chapter 1 provides the basis for selection of actions for a Danish strategy that aims to promote sustainable use through initiatives at national as well as EU level. This includes product type specific measures that are focussed on product types that are likely to contain active substances with a significant hazard profile. For this purpose, a priority setting of biocide product types was made. The priority setting is used in the discussion of the solutions and tools in Chapter 3 and further in the development of element to a strategy in Chapter 4.

## 2.1 Priority setting

The priority setting is based on data from the ECHA database on Biocidal Active Substances (ECHA 2015c). The following criteria are used to set priorities:

1. Active Substances fulfilling the exclusion criteria according to Article 5 of the BPR, i.e. substances that are classified as CMR (Cat 1A or 1B), substances that are considered as having endocrine disrupting effect, or according to REACH considered as having such properties. In addition substances that meet the criteria for being PBT or vPvB according to REACH Annex XIII.
2. Active substances that meet the conditions specified in Article 10(1) (a), (b) or (d) for being candidates for substitution.

The information on combinations of active substance/product type in the ECHA database on Biocidal Active Substances (ECHA 2015c) includes those for which an application for approval has been submitted under Directive 98/8/EC or Regulation (EU) No 528/2012, including "existing" active substances included in the Review Programme and "new" active substances. The active substances falling under the criteria mentioned above were identified and allocated to the product types they are notified or approved in (Appendix 2).

Based on this information, the number of active substances with such properties was for each product type compared to the total number of active substance in the database for that product type. The percentage of active substances meeting the criteria 1 or 2 above, compared to the total number of active substances approved or under review for that product type, was calculated and used to prioritise the product types.

By selecting product types with a high fraction of active substances that meet the exclusion criteria or are identified as candidates for substitution, the focus is placed on product types where the risk to humans or the environment is potentially high. A high risk reduction potential requires in addition, that suitable alternative active substances or techniques are available.

A subsequent higher tier assessment of priorities for actions on sustainable use of biocides should include a broader range of product types and active substances. The approach suggested in the

European Commission Note for Guidance (European Commission 2015) on comparative assessment of biocidal products could provide a methodological input to this.

**TABLE 2-1 PRIORITY RANKING OF PRODUCT TYPES (PT) BASED ON THE HAZARD PROPERTIES OF THE ACTIVE SUBSTANCES (AS). SEE ANNEX 2 FOR MORE DETAILS**

| PT No. | No. of AS meeting exclusion criteria or criteria for candidates for substitution | Total No. of AS in PT | % | Priority |
|---|---|---|---|---|
| 1 | 4 | 34 | 10 | |
| 2 | 13 | 84 | 15 | x |
| 3 | 5 | 52 | 10 | |
| 4 | 6 | 58 | 10 | |
| 5 | 3 | 22 | 14 | |
| 6 | 5 | 52 | 10 | |
| 7 | 6 | 32 | 13 | |
| 8 | 13 | 44 | 30 | x |
| 9 | 4 | 42 | 10 | |
| 10 | 4 | 31 | 13 | |
| 11 | 5 | 50 | 10 | |
| 12 | 3 | 39 | 8 | |
| 13 | 3 | 30 | 10 | |
| 14 | 9 | 15 | 60 | x |
| 15 | 0 | 1 | 0 | |
| 16 | 0 | 0 | 0 | |
| 17 | 0 | 1 | 0 | |
| 18 | 15 | 62 | 24 | x |
| 19 | 2 | 15 | 13 | |
| 20 | 0 | 1 | 0 | |
| 21 | 2 | 12 | 17 | x |
| 22 | 1 | 8 | 13 | |

Based on this simple ranking and a pragmatic cut off at 15 % of active substance within a product type that falls under the criteria of points 1 or 2 above, the following product types were identified as having a priority:

- PT 2: Disinfectants and algaecides
- PT 8: Wood preservatives
- PT 14: Rodenticides
- PT 18: Insecticides
- PT 21: Antifouling products

The data indicates that within these product types a relatively high fraction of active substance meets the exclusion criteria or the above mentioned criteria for being candidates for substitution. A quantification of the actual risk reduction potential within the individual product types requires, however, a more detailed evaluation, including whether the active substance with a lower hazard within each prioritised product types and available non-chemical alternatives are suitable alternatives. This would entail a higher tier evaluation, as referred to above, which is outside the scope of the current report.

# 3. Discussion of identified solutions and tools

Chapter 3 summarises the identified possible solutions for sustainable use of biocides in Chapter 1 and discusses the relevance in the context of a Danish strategy considering the possibilities of minimising use of biocides, e.g. by use of technical alternatives, and reducing the risk to humans and the environment. The expected efficacy of the solutions is discussed as well as the role Danish industry could play in the further development. The product types that are prioritised in Chapter 2 are discussed separately with the aim to identify relevant and specific measures at product type level.

## 3.1 General observations

Sustainable use of biocides aims to reduce the overall risk of effects to humans and the environment considering the technical, economic, social and health/environmental implications of the use. The general objective is that biocides should only be used where deemed necessary. The benefits to human health and the environment of a sustainable solution should, however, be balanced against the technical and functional needs for controlling microbial growth, pests etc. as well as cost implications for the producer, the end user and the society as such. It is important to note that sustainability goes beyond 'safe use', which is normally the goal in a risk assessment/ risk management situation, and aims to reduce the impact as far as possible under the given technical and economic conditions.

Consequently, the sustainability of a solution within biocide use should be seen in a life cycle perspective, meaning that the whole supply chain and life cycle of the item, product or service where a biocide is used, need to be considered. In order to be sustainable, a reduced use of a biocide should not, for example, lead to risk of infections in a hospital and increased use of antibiotics, and the sustainability of an antifouling paint based on self-polishing properties should balance the lower environmental toxicity against the efficacy of the antifouling properties and possible increased fuel consumption and $CO_2$ emissions.

The main groups of solutions identified in Chapter 1 are discussed in terms of relevance in a Danish strategy containing general recommendations as well as more specific recommendations for the prioritised product types presented in Chapter 2. In this evaluation of the solutions the possible challenges and interests of SMEs are considered, the expected efficacy of introducing sustainable use judged, and the cost implication is addressed at a preliminary level. Moreover, possible strongholds of Danish industry in terms of expertise and innovation are considered.

It should also be noted that available guidance from ECHA addresses how the possible risks to humans and the environment should be assessed, and also contain approaches that can be used for evaluating the sustainability of use of biocides. The Technical Guidance note on comparative assessment of biocidal products (European Commission 2015), suggests a tiered approach for comparing a biocidal product with other biocidal products, including non-chemicals or technical methods with regard to risks they pose and benefits from their use. Moreover under REACH guidance is available for assessment of alternatives, which is a technical analysis and risk

assessment of identified available alternative chemicals and technical solutions. The analysis is a mandatory part of an application for authorisation for a substance on the Authorisation List (REACH, Annex XIV) (ECHA 2011).

## 3.2 Technical solutions

Technical solutions can be an alternative to biocides, or a way to reduce the need for biocides or introduce less harmful biocides. The technical solutions received attention at the workshop with Danish stakeholders, and was seen as an area where Danish SME could contribute. The discussion was concentrated on the biocide main groups: Disinfectants and Preservatives. Two of the five product types that are prioritised in Chapter 2 belong to these groups: PT 2: Disinfectants and algaecides not intended for direct application to humans or animals; and PT 8: Wood preservatives.

The stakeholder workshop identified cross fertilisation of ideas and solutions between industry sectors as a way to stimulate innovation. For example, the expertise on hygienic design within the food sector that was presented at the workshop, could be used to generate solutions in other sectors where microbial infection or growth in production systems is a challenge, e.g. in the healthcare sector and in the paint industry.

The Danish Centre for Hygienic Design at the Danish Technological University has established a testing facility for certification of the hygienic properties of production equipment for the food sector according to the standards of the European Hygienic Engineering and Design Group (EHEDG). The certification is voluntary, but demonstrates that the design of equipment is important to meet hygienic requirements, and that a certification system is a measure to implement hygienic standards in industry.

It seems there is a potential for using the thinking behind hygienic design in the development of sustainable solutions for disinfectants (PT 2) in general.

Within the area of wood preservation (PT 8), the stakeholder workshop discussed design of construction and choice of material, e.g. wood with a higher resistance to micro-organisms, and technical solutions where humid conditions are avoided would be measures that could reduce the need of wood preservatives. It should be noted that at European level a review of a BREF note of wood preservation has been initiated covering wood preservation plants with a capacity exceeding 75 $m^3$ per day (European Commission 2015b).

The solutions that are relevant in terms of effectively reducing the use and exposure to biocides are listed below.

### 3.2.1 Relevant technical solutions and tools supporting sustainable use

- Physical control methods for control of rodents like traps equipped with advanced sensor technology are available on the market. The techniques may in some cases replace use of rodenticides. Development of physical control methods is suitable for pests organisms of a certain size, e.g. mammals, insects or acarides.

- Sterile water and wipes that are made of composite fibres have shown promising results when applied in the healthcare sector. This could be further improved in combination with hygienic design of equipment. Barriers for implementation of such solutions as technical alternatives to PT 2 disinfectants are poorer efficacy and smaller bandwidth of its application.

- The recent advances in hygienic design of equipment and processes in food production may be relevant also for use areas of disinfectants (PT 2). The principles could be used

across sectors to improve hygiene in production facilities and the efficacy of the applied biocides with the net result that less biocides are needed. Improved hygienic design may not only reduce the need for biocides but also reduce maintenance, down time of process equipment and water and energy used for cleaning. Hospitals and the healthcare sector, paint production and other industrial production where microbial contamination is likely to occur could benefit from this knowledge. A barrier for introducing hygienic design is the high costs of replacing machinery and production equipment.

- Sustainable use of PT 8 wood preservatives was a discussion item at the stakeholder workshop. Design solutions that provide a better protection of wood construction against rain and weathering can reduce the need of wood preservatives. Heat-treatment and active substances with a low toxicity such as sodium silicates were proposed as possible sustainable solutions, which can substitute traditional wood preservatives in some areas. It was also indicated that a careful selection of building materials with a higher resistance to microbial growth and sealants/ fillers that allow diffusion of humidity from condensation, probably could reduce the need for wood preservatives. It was indicated that materials and techniques used earlier were better solutions from a sustainability point of view, but were phased out in the industrialisation of the construction sector.

- Packaging systems can be used to avoid unintended over-dosing of biocides by consumers and non-trained professionals. This includes design of packaging/ containers with dosing systems that release only the required amount of biocides per use. This would be useful for many private consumer scenarios within disinfectants and insecticides.

- The recent discussions in the Danish biocides panel are generally in line with the observations from the stakeholder workshop. Examples are:
    - Antifouling paint with improved physical properties (self-polishing) that reduces adherence of organisms to submerged surfaces and ships. (PT 21: Antifouling products is prioritised in Chapter 2).
    - Design and selection of materials for windows and facades requiring a minimum of biocide protection of wood constructions. (PT 8: Wood preservatives are prioritised in Chapter 2).
    - Development of sustainable goods like paints, fibres, polymerised materials and construction materials that need less preservation with biocides.
    - Selection of insulation materials that are more sustainable seen in a life cycle perspective.
    - Design of sewage systems reducing inhabitation by rats. (PT 14 Rodenticides are prioritised in Chapter 2).

- The stakeholder workshop identified lack of resources as a barrier for innovation at SMEs. Cooperation and use of the Simplified Authorisation Procedure were proposed as possible ways forward, and financial support to development of alternatives seen as essential for SMEs that generally have very limited available resources for innovation.

- ECHA has published a practical guide on Consortia under the BPR as well as a Guidance on data sharing under REACH (ECHA 2012, 2015b). These contain recommendations regarding establishment and operating consortia and sharing data as well as the burden of preparing applications for authorisation.

The further development of technical solution mentioned above could be supported through establishment of collaborative structures across sectors aiming to develop and share innovative solutions on sustainable use of biocides. Such partnerships should include SME within the biocides

area as well as end users. Technological Service Institutes would be able to drive and facilitate the cooperation.

## 3.3 Guidance, training and communication

Incorrect use of biocides, either too high or too low application rate or frequency, may cause increased risk of effects to humans and the environment or that the biocide does not have the intended effect. In order to ensure adequate and efficient biocide use without unnecessary exposure, best practice needs to be described and guidance developed. Best Practise documents and guidelines have been developed for some product types and areas of application by European industry associations, such as CEFIC's guidance and suggestion to risk mitigation on rodenticides, CEPE's guidance on 'Personal Health Protection during Application of Antifouling Paint' or AISE's 'Tips for Sustainable Use of Biocides by Professionals'. Such codes of best practise and guidelines are together with training seen as important measures within all biocidal product types for the implementation of sustainable use of biocides. In addition ECHA has published Transitional Guidance documents on Evaluation of Environmental RMM for Disinfectants PT 1-5 (ECHA 2015). The guidance includes advice on use of generic as well as specific technical measures that can be used to reduce the risk of environmental effect from use of biocidal products.

It is important, however, that guidance and training is in national language, product types specific and targeted and readily available to the different user groups. The various user groups have different backgrounds and ability to understand technical guidance, and need to be instructed in different ways. Trained professionals are likely to understand and use technical instructions, whereas non-trained professionals may not be able to understand such instructions. Instead, dedicated and easy understandable instructions is needed. Instructions to the consumer need to be communicated on a broader scale, e.g. awareness campaigns (Danish 'Think' campaign), instruction on leaflets in the package, use of Quick Response codes (QR codes) linking to further information on web pages, or given by the retailer upon purchase.

In Denmark, only professional pest control of rodents requires certification. In other areas, professionals like painters or farmers are trained in using biocides via their education, while so-called non-trained professionals, e.g. cleaners, receive very little training.

Principles of Integrated Pest Management (IPM) were developed for the pesticide area and describe principles for sustainable use of pesticides (European Parliament and the Council 2009a). It has been suggested to apply the IPM principles in the biocides area, and the European Commission has considered the possibility of including biocides in the Sustainable Use Directive. However, currently no initiatives are planned.

In Denmark, the National Centre for Infection Control has developed an IPM-like approach on the use of disinfectants in Danish hospitals. It is, however, questionable whether IPM is suitable for all product types since the options for reducing or replacing biocides use by alternative solutions are much wider within biocides than for plant protection products. IPM could, however, be relevant for pest control products, including PT 14: Rodenticides, and PT 18: Insecticides.

The relevant solutions in terms of reducing the exposure and possible impact from biocides are summarised below.

#### 3.3.1.1 Relevant guidance, training and communication solutions supporting sustainable use

- Best Practice reference documents for specific product types and their application can integrate solutions for sustainable use of biocides and provide basis for training schemes for professionals. Ideally codes of best practices should be developed at EU level, e.g. by

industry associations, and used as basis for guidance at national level targeting the different user groups.

- Training schemes on biocide use for professionals are important measures for implementing sustainable use in the market. Training schemes should refer to available best practices and be integrated in the curriculum of education of professionals and offered as supplemental training.

- Instructions to the consumers need to be communicated on a broader scale, e.g. as awareness campaigns (Danish 'Think' campaign), instructions and QR codes on leaflets in the package or given by the retailer upon purchase.

- The IPM approach would be relevant for specific product types, e.g. PT 14: Rodenticides, and PT 18: Insecticides, and integrated in best practice documents and guidance.

## 3.4 Standardisation and certification

Standardisation and certification of equipment are mentioned as measures for reducing exposure and possible risks to humans and the environment by ensuring better handling and use of biocides. A Danish scheme for certification of professionals within control of rodents is in place. In France, certification schemes are under consideration for disinfectants (veterinary area, food production), wood preservatives and insecticides. It has been noted that certification of personnel can be costly for the SMEs and could be seen as a barrier for entering a market.

At the stakeholder workshop, the Danish Technological University (DTU food) presented how certification of process equipment according to the standards European Hygienic Engineering and Design Group (EHEDG) is used to ensure high hygienic standards in the food sector. The institute is certified by the Danish certification body DANAK for testing of hygienic properties of equipment (EN 1672-2 and EN ISO 14159 on hygiene requirement). There seems to be a potential for cross sector learning of the benefits of such certification.

The relevant solutions in terms of reducing the exposure and possible impact from biocides are summarised below.

### 3.4.1 Relevant standardisation and certification solutions supporting sustainable use

The observed solutions and tools include:

- Broadening of the certification of professionals to other product types than PT 14: Rodenticides, where suitable. Certification of personnel, however, is regarded as a possible barrier for SMEs.
- Certification schemes for equipment and processes within other than the food sector. This could be relevant in the healthcare sector (PT 2: Disinfectants) and industrial wood preservation (PT 8).
- Restriction of certain modes of application, e.g. to avoid risk by private use of insecticides in spray cans as observed in a report from the Danish EPA (2015).
- Restriction of sale of insecticides to consumers by limiting retail sale to certified companies with personnel trained to provide instructions on sustainable use.

## 3.5 Economic barriers and instruments

Economic instruments as fees and charges can be used to push the market towards less hazardous biocidal products and in lower volumes and to stimulate a development towards more sustainable use of biocides.

The stakeholder workshop confirmed cost as a barrier for many SMEs to develop and market new and less harmful biocidal products, e.g. in the disinfectants area. It was also debated if Danish SMEs within the disinfectants area (PT 2) have a common interest in including more active substance on the Annex I of the BPR, thereby improving the possibilities for SMEs to develop and market sustainable biocide products via the Simplified Authorisation Procedure. A revision of the future structure for industry charge and annual fee could include incentives for industry to develop more sustainable products. It has also been recommended to the European Commission that the BPR could be amended to include an exemption to the advertising restrictions for those products authorised under the simplified authorisation procedure.

The relevant solutions in terms of reducing the exposure and possible impact from biocides are summarised below.

### 3.5.1 Relevant economic instruments as a solution supporting sustainable use

- Adjustment of the Danish charge and fee regulation on biocides to include incentives for industry to stimulate development of more sustainable biocidal products. This could be targeted at active substances meeting the exclusion criteria and candidates for substitution across the product types.

## 3.6 Monitoring of sales and use

A better knowledge on sales and use of biocidal products is important for the authorities to prioritise initiatives for sustainable use of biocides. Currently, information on uses and expected sales volumes is reported only at the product authorisation stage without obligatory updating. Article 68 of the BPR contains a provision for the authorisation holder to keep information records of the biocidal product they place on the market. The Commission is currently investigating how the provision can be extended to include yearly updates, and whether the ECHA database R4BP could be developed to receive these data.

Environmental monitoring could contribute with data to support and prioritise initiatives for sustainable use of biocides. Monitoring is, however, expensive and interpretation often difficult. Environmental monitoring of biocide active substances is therefore not suitable on a broad scale but could be relevant as a supplementing measure to other RMM for specific substances of concern. The implementation would be through the existing national legal provisions on environmental monitoring. For example, environmental monitoring of TBT substances was applied in antifouling paint used to provide evidence for the substances persistency and effects and contributed to the establishment of a global phase out scheme. It should be noted that the substances that are relevant for environmental monitoring are those that already fall under the substitution criteria and where a comparative assessment is required, e.g. having persistent, bioaccumulative and toxic properties.

The relevant solutions for providing data on use of biocides are summarised below.

### 3.6.1 Relevant monitoring solution supporting sustainable use

- A legal initiative is needed that makes it mandatory for authorisation holders to report the volumes and types of biocides sold on a yearly basis.
- Environmental monitoring of specifically selected active substances of concern.

## 3.7 Potential solutions and tools for prioritised Product Types

In the following section, the solutions addressed above are discussed in terms of relevance for the prioritised product types considering also the perspective of SMEs and possible Danish strongholds in terms of knowledge and innovation potential in the biocides area.

### 3.7.1 PT 2: Disinfectants

PT 2 Disinfectants include a wide range of biocidal products applied for disinfection of surfaces, materials, and furniture in the private and public domain. The relevant solutions are summarised below.

**Technical solutions**

- The experiences and solutions that have been obtained within hygienic design in the food sector could inspire development of innovative solutions in other sectors, e.g. the health care sector and in non-food process industry. A way forward could be to establish collaborative structures across industry sectors that apply disinfectants and aiming at developing shared innovative solutions on sustainable use of biocides.
- Design of packaging systems that releases only the required amount of biocides per use is a possible technical measure to avoid over-dosing of biocides by consumers and non-trained professionals.

**Guidance training and communication**

- Development of codes of best practises for PT 2, ideally by relevant European industry associations, which can be integrated in more specific guidance at national level. For example has the Danish National Centre for Infection Control developed an IPM-like charter on the use of disinfectants in Danish hospitals. It should be considered to use the charter as a basis for implementing sustainable use of disinfectant in the Danish healthcare sector. It should be noted that ECHA has published a guidance specifically on PT2 that focuses on RMM for environmental release (ECHA 2014). The RMM is intended for use during the authorisation of biocidal products as well as the evaluation of active substances, especially if an environmental risk is identified.
- Training schemes on sustainable use of PT 2 Disinfectants in various areas. The schemes could be included in existing curricula and training courses.
- Raise awareness among consumers on sustainable use of biocides via awareness campaigns, and by direct instruction on leaflets in the package or given by the retailer upon purchase.

**Standardisation and certification**

- Development of a certification system for professional users of biocides in the health care and food sector.
- Certification of equipment and processes within other sectors than the food sector, e.g. in the health care sector.

**Economic barriers**

- The structure of fees and charges could include incentives for SMEs to develop less hazardous biocides and encourage to include more active substance on the Annex I of the BPR
- In order to overcome the economic barriers of developing and introducing new products on the market, Danish SMEs could explore the possibilities of the Simplified Authorisation Procedure and of preparing applications for new substances on the Annex I jointly.

**Relevance for Danish enterprises**

The potential for Danish enterprises to develop technical solutions that can contribute to sustainable use of biocides within PT 2 seems high. There are a relatively high number of Danish

SMEs within production and distribution of PT 2 biocides, and innovative environments could be stimulated through the establishment of partnerships between industry and relevant knowledge centres, e.g. Technological Services Institutes.

Specific guidance, instructions and training schemes on use of disinfectants are relevant measures for sustainable use of biocides in industry. Specific guidelines, instructions and awareness campaigns are needed for the non-trained professionals and consumers.

Certification of personnel and equipment could be a relevant measure, e.g. in food industry, hospitals and in the health care sector where high hygiene standards are necessary. Certification is, however, resource demanding and could be seen by SMEs as a barrier for entering and maintaining a market position.

**Efficacy in providing sustainable solutions**

The efficacy of hygienic design as a measure for sustainable use of PT 2 biocides is likely to be high and an area where industry could benefit from exchange of learning across sectors. The potential of hygienic design was seen as important at the stakeholder workshop but needs to be further qualified through discussions with the biocide suppliers and the relevant end user sectors.

In general, guidance, instructions and training are likely to be efficient measures for sustainable use of biocides, e.g. correct dosing, minimisation of spillage etc.

Certification of personnel and equipment could be a relevant instrument in areas where the requirements for hygienic control are high.

**Preliminary cost considerations**

The SMEs that produce and supply PT 2 disinfectants probably does not on their own have the resources to investigate possible solutions in hygienic design and carry out development of sustainable solutions. Innovation within the area could be stimulated through establishment of partnerships.

Guidance, instructions and training can be efficient measures and less costly compared to technical alternatives, which may require investments, and certification schemes requiring education, documentation and auditing. Certification is seen by SMEs as relatively costly and should be dedicated to areas where it can be balanced against the consequences of not having an efficient disinfection, e.g. risk of infections in health care environments.

Reducing the economic barriers for introducing new biocidal products on the market, e.g. by lowering the fees and charges for less hazardous biocides, was at the stakeholder workshop identified by industry as of high importance. It should be noted that cooperation between industries can also be a way to reduce costs.

### 3.7.2 PT 8: Wood preservatives

Relevant solutions and tools for PT 8: Wood preservatives, were discussed at the stakeholder workshop and the relevant technical and other measures for sustainable use discussed in section 4.2 – 4.6 are summarised here.

**Technical solutions**

Improved design of constructions (constructive wood design) can reduce the exposure of e.g. windows and doors to rain and weather and reduce the need for wood preservatives. Furthermore, selection of materials with a high natural resistance to microbial growth and technical solutions that allow gas exchange have been identified as possible solutions that reduces the need for wood preservatives. Finally, new preservation techniques using heat is under development providing an alternative to biocide-based solutions in some use areas.

**Guidance training and communication**
European standards are available on wood and wood based products, including EN 351 on preservative treated wood (European Standard 2007). In the Nordic countries, the standard EN351 is implemented through the Wood Preservation Classes according to the Nordic Wood Preservation Council (2013). The standards include technical requirements for the wood and wood preservatives, the treatment process, machining and marking of treated wood product. At European level a review of a BREF note of wood preservation, specifying the Best Available Techniques in the sector, has been initiated covering wood preservation plants with a capacity exceeding 75 $m^3$ per day (European Commission 2015b) . It should be considered if there is a need to develop easily understandable guidance for professionals on this basis. Training schemes that focus on sustainable use could also be integrated in curriculum for education of professionals. Consumers need to be targeted by campaigns, instruction on the package and by the retailer.

**Standardisation and certification**
A certification scheme for professional users of wood preservatives is under consideration in France, and is a possible way to introduce sustainable use by professionals. Certification schemes for equipment could be a relevant solution at industrial installations for preservation of wood.

**Relevance for Danish enterprises**
Denmark has a long tradition for R&D within wood preservation with independent knowledge centres for testing of new technical alternatives and solutions. The sector is dominated by international companies, which are also the main players within R&D. Nevertheless, the necessary knowledge seems to be available at Danish technological centres and could provide a basis for innovation, e.g. within design of constructions and new preservation technologies.

**Efficacy in providing sustainable solutions**
The efficacy of the suggested technical alternatives are probably significant. Design solutions as a way to minimise the need for wood preservatives is an area where Danish enterprises may play a role. New techniques (e.g. heat treatment of wood and less hazardous active substances) sounds promising and could be solutions at least in some areas of application.

Certification schemes for industrial scale use of wood preservatives could probably reduce exposure and environmental release of wood preservatives.

**Preliminary cost considerations**
Design solutions, selection of more resistant materials as well as techniques that prevent wood constructions from being exposed to humidity are probably cost efficient solutions seen in a life cycle perspective.

Development of guidance, instructions and training schemes on sustainable use of wood preservatives is relatively low cost measures and easy to implement. Certification is by nature more resource requiring due to training, implementation and auditing schemes, and likely to be unpopular among SMEs.

### 3.7.3 PT 14: Rodenticides
The identified relevant solutions and tools for PT 14 Rodenticides, include:

**Technical solutions**
Some technical alternatives for rodenticides including physical traps and sensor technology are available on the market. Also packaging solutions, e.g. single dose pre-packed bait, could be used to enable correct dosing by non-trained professionals and consumers. Specifically for control of rats, improved design of sewage systems can reduce inhabitation.

**Guidance training and communication**
Codes of best practise integrating IPM principles and guidance for professionals have been identified as measures to introduce sustainable use of rodenticides. In a recent review, the current knowledge and experiences with rodenticides have been summarised in a report to the European Commission (Berny et al 2014). The report discusses the concerns with the currently used biocidal products in terms of development of resistance and secondary poisoning of predators and also reflects the current experiences on non-chemical methods such as traps. Finally, it includes a number of recommendations and RMM to be applied for active substance approval.
A guidance on control of rats is available from the Danish Nature Agency - (Naturstyrelsen 2015) - and training schemes are integrated in the certification schemes in place. More careful instruction of non-trained professionals and consumers on the use of rodenticides would probably promote sustainable use among these user groups. It should be noted that the Nature Agency has issued a leaflet on non-biocidal control of rodents (Naturstyrelsen 2012).-

**Standardisation and certification**
Control of rats is professionalised and a certification system is in place in Denmark, and in the review report to the European Commission (Berny et al 2014) one of the main recommendations is that rodenticides should if possible only be used by trained professionals. The BPR requires a comparative assessment of biocidal products and thus intends to phase out active substances that have been identified as candidates for substitution. This provision is highly relevant for rodenticides as it targets active substances used in rodenticides that have been observed in predators and thus may persist or accumulate in the food chain.

**Relevance for Danish enterprises**
Development of technical alternatives to rodenticides is in focus due to an increasing number of rats in urban environments. Observations of secondary poisoning of predators underline the need for technical alternatives. Danish SMEs could potentially play a role in further developments of such solutions.

**Efficacy in providing sustainable solutions**
The technical alternatives to rodenticides are important because of the reduced efficacy of rodenticides due to anticoagulant resistance and concern about secondary poisoning of predators. Packaging solutions and increased awareness among non-trained professionals and consumers could support use of technical alternatives and lead to more careful application of rodenticides.

**Preliminary cost considerations**
Use of the available technical alternatives to rodenticides is probably more labour intensive and costly, but since the pest is an increasing problem the technical solutions offer important alternatives to biocidal products.

### 3.7.4 PT 18: Insecticides
The relevant solutions and tools for PT 18: Insecticides, include:

**Technical solutions**
Packaging systems can enable correct dosing by non-trained professionals and consumers. This includes design of containers with dosing systems that release only the required amount of biocides per use. Moreover, alternatives to spray can application of insecticides can effectively reduce the identified risk to professional and private users exposed to micro-sized aerosols.

**Guidance training and communication**
As mentioned in section 4.3 integration and communication of IPM principles in guidance to professionals as well as in instruction to the consumers would be highly relevant. This would

include consideration on how to minimise formation of resistance and possible bioaccumulation in the target organisms.

**Standardisation and certification**
Certification of professional users is a possible relevant measure. The French authorities are considering a certification for professional use of insecticides. Relevant measures for consumers could be a restriction of sale to certified retailers, which are trained to provide instructions on sustainable use. Finally, there is a need to restrict insecticides from being applied by spray cans due to an identified risk by inhalation.

**Relevance for Danish enterprises**
The market for insecticides is dominated by international companies, and Danish enterprises have only limited possibilities for developing alternative sustainable solutions.

**Efficacy in providing sustainable solutions**
Packaging systems enabling correct dosing and restriction on use of insecticides in spray cans will effectively reduce the exposure and risk of effects during use of insecticides by professionals and consumers. Moreover, guidance for professional users based on IPM principles, restriction of sales and better instructions to private user are likely to lead to more careful use of insecticides.

**Preliminary cost considerations**
The mentioned technical solutions are relatively low cost measures and the responsibility of the manufacturers. The same applies for guidance and better instructions to consumers. Restriction of sales and certification of retailers will probably cause an increase of the prices of insecticide products for consumer use.

### 3.7.5 PT 21: Antifouling products
Relevant solutions and tools for PT 21: Antifouling products, include:

**Technical solutions**
Research on technical alternatives to biocidal antifouling have been ongoing for many years, e.g. coatings with self-polishing properties, encapsulated active substances ensuring a slower release and active substance with a low environmental hazard. Nevertheless, the currently used paints are based on a combination of self-polishing properties and slow release of active substance, which most often have a high environmental toxicity and persistency.

**Guidance training and communication**
Dedicated guidance on use of antifouling paint and instructions to the private user are available from the manufacturers. Although the focus on these are on the application process, the main part of the environmental release is intended and takes place during service life.

**Standardisation and certification**
The maximum release of active substance from antifouling coatings is regulated by the product authorisation. Moreover, the BPR requires a comparative assessment of antifouling products with the aim to phase out active substances that have been identified as candidates for substitution, and alternatives with a lower overall risk and with sufficient efficiency are available. In Finland, the use of antifouling is prohibited in freshwater environments, and in Germany the use is restricted in certain freshwater bodies.

**Relevance for Danish enterprises**
The market is dominated by large international companies, who are also the main actors in R&D, including a Danish. Development of alternatives within antifouling requires resources and

specialised chemical and technical knowledge. In order to play a role in innovation SMEs probably need to cooperate with one of the main players on the market.

**Efficacy in providing sustainable solutions**
Development of sustainable solutions within efficient antifouling properties will probably include a combination of more environmentally friendly active substances, technical/ chemical solutions controlling the release rate and physical measures for preventing of growth, e.g. self-polishing surfaces.

**Preliminary cost considerations**
Development of alternatives to existing antifouling coatings is highly resource requiring. Better guidance to the users is a low cost measure (and the responsibility of the manufacturer).

### 3.7.6 General solutions covering a broader range of PTs

In addition to the product type specific measures discussed above, some of solutions have a broader relevance for sustainable use of biocides in general. This includes development of codes of best practice, guidance to professionals, information to the general public, economic instruments and monitoring.

Although guidance needs to be in national language and dedicated to individual user groups the development of codes of best practice and guidelines should preferably be at an European level and lead by European industry association, who has the necessary technical knowledge and communication network. Better information to professional and private users on sustainable use of biocides is likely to be a cost effective measure for obtaining more sustainable use.

Charges and fees have been mentioned as effective instruments to move suppliers in the direction of more sustainable solutions, e.g. by creating incentives for development of more sustainable products. The regulation is partly at national and partly at European level.

Mandatory yearly reporting of the sales of biocides by the producers would provide a good basis for priority setting of initiatives for sustainable use of biocides. In specific cases, environmental monitoring of specific active substances could be relevant in order to assess the environmental risk and efficiency of RMM. The necessary legal provisions could be established at national level.

# 4. Strategy development

The proposal for elements to a national strategy on sustainable use of biocides are at two levels: Proposals for initiatives at a national Danish level, and proposals for initiatives at an EU level. The initiatives at national level focus on support to development of innovative solutions within the prioritised product types, but cover also softer measures as guidance and training where relevant.

Some of the relevant solutions are best suited for action at EU level. This includes a coordinated effort by European industry associations in developing codes of best practice that can act as back bone in development of more specific guidance at national level.

The overall aim of the strategy is that biocides are only be used where deemed necessary and if possible replaced with technical alternatives. Hazardous biocides should be substituted with less harmful alternatives, and where no alternatives exist, the use should be according to best practise.

## 4.1 Initiatives at a Danish national level

### 4.1.1 PT 2: Disinfectants

It is proposed to explore the possibilities for developing technical alternatives to biocides by hygienic design. Based on the experiences from the food sector innovative sustainable solutions could be developed for other sectors with high hygienic requirements, e.g. hospitals, the health care sector and process industry, which depend on biocides to control microbial growth.

Packaging solutions that prevent unintended over-dosing of biocides by consumers and non-trained professionals, i.e. containers with dosing systems that release only the required amount of biocides per use.

Danish National Centre for Infection Control has developed a charter on the use of disinfectants in Danish hospitals. It should be considered to use this as a basis for implementing sustainable use of disinfectant in the healthcare and other sectors. Guidance on sustainable use of disinfectants should be included curricula and training courses for professionals. Consumers should be targeted through awareness campaigns on sustainable use of biocides and instructions for use on leaflets in the package or given by the retailer upon purchase.

Certification systems for professional use of disinfectants in the health care and food sector could be considered as well as certification of equipment and processes.

It is suggested that innovative environments are established through partnerships between industry, end-users and technological service centres. The initiator could be industry facilitated by Technological Service Institutions.

### 4.1.2 PT 8: Wood preservatives

There should be a stronger focus on design solutions in constructions that reduces the exposure of wood constructions and thus the need for wood preservatives. Technical solutions also include consideration of the choice of materials and solutions, e.g. sealants/ fillers, that ensure a sufficient gas exchange and a sufficient long service life of wood constructions in buildings. Furthermore,

promising new treatment techniques without use of chemicals or based on less harmful active substances indicate that the technological developments can provide sustainable alternatives to existing wood preservatives in the future. Further research and product development by Danish stakeholders within this area should be supported, e.g. by recommending allocation of research funds to relevant projects.

At European level a review of a BREF note of wood preservation (European Commission 2015b), specifying the Best Available Techniques in the sector, has been initiated covering wood preservation plants with a capacity exceeding 75 $m^3$ per day. It should be considered if this BREF note can provide basis for development of national guidance. In addition to this BREF note, it should be considered if a certification scheme would be a suitable measure to ensure adherence to best practise in industrial scale wood preservation.

### 4.1.3 PT 14: Rodenticides

It is recommended to support further development of technical solutions, physical traps and sensor technology as well as packaging solutions that enable correct dosing of rodenticides by professional and private users. Specifically for control of rats, improved design of sewage systems can reduce inhabitation

The Danish Nature Agency has issued a draft guidance on use of rodenticides as well as a leaflet on non-biocidal control of rodents. It should be considered if further guidance is needed to sufficiently cover the need for instructions of non-trained professionals and private users on sustainable use of biocides.

The BPR includes provisions for comparative assessment biocidal products and phase out of active substances that have been identified as candidates for substitution. This could include active substances that have been found in wild life predators, indicating accumulation in the food chain.

### 4.1.4 PT 18: Insecticides

An important technical risk mitigation measure is development of packaging systems enabling correct dosing of insecticides by non-trained professionals and consumers. Furthermore, it is needed to restrict the use of insecticides in spray cans as it entails a risk to the user due to inhalation of respirable aerosols. . Consumers should be guided through awareness campaigns on sustainable use of biocides and instructions for use on leaflets in the package or given by the retailer upon purchase.

### 4.1.5 PT 21: Antifouling products

The release from antifouling coatings is regulated via the product authorisation under the BPR, which also requires a comparative assessment with the aim to substitute substances with a high hazard with alternatives substances with a lower overall risk.

### 4.1.6 General solutions covering a broader range of PTs

An important general measure is to inform professional and non-professional users about sustainable use of biocides through development of codes of best practice, guidance to professionals, and information to the general public.

It is further recommended to establish monitoring of the sales and use of biocides.

Finally charges and fees have been mentioned as effective instruments in creating incentive for sustainable use of biocides.

## 4.2 Initiatives at EU level

In order to support monitoring of sales and use at national level, it is proposed that the European Commission and ECHA investigate the possibility of extending the R4BP so it can serve as an EU-wide tool for the collection of data on the use of biocidal products and the mechanisms for doing so.

It is proposed to continue the development of best practise documents on sustainable use of biocides by European Industry Associations. These documents are useful as backbone in development of guidance at national level and could also be incorporated within any training schemes or certification requirements for biocidal products, should steps be taken to harmonise this at the EU level in the future. Where there is a need to develop further guidance/best practice for individual product types, the Commission should consider establishing working groups with the relevant industry associations. Furthermore, the Commission should coordinate activities among Member State on development of national guidance incorporate best practices.

It is proposed to support further harmonisation of the RMM used across the Members States in the authorisation of biocidal products. A harmonised approach is available in the Technical Guidance note on Environmental RMM for Disinfectants Product Type 2 (ECHA 2014) and Berny et al. (2014) have in their review report on anticoagulant rodenticides suggested a RMM approach.

# 5. References


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## Appendix 1 - Workshop on sustainable use of biocidal products in Denmark

**List of attendees**

The following list of persons attended the workshop on sustainable use of biocides on January the 28th at the Danish EPA in Copenhagen

| No. | Name of company/ agency/ organisation | Name of participant | Role within sustainable use | Representing product-type |
|---|---|---|---|---|
| 1 | **DEPA** | Sonja Canger | Regulator | All, simplified procedure |
| 2 | **DEPA** | Rikke Gleerup Ovesen | Regulator | All, simplified procedure |
| 3 | **DEPA** | Jørgen Larsen | Regulator | All, simplified procedure |
| 4 | **DHI** | Jens Tørsløv | Consultant | All |
| 5 | **DHI** | Michael Fink | R&D, Consultant | All, simplified procedure |
| 6 | **Århus Universitet** | Kai Bester | R&D | 7, 10 |
| 7 | **Teknologisk Institut** | Morten Klamer | Consultant | 7, 8, 9, 10 |
| 8 | **Sæbefabrikken A/S** | Jens Erik Hansen | SME | 1, 2, 4 |
| 9 | **EVD** | Lars Jørgensen | SME, R&D | 6, 7, 10 |
| 10 | **DTU, IPA, hygienisk design center** | Gun Wirtanen | R&D | 2, 3, 4 |
| 11 | **Boesens fabrikker ApS (Nordcoll)** | Steen Karlsen | SME | 7, 8 |
| 12 | **Beck & Jørgensen A/S** | Peter Dahl | SME, R&D | 7, 8, 10 |
| 13 | **Danish Wood Technology A/S** | Claus Holm | SME | 8 |
| 14 | **Danish Concrete Technology ApS** | Kell Thomas | SME | 8 |
| 15 | **J.N. Jorenku** | Majbritt Olsen | SME | 3, 4 |
| 16 | **Århus Universitet** | Ulla E. Bollmann | R&D | 7, 10 |
| 17 | **Kemex A/S** | Torben Frits Nielsen | SME | 1, 2 |
| 18 | **Danlind A/S** | Bettina Lindholt | SME | 2 |
| 19 | **Rådet for Bedre Hygiejne** | Lars Münter | Organisation | 1, 2, 3, 4, 5 |
| 20 | **Blue and Green** | Cecilia Evaldsson | SME | 2, 7, 10 |

**Workshop Agenda**

| | |
|---|---|
| **10:00** | Welcome and Introduction by the Danish EPA and DHI<br>• Background for the workshop<br>• What is sustainable use of biocides<br>• Expectations to the workshop |
| **10:15** | Presentation of the workshop participants (tour de table)<br>• Name, background, role and interests |
| **10:30** | Session 1: Views from research and development centers<br>• Introduction DHI<br>• Morten Klamer, DTI: Sustainable use of Biocides in Denmark in Paints and Wood Preservatives<br>• Kai Bester, AU: Biocide Leaching from Building Material<br>• Gun Linnea Wirtanen, DTU: Activities at the Centre for Hygienic Design |
| **12:00** | Lunch |
| **13:00** | Session 2: Views from industry on sustainable use of biocides<br>• DHI: Introduction<br>• Lars Jørgensen, EVD: Sustainable use of biocides in the construction sector<br>• DHI: Authorisation by use by the simplified procedure |
| **14:15** | Session 3: Initiatives on sustainable use of biocides, innovative solutions and biocides development<br>Discussion of possible solutions including:<br>• Development of innovative technical solutions and more sustainable products<br>• Best practice, guidance etc.<br>• Integrated Pest Management<br>• Standardisation and certification<br>• Economic instruments<br>• Marketing and barriers, including Article 72 of the BPR |
| **15:30 – 16.00** | Wrap up |

## Appendix 2 - List of combination of active substances meeting either the exclusion criteria or selected substitution criteria.

Active substances that meet the criteria below were identified and allocated to product types based on the information in the ECHA database on Biocidal Active Substances (ECHA 2015c).

1. Active Substances fulfilling the exclusion criteria according to Article 5 of the BPR, i.e. substances that are classified as CMR (Cat 1A or 1B), substances that are considered as having endocrine disrupting effect, or according to REACH considered as having such properties. In addition substances that meet the criteria for being PBT or vPvB according to REACH Annex XIII.
2. Active substance that meet the conditions specified in Article 10(1) (a), (b) or (d) for being a candidate for substitution.

| Product Type | Active Substances | EC No. | CAS No. | Exclusion criteria met (CMR PBT, vPvB, ED) | Selected substitution criteria met (respiratory sens, two of PBT) |
|---|---|---|---|---|---|
| **7, 10** | *3-(4-isopropylphenyl)-1,1-dimethylurea / Isoproturon* | *251-835-4* | *34123-59-6* | Yes | No |
| **18** | Abamectin | 265-610-3 | 71751-41-2 | No | Yes |
| **2,7,9** | Dimethyloctadecyl[3-(trimethoxysilyl) propyl]ammonium chloride | 248-595-8 | 27668-52-6 | No | Yes |
| **2,4,8,10** | Poly(oxy-1,2-ethanediyl), .alpha.-[2-(didecylmethylammonio)ethyl]-.omega.- hydroxy-, propanoate (salt) (Bardap 26) | Polymer | 94667-33-1 | No | No (potential substitution) |
| **8** | Bifenthrin | n/a | 82657-04-3 | No | Yes |
| **8** | Boric acid | 233-139-2 | 10043-35-3 | Yes | Yes |
| **8** | Boric Oxide | 215-125-8 | 1303-86-2 | Yes | Yes |
| **14** | Brodifacoum | 259-980-5 | 56073-10-0 | Yes | No (potential substitution) |
| **14** | Bromadiolone | 249-205-9 | 28772-56-7 | Yes | No (potential substitution) |
| **7,9,10** | Carbendazim | 234-232-0 | 10605-21-7 | No | Yes |
| **14** | Chlorophacinone | 223-003-0 | 3691-35-8 | Yes | Yes |
| **2,3** | *Chlorophene* | *204-385-8* | *120-32-1* | Yes | No |
| **8, 18** | E)-1-(2-Chloro-1,3-thiazol-5-ylmethyl)-3- methyl-2-nitroguanidine (Clothianidin) | 433-460-1 | 210880-92-5 | No | Yes |
| **14** | Coumatetralyl | 227-424-0 | 5836-29-3 | Yes | No |
| **8** | Creosote | 232-287-5 | 8001-58-9 | Yes (mixture containing PBT and vPvB substances) | Yes |

| Product Type | Active Substances | EC No. | CAS No. | Exclusion criteria met (CMR PBT, vPvB, ED) | Selected substitution criteria met (respiratory sens, two of PBT) |
|---|---|---|---|---|---|
| **21** | N′-tert-butyl-N-cyclopropyl-6-(methylthio)-1,3,5-triazine-2,4-diamine (Cybutryne) | *248-872-3* | *28159-98-0* | No | Yes |
| **18** | alpha.-cyano-4-fluoro-3-phenoxybenzyl 3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (Cyfluthrin) | 269-855-7 | 68359-37-5 | No | Yes |
| **18** | Cyhalothrin, lambda | 415-130-7 | 91465-08-6 | No | Yes |
| **8** | Cyproconazole | n/a | 94361-06-5 | Yes | Yes |
| **18** | *(RS)-3-Allyl-2-methyl-4-oxocyclopent-2- enyl-(1R,3R;1R,3S)-2,2-dimethyl-3-(2- methylprop-1-enyl)-cyclopropanecarboxylate (mixture of 4 isomers 1R trans, 1R: 1R trans, 1S: 1R cis, 1R: 1R cis, 1S 4:4:1:1) (d-Allethrin)* | *Ppp*[1] | *231937-89-6* | No | No (potential substitution) |
| **1,2,4** | 5-chloro-2-(4-chlorphenoxy)phenol (DCPP) | 429-290-0 | 3380-30-1 | No | No (potential substitution) |
| **14** | Difenacoum | 259-978-4 | 56073-07-5 | Yes | Yes |
| **14** | Difethialone | Ppp[1] | 104653-34-1 | Yes | Yes |
| **8** | Disodium octaborate tetrahydrate | 234-541-0 | 12280-03-4 | Yes | Yes |
| **8** | Disodium tetraborates | 215-540-4 | 1330-43-4, 12179-04-3, 1303-96-4 | Yes | Yes |
| **18** | 1R-trans phenothrin | 247-431-2 [1] | 26046-85-5 | No (potential substitution) | No (potential substitution) |
| **18** | *(1,3,4,5,6,7-hexahydro-1,3-dioxo-2H- isoindol-2-yl)methyl (1R-trans)-2,2- dimethyl-3-(2-methylprop-1-enyl)cyclopropanecarboxylate (d-Tetramethrin)* | *214-619-0* | *1166-46-7* | No | No (potential substitution) |
| **18** | *(RS)-3-Allyl-2-methyl-4-oxocyclopent-2- enyl (1R,3R)-2,2-dimethyl-3-(2-methylprop-1-enyl)-cyclopropanecarboxylate (mixture of 2 isomers 1R trans: 1R/S only 1:3) (Esbiothrin)* | *Ppp*[1] | *260359-57-7* | No | No (potential substitution) |
| **2** | *Ethylene oxide* | *200-849-9* | *75-21-8* | | |
| **8,18** | Etofenprox | 407-980-2 | 80844-07-1 | No | Yes |
| **8** | Fenpropimorph | 266-719-9 | 67564-91-4 | No | Yes |
| **18** | Fipronil | 424-610-5 | 120068-37-3 | No | Yes |

| Product Type | Active Substances | EC No. | CAS No. | Exclusion criteria met (CMR PBT, vPvB, ED) | Selected substitution criteria met (respiratory sens, two of PBT) |
|---|---|---|---|---|---|
| **14** | Flocoumafen | 421-960-0 | 90035-08-8 | Yes | Yes |
| **8** | Flufenoxuron | 417-680-3 | 101463-69-8 | Yes | Yes |
| **2,3,22** | Formaldehyde | 200-001-8 | 50-00-0 | Yes | No |
| **1,2,3,4, 6, 11, 12,13** | Glutaraldehyde | 203-856-5 | 111-30-8 | No | No |
| **18** | *1-(3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenyl)-3-(2,6-difluorobenzoyl) urea (Hexaflumuron)* | 401-400-1 | 86479-06-3 | Yes | Yes |
| **2,6,11, 13** | *.alpha.,.alpha.',.alpha.''-trimethyl-1,3,5- triazine-1,3,5(2H,4H,6H)-triethanol (HPT)* | *246-764-0* | *25254-50-6* | Yes | Yes |
| **18** | Imidacloprid | 428-040-8 | 138261-41-3 | No | Yes |
| **19** | Margosa Extract | 283-644-7 | 84696-25-3 | No | No |
| **6,13** | N,N′-methylenebismorpholine (MBM) | 227-062-3 | 5625-90-1 | Yes | Yes |
| **2,6,11, 12,13** | *3,3′-methylenebis[5-methyloxazolidine] (Oxazolidin/MBO)* | *266-235-8* | *66204-44-2* | Yes | Yes |
| **1,2,3,4, 5,6,9,11** | PHMB | Polymer | 27083-27-8 / 32289-58-0 | No | Yes |
| **8** | N-Didecyl-N-dipolyethoxyammonium borate/Didecylpolyoxethylammonium borate (Polymeric betaine) | | 214710-34-6 | No | Yes |
| **2,4,5,7, 9** | Silver Zinc zeolite | - | 130328-20-0 | Not relevant | Not relevant |
| **2,11,12** | Sodium Bromide | 231-599-9 | 7647-15-6 | No | No |
| **18** | Spinosad | 434-300-1 | 168316-95-8 | No | Yes |
| **7,8,10** | Tebuconazole | 403-640-2 | 107534-96-3 | No | Yes |
| **18** | *Tetramethrin* | *231-711-6* | *7696-12-0* | No | No (potential substitution) |
| **2,3,4,5** | *Tosylchloramide sodium (Tosylchloramide sodium — Chloramin T)* | *204-854-7* | *127-65-1* | No | Yes |
| **1,2,7,9** | Triclosan | 222-182-2 | 3380-34-5 | No | No (potential substitution) |
| **14** | Warfarin | 201-377-6 | 81-81-2 | Yes | Yes |
| **14** | Warfarin sodium | 204-929-4 | 129-06-6 | Yes | Yes |
| | | | | | |
| **18** | Dinotefuran | - | 165252-70-0 | Y | No |

| Product Type | Active Substances | EC No. | CAS No. | Exclusion criteria met (CMR PBT, vPvB, ED) | Selected substitution criteria met (respiratory sens, two of PBT) |
|---|---|---|---|---|---|
| **21** | Medetomidine | | 86347-14-0 | N | No |
| **18,19** | Metofluthrin | | 240494-70-6 | Y | No |

Notes:
[1]PPP = Plant Protection Product

**Survey and strategy for sustainable use of biocides**

The project was initiated by the Danish Environmental Protection Agency (Danish EPA) to provide a survey and strategy on sustainable use of biocides. Sustainable use of biocides entails that biocides should only be used where deemed necessary and if possible replaced by technical alternatives. Sustainable use also includes substituting of hazardous biocides with less harmful alternatives and reducing the use of biocides where feasible.

The report includes an overview of identified solutions and tools for sustainable use of biocides, a discussion of their relevance, and a proposal for a Danish strategy containing initiatives at a national level as well as at EU level. Five product types (disinfectants and algaecides (PT 2), wood preservatives (PT 8), rodenticides (PT 14), insecticides (PT 18) and antifouling products (PT 21)) were prioritized based on the number of active substances falling under the exclusion criteria or considered candidates for of substitution according to BPR compared to the total number of active substances for each product type.

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