GOING BEYOND EMS

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1 Summary

Environmental Management Systems (EMSs) are based on a principle of continuous improvement, and it is possible to become ISO 14001 or EMAS certified without fulfilling any given level of environmental performance beyond legal compliance.

Studies show that there is no clear evidence that producers with an EMS have a "better" environmental performance than producers without an EMS. The European Environmental Bureau (EEB) and the European consumer voice in standardisation (ANEC) also come to this conclusion. They express their concerns and their views on Environmental Management Systems such as ISO 14001 and EMAS in a joint position paper.

A minimum level of environmental performance for the companies that are to obtain an EMS certification should be ensured. Furthermore, key environmental performance indicators, which allows for comparison between different organisations should be developed. In this way it will be more "true" to view the EMS certification as a positive characteristic with regard to the environmental performance of the company.

As part of the normal legislative process, the EMAS Regulation is due to be revised in 2006. The European Commission has contracted out an external evaluation study on the performance of both the EMAS and Eco-label schemes – the so-called EVER study. One of the highlighted options for the EMAS scheme is to transform the EMAS system into a truly and widely recognised "standard of excellence". This should be carried out by defining and using Key Performance Indicators (KPIs), in order to stimulate a higher attention to performance and to enhance benchmarking between competitors.

This will send future EMS in the direction of a system that promotes benchmarking between companies, which is basically the idea with this present study. However, this study would like to go even further and transform EMS into an eco-label for companies and set minimum requirements for the environmental performance.

The key purpose of this study is to influence the future developments of EMS – both at the international level (ISO 14001 and ISO 2600 (CSR)) and within Europe (EMAS).

It has been the intention to suggest requirements that cover the main environmental areas, but the proposed requirements should neither be regarded as complete and nor are the suggested levels more than a reasonable starting point for a debate.

The purpose of this study has therefore been to develop a suggestion for a set of environmental minimum requirements (environmental baseline requirements), which companies that whish to get e.g. an EMS certification could be asked to fulfil. Requirements can be developed for both the companies and their products.

Two sets of requirements have been developed in this study.

1. Generally applicable global requirements (for all industrial sectors)
2. Sector specific requirements for the textile industry.

It has been the intention of this study to use the general requirements at the global level, and use both the general and sector specific requirements *together* in Europe. This does, on the other hand, not exclude a higher minimum level that could be used elsewhere.

The textile industry is used as an example, when developing the sector specific requirements, as the sector is known to be relatively demanding on the environment, as the industry faces intense environmental regulation and as eco-labelling of textile products is relatively widespread in the sector.

It has not been a purpose of this study to invent new requirements, but merely to suggest environmental baseline requirements based on existing guidelines, protocols, conventions etc (such as the World Bank Group guidelines, Global Reporting Initiative, Kyoto and Montreal protocol, OSPAR and Rotterdam convention, eco-labelling of textiles, BREF document on textiles) . In this way the requirements are based on solid material, and there is a sound reason to use them as baseline requirements and to implement them in the existing EMS standards.

In all, 20 requirements have been developed on a general global level, and 33 requirements on a sector level for the textile industry. The requirements are covering the following aspects:

- General principles
- Air emissions
- Liquid effluents
- Waste
- Noise
- Consumption of energy in production
- Consumption of water in production
- Hazardous and harmful substances
- Consumption of water, energy, etc. by products (only on sector level)
- Product quality (only on sector level)

It has been a purpose of this study just to show the principle of a possible approach, as this study has had limited funding, and thereby a limited scope. For this reason, it has been a deliberate choice not to include parameters such as radiation, biodiversity, land use, transport, workers protection, social aspects, etc.

Further elaborations and refinements are therefore necessary, and must be carried out in order to convert the ideas of this study to something that will function in practise. It is therefore suggested that a more comprehensive study should be commissioned to elaborate both on the general requirements suggested in this study, but also on the aspects that has been omitted in this study. In addition, such a comprehensive study should develop a complete proposal for one sector (such as the textile sector). Such a study should, furthermore, look at the performance levels in details and perform an evaluation of how many companies (how large a percentage) that will be able to live up to the requirements with the suggested number of requirements, emission levels, etc. A balanced multi-stakeholder panel should accompany the study in order to gain broad acceptance.

2 Introduction

2.1 Background

Environmental Management Systems (EMSs) are based on a principle of continuous improvement, and it is possible to become e.g. ISO 14001 certified without fulfilling any given level of environmental performance beyond legal compliance. So in principle companies with a nasty environmental performance that have high releases to the environment can be certified according to e.g. ISO 14001, and just make tiny improvements every year in order to fulfil the standard, because it is not necessary to fulfil any minimum requirements or criteria as far as actual environmental performance is concerned. In addition, recognition in the shape of a certificate does not reflect that a certain level of performance has been achieved, but only that appropriate management practices have been put in place in a systematic manner.

The Secretary General from ANEC – the European consumer voice in standardisation – puts it like this: "At the moment, the EMS standards are so weak, almost anyone can apply them and claim to be acting in an environmental friendly way without actually changing much in their business practise". (ANEC, 2003).

According to the PERFORM project on Sustainability Performance Benchmarking (Sorell et al, 2005) there appears to be a positive significant difference in the environmental performance between EMS and non-EMS companies, but only for some sectors and for a minority of indicators. The study therefore concludes that the analysis provides no clear evidence that producers with an EMS have a "better" environmental performance.

Having an EMS certification is, however, seen as a positive characteristic with regard to the company's environmental performance. EMS certifications are for example used as a positive indicator in green procurement in the public sector.

It is therefore relevant to ensure a minimum level of environmental performance for the companies that are to obtain an EMS certification. In this way it will be more "true" to view the EMS certification as a positive characteristic with regard to the environmental performance of the company.

This lack of absolute requirements is the basic premise of e.g. the ISO 14001 EMS standard and will likely become the premise of the up-coming guideline on social responsibility – ISO 26000 series – which will encompass both the ethics/social responsibility part and the environmental part of the concept of sustainability.

Absolute requirements have been proposed within the field of social responsibility, as reflected in a number of recent sets of rules and guidelines e.g. SA 8000. Something similar could be useful in the environmental field, where it would be relevant to have a set of minimum performance

requirements, a set of reporting requirements and a set of adequate benchmarks. The requirements can be set for both product and company performance.

Product performance has been the subject of e.g. eco-label schemes, whereas process or site performance has been treated in e.g. the pan-European – so-called BREFs[1] (BAT Reference Documents), but a comprehensive and interrelated set of requirements, criteria and benchmarks has not been developed.

The European Environmental Bureau (EEB) and the European consumer voice in standardisation (ANEC) express their concerns and their views on Environmental Management Systems such as ISO 14001 and EMAS in a joint position paper. The conclusions of this paper are that there is little evidence to suggest that the adoption of an EMS can be viewed as an environmental performance boost, and that the following measures should be considered to make the instrument more substantive (only some of the examples mentioned are listed):

- EMS standards must contain a clear obligation to comply with legal provisions.
- Continual improvement of environmental performance shall mean a measurable reduction of environmental burdens and resource consumption.
- Key environmental performance indicators, which allows for comparison between different organisations shall be developed.
- Minimum performance levels based on the state-of-the-art shall be defined. (ANEC/EEB, 2003).

As part of the normal legislative process, the EMAS and EU Eco-Label Regulations are due to be revised in 2006. In the framework of the coming revision, the European Commission has contracted out an external evaluation study on the performance of both schemes (Evaluation of EMAS and Eco-label for their Revision – the so-called EVER study). The final report of the study was published in December 2005 (EVER, 2005).

The EVER study proposes options and recommendations for the revision process. One of the highlighted options for the EMAS scheme is to transform the EMAS system into a truly and widely recognised "standard of excellence". This should be carried out by defining and using Key Performance Indicators (KPIs), in order to stimulate a higher attention to performance and to enhance benchmarking between competitors. The KPIs are to be identified and created by different working groups under the European Commission, and should be sector-specific. Companies operating in different sectors would then be asked to measure their performance on the basis of the different KPIs (e.g. global warming, ozone depletion, energy saving etc.) and publish them in the environmental statement. The EVER study suggests to use the BREFs or the EU Ecolabel criteria as the basis for creating the different KPIs. Finally, the EVER study suggest to set a requirement for the EMAS registered organisations of a certain minimum improvement – e.g. to improve a minimum number of KPIs. This will ensure that the organisations must pursue continuous improvements (EVER, 2005).

[1] IPPC Reference Document on Best Available Techniques. European Commission, Integrated Pollution Prevention and Control (IPPC).

This will send future EMS in the direction of a system that promotes benchmarking between companies, which is basically the idea with this present study. However, this study would like to go even further and transform EMS into an eco-label for companies and set minimum requirements for the environmental performance.

2.2 Purpose

The key purpose of this study is to influence future developments of EMS – both at the international level (ISO 14001 and ISO 2600 (CSR)) and within Europe (EMAS). EMAS is due to be revised in 2006, and is in that respect the primary focus for this study.

It has merely been a purpose of this study to show the principle of a possible approach, as this study has had limited funding. Further refinements are therefore necessary, and must be carried out in order to convert the ideas of this study to something that will function in practise.

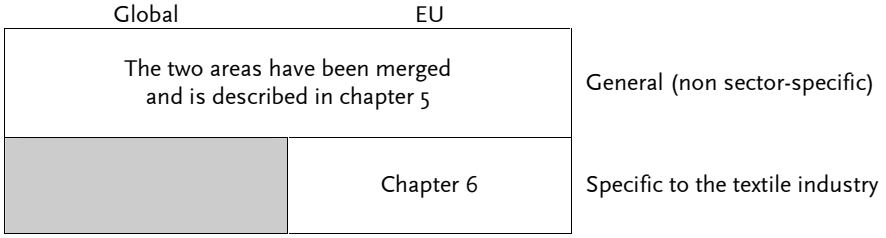
It has been the intention to suggest requirements that cover the main environmental areas, but the proposed requirements should neither be regarded as complete, nor are the suggested levels more than a reasonable starting point for a debate.

The purpose of this study has therefore been to develop a suggestion for a set of environmental minimum requirements – named environmental baseline requirements, which companies that whish to get e.g. an EMS certification could be asked to fulfil. Requirements can be developed for both the companies and their products.

Originally, the plan of this study was to develop such a set of requirements on a global level, a European level, and develop general requirements and specific requirements for the textile industry, as illustrated in the figure below.

The global requirements are related to the international EMS level (ISO 14001) and the European requirements are related to EMS on a European level (EMAS), and the purpose was to develop requirements that can be used in the two different EMS systems.

However, in the process of this study it turned out, that in practise it is not possible, from available information, to derive two different sets of general requirements for a global and European level, as there is no practical difference between the general global requirements and the general European requirements.



For this reason, two sets of requirements have been developed.

1. Generally applicable global requirements (for all industrial sectors)
2. Sector specific requirements for the textile industry.

It has been the intention of this study to use the general requirements at the global level, and use both the general and sector specific requirements *together* in Europe.

With the term generally applicable global requirements is understood the minimum requirements that can be used globally. This does, on the other hand, not exclude a higher minimum level that could be used elsewhere, e.g. in Europe. It would be desirable to have a higher level in Europe, and as this was not possible to make within the frame of this study, it should be investigated further in the future and should be the practical result of a political process aimed at implementing this concept.

The general global requirements must of course be very general, as they must be applicable for all companies in all sectors all over the world. This will in it self set limitations for how many requirements that can be set, and how specific they are. For this reason, a set of sector specific requirements have also been developed. The textile industry is used as an example, as the sector is known to be relatively demanding on the environment, as the industry faces intense environmental regulation and as eco-labelling of textile products are relatively widespread in the sector.

It has not really been a purpose of this study to invent new requirements, but merely to suggest environmental baseline requirements based on existing guidelines, protocols, conventions etc. In this way the requirements are based on solid material, and there is a sound reason to use them as baseline requirements and to implement them in the existing EMS standards.

Another purpose of this study has been to suggest how the companies should report their environmental performance. Suggestions are made for both how to report and how often to report.

In brief, the purpose of this study has been:

- To develop a suggestion for a set of global environmental baseline requirements that would apply to all companies and their products.
- To develop a suggestion for the reporting of such environmental baseline requirements.
- To develop a suggestion for environmental baseline requirements for an industrial sector. The textile industry is used as an example.
- To make recommendations for further work.

2.3 Structure of the report

The report contains eight chapters. Chapter one is a summary. This chapter two "Introduction" is an introduction to the report and describes the background and the purpose of this study.

Chapter three "General principles of the approach" summarises the problems we have met and dealt with in proposing environmental baseline requirements on both a general and on a sector level.

Chapter four is a description of how we have arrived at the environmental baseline requirements. It has not been an easy task to propose general requirements, and in this chapter it is described what has been possible.

The very large chapters five and six contain the proposed environmental baseline requirements. In chapter five "Generally applicable global requirements" the proposed general requirements are listed and discussed.

In chapter six "Textile sector specific requirements" the proposed requirements on a European level specific for the textile industry are listed and discussed.

The proposed requirements in chapter five and six are listed according to the following subjects, i.e. environmental baseline requirements are proposed for each of the following subjects:

- General principles
- Air emissions
- Liquid effluents
- Waste
- Noise
- Consumption of energy in production
- Consumption of water in production
- Hazardous and harmful substances
- Consumption of water, energy, etc. by products (only on sector level)
- Product quality (only on sector level)

Each requirement is described using the following structure:

- Which requirement can be set?
- What is the scope for this particular requirement?
- What is the rationale behind this requirement?
- How should the requirement be verified?
- Should the requirement be reported and, if so, how should it be reported?
- Comments

Chapter seven summarises the conclusions and proposes recommendations for future work.

Chapter eight is a presentation of the references used in this study.

3 General principles of the approach

The main goal of this study has, as mentioned, been to inspire the future revisions of Environmental Management Systems of today. In principle the EMS can be expanded to being an eco-label for companies. It should not replace eco-labelling for products, but be a supplement. On the European level, the organisational framework of such a system could possibly be set up in analogy to the existing Eco-labelling system. This aspect must, however, be addressed more intensively in the future, perhaps in a global NGO forum.

Similar to the Eco-labelling system for products, one could strive for overall performance levels for both the general and sector specific requirements at about 30%, i.e. that the best 30% of the companies should be able to comply with the requirements. An alternative performance level could simply be above average. Anyhow, it is the subject of a political process to determine the exact level of ambition.

This chapter contains some other general remarks and thoughts, which also should be considered in a future political process, when the requirements and framework for the system of the future EMS are determined.

3.1 How strict should the requirements be?

Examples of environmental baseline requirements are listed in the following chapters. For the textile industry numerous examples are given, but it is possible to set even more environmental baseline requirements. However, not all requirements should be used if the goal is to get as many companies to be certified according to an EMS and thereby use the requirements. Some kind of balance must be obtained between setting environmental baseline requirements that will improve the overall environmental performance of both companies and products, but also ensure that the requirements are not too strict, so that the requirements will not be used at all.

The requirements can be strict in three different ways:

- The number of requirements can be too high
- The level of the emissions or other measurable limits can be too strict
- The requirements must be fulfilled for too many of the companies in the supply chain

Finding the correct balance between the strictness of the requirements has not been the purpose of this study. The purpose has simply been to suggest what can be used as environmental baseline requirements.

Especially the number of requirements that should be used and how large a part of the supply chain that should be covered is more a political discussion, which will not be covered in details in this study.

The history of the EU eco-labelling scheme for textiles show that especially criteria that involve the suppliers are the most difficult to live up to, as it is

both time consuming and a difficult task to influence the suppliers (Poulsen, 2004).

The aspect of the level of emissions or other measurable limits, is, on the other hand, addressed in this study. For the textile industry the eco-labelling criteria have primarily been used when proposing environmental baseline requirements. The eco-labelling criteria are typically developed so that only about 30% of the products on the market can comply with the criteria. This may be too strict a cut in this context, but on the other hand one may assume that companies that wish to have an EMS certificate also want to improve the environment, and therefore some kind of higher environmental level must be expected.

3.2 Which aspects should the requirements cover?

The environmental baseline requirements should in principle cover all environmental aspects. In this study we have focused on the main environmental areas. The presentation of the suggested environmental baseline requirements therefore follows the headlines listed below:

- General principles
- Air emissions
- Liquid effluents
- Waste
- Noise
- Consumption of energy in production
- Consumption of water in production
- Hazardous and harmful substances
- Consumption of water, energy, etc. by products (only on sector level)
- Product quality (only on sector level)

Because this study merely includes the most important environmental aspects, it does not mean that other aspects should not be taken into consideration. With the limited funding available for this project, it has been a deliberate choice not to include parameters such as radiation, biodiversity, land use, transport, workers protection, social aspects, etc. Future work, therefore, needs to elaborate on aspects omitted in this study.

The goal has been to set absolute and measurable requirements. The reason for this is that measurable aspects easily can be verified, whereas it is much more difficult to verify objectives, such as "the company should have an objective of not using substances mentioned in the Montreal Protocol".

For consumption of water and energy in the production our purpose has also been to set an absolute and measurable requirement. However, on a general global level it is not possible to set an absolute requirement because the consumption differs extremely between different sectors. Such a requirement should therefore be set on a sector level and not on a general level, if it is possible to find levels for e.g. the industrial average.

However, in some cases, especially with regard to chemicals, where it is not possible to restrict or ban a use of certain chemicals (e.g. because alternatives are too expensive or no alternatives exists), it may be necessary simply to use reporting requirements as a requirement. The rationale is that even though it

may not be possible to restrict the use of certain substances, then at least companies may be required to report to the public that they use these substances, and in this way force the companies to look for environmentally better alternatives.

3.3 Which requirements are most relevant?

Many different requirements can be set in the sector specific case (especially if the requirements do not have to apply for the whole sector). The question is, however, how to determine which requirements that are the most relevant from an environmental point of view.

This information is partly given in the BREF document, where it is stated, which environmental problems are the largest for the textile industry. The best way to determine which requirements are most relevant is however to rely on the eco-label criteria, as the eco-label criteria are developed in order to "remove" the largest environmental impacts. For this reason, especially the eco-label criteria of the widely disseminated EU Flower have been used when proposing environmental baseline requirements for the textile sector.

3.4 Should the requirements be for the company only or for the entire supply chain?

In the existing EMS standards it is mentioned that the certified company should make demands on their suppliers for a certain environmental performance, but only for the activities they can control and influence.

In ISO 14001, demands on the suppliers are formulated quite vaguely: "The organisation shall establish and maintain procedures … for activities … that it can control and … influence…", and "consideration should be given to … indirect aspects… such as … environmental performance and practices of contractors and suppliers". (ISO 14001.2, 2003).

Similar it is written in the EMAS standard that "The organisation shall establish and maintain procedures … for activities … that it can control and … over which it can be expected to have an influence…". However, the EMAS standard is more direct and demands that the company must "communicate relevant procedures …related to the identifiable significant environmental aspects … to suppliers and contractors".

These rather vague demands are, of course, included in order to improve the overall environmental performance of the products the company is producing. Setting environmental baseline requirements for EMS certified companies will improve the general environmental performance for the certified companies, but not necessarily for the products, if suppliers are not obliged to live up to the same requirements.

As a hypothetical case, it is possible for companies with an EMS certification to outsource the most environmentally "dirty" processes to suppliers, and thereby still obtain an EMS certification, but the overall environmental performance of their products may not have improved.

For this reason the same environmental baseline requirements should apply to the entire supply chain and not just for the company in question, in order to

ensure that environmental problems are not just exported to another company or another country. Hence, more strict demands on suppliers are necessary, compared to the existing rather vague demands in the EMS standards.

It is utopian to believe that such a requirement can be set for the entire supply chain. In some sectors the supply chain is long, and the companies may not know of all the suppliers in the supply chain.

It is therefore important to find the correct balance between setting environmental baseline requirements that will improve the overall environmental performance of both companies and products, and to ensure that the requirements are not too strict, so that the requirements will not be used at all.

4 Procedure/method used

This study has been carried out solely as a desk study, using information accessible on the Internet. Relevant phase out conventions of global recognition, globally applied guidelines for threshold emission values, general recognised negative lists etc. have been reviewed in order to find generally acceptable emission levels and similar that can be used as environmental baseline requirements.

In the following, the most relevant sources of information used for this study, are described briefly. The exact use of the different sources of information for the purpose of this study is described in details in the chapters (chapter 5 and 6) listing the environmental baseline requirements on the global and sector specific level respectively.

4.1.1 Sources of information

The most relevant sources that have been reviewed and used for setting general global and specific textile sector environmental baseline requirements are summarised in the table below.

On the global level the primary source for setting global applicable environmental baseline requirements is the World Bank Group guidelines, but the international conventions, protocols and the like have also been used for setting environmental baseline requirements for chemicals.

On the sector level the primary sources of information for setting environmental baseline requirements have been the document on Best Available Techniques for the textile industry and different eco-labelling schemes for textile products.

Sources	General global requirements	Textile sector specific requirements
In general	World Bank Group guidelines	BREF document: BAT for the Textiles Industry
	OECD guidelines for Multinational Enterprises	Eco-labelling of textiles
	Kyoto protocol to the Convention on Climate Change	Other labelling schemes such as Oeko-Tex 1000 for companies
	Global Reporting Initiative	Survey on environmental baseline requirements for textiles. Poulsen PB, 2004.
	UN's Global	Guidance for the Textile Sector (IPPC)
	PERFORM – Sustainability Performance Benchmarking	PARCOM Recommendation concerning BAT for wet processes in the textile processing industry
	Basel convention	
	The European Pollutant Emission Register (EPER)	

Sources Specific for chemicals	General global requirements OSPAR convention OSPAR list of substances of Possible Concern OSPAR list of chemicals for priority action Montreal Protocol on Substances that deplete the ozone layer Stockholm convention on POPs UNECE Protocol on POPs PARCOM decisions Rotterdam Convention on PIC procedure for certain hazardous chemicals Vienna convention for the Protection of the Ozone layer List of Priority Substances under EU Water Framework Directive World Resources Institute – The Greenhouse Gas Protocol The WHO recommended Classification of Pesticides by Hazard	Textile sector specific requirements BREF document: BAT for the Textiles Industry Eco-labelling of textiles

4.2 How do we arrive at the environmental baseline requirements?

As described, it is not the purpose of this study to invent new requirements from "out of thin air". The purpose is to propose requirements that are based on existing guidelines, protocols, conventions etc. In this way the requirements are based on solid material, and there is a reasonable sound cause to use them as baseline requirements and to implement them in the existing EMS standards.

The requirements are constructed so they contain actual emission levels or at least measurable aspects in preference to the more weak objectives to do "this or that". The reason for this is that measurable aspects can easily be verified, whereas it is much more difficult to verify objectives. One way to put objectives into practise could be to write them down in the company's environmental policy, but put roughly – policies will not have an effect if they are not fulfilled. Requirements in the form of objectives will most likely be adequately fulfilled if they are just expressed in the company policy, because these kinds of requirements are difficult to verify, and they may in practise have little effect.

Numerous international documents have therefore been reviewed in order to find globally acceptable emission levels and other measurable aspects that can be used as general environmental baseline requirements. The primary documents that have been reviewed were presented in section 4.1.1 "Sources of information" in the introduction.

The problem is, however, that many of the international documents are not based on absolute reduction targets. E.g. the Kyoto Protocol is based on relative reduction targets. Relative reduction targets are not suitable for defining absolute environmental baseline requirements that are relevant for

companies, as it is easier for inefficient companies than efficient companies to comply with criteria based on relative reduction targets.

Other international documents based on continuous improvements of current levels are e.g. the OECD Guidelines for multinational enterprises. The guidelines focus on the establishment of structures for maintaining good environmental practise, include environmental aspects in decision-making, continually improve the environmental performance etc. Again these are not aspects that are relevant for setting absolute environmental baseline requirements.

In addition, a number of the international documents are merely based on a declaration of intent in accordance with the means at their disposal and their capabilities. An example of this is the Vienna Convention for the Protection of the Ozone Layer.

Since the year 2000 European companies must report certain pollutants to the European Pollutant Emission Register. Member states have to produce a triennial report on the emissions of industrial facilities into the air and waters. The register covers 50 pollutants which must be included if certain threshold values are exceeded. These values are, however, set so that 90% of all emissions should be reported in the Emission Register. Furthermore, the register is based on total figures without correlation to the production volume. Unfortunately, this makes it inapplicable as background for defining environmental baseline requirements. If production volumes were included as well, it could be a good tool in the process of setting environmental baseline requirements.

In general, only few documents are using absolute emission levels. This is the reason why the proposed environmental baseline requirements mainly are based on a few documents.

On the global level the primary source for setting global applicable environmental baseline requirements are the World Bank Group guidelines (Pollution Prevention and Abatement Handbook: Toward Cleaner Production). The handbook is specifically designed to be used in the context of the Bank's environmental policies. It promotes the concepts of sustainable development by focusing attention on the benefits - both environmental and economic - of pollution prevention, including cleaner production and good management techniques. It represents state-of-the-art thinking on how to reduce pollution emissions from the production process. One great advantage of this handbook is that absolute emission levels and other measurable limits have been set.

Two sets of environmental baseline requirements are proposed: General global requirements and sector specific requirements, with the textile sector used as an example. This is described in chapter 4 and 6 respectively.

This study shows that absolute requirements can be set on a general global level, which applies to all companies all over the world and in all industrial sectors. However, as the requirements must apply to all sectors, they are of course very general, which in it self set limitations for how many requirements that can be set, and how specific they are.

Much better and more specific requirements can be set, when a sector approach is used. This is shown in the proposed requirements listed in chapter 6, where the textile industry is used as an example.

Even though the textile sector is an inhomogeneous sector characterised by a lot of companies specialising in relatively narrow process steps that the textile product goes through, it is easier to set environmental baseline requirements for a specific sector, as the sector faces the same environmental issues.

Furthermore, many more documents describing reasonable emission levels and best available techniques are available. The extensive IPPC Reference Documents on Best Available Techniques (the so-called BREF documents) gives a detailed overview of emission reduction and other techniques that are considered to be most relevant for determining the Best Available Techniquie (BAT) and BAT-based permit conditions.

The BREF documents cover specific sectors, and can to some extent be used to establish requirements relating to specific processes and selection of chemicals. They can only be used to some extent, as the described BATs in most cases are very process specific and therefore cover only a small part of the textile industry. Some examples of use of the BREF document for the textile sector are given in chapter 6.

For the textile sector, it is an obvious choice to use eco-labelling of textile products when proposing environmental baseline requirements. The criteria used in different eco-labelling schemes are chosen because they represent the areas where the largest environmental burdens exist for the sector.

Examples of environmental baseline requirements are listed in chapter 4 and 6. For the textile industry numerous examples are given, but it is possible to set even more environmental baseline requirements.

It must be stressed, that the suggestions for requirements are only examples. Many more suggestions can be made based on e.g. the IPPC BREF-document and national documents, but they will in most cases be very narrow in their scope and therefore only applicable to a limited fraction of companies within the textile sector.

A detailed comparison with other sources of information on acceptable emission levels has not been made in this study. A few immediate comparisons of specific issues indicate however, that the emission levels are pretty much in line with the requirements set by national and local authorities in Western Europe. The emission levels are thus not representing best available technology, but rather average conditions when good household practices are implemented.

Finally, it must be pointed out, that the existing legal provisions have not been systematically crosschecked with the proposed requirements. This is also extremely difficult to do, in particular outside of Europe. It is therefore, a general understanding that naturally legal values takes precedence if the values used in the proposed requirements suggest a lower level of environmental protection.

5 Generally applicable global requirements

Several international conventions, protocols etc. on protection of the environment and human health exist. These can be used as a basis for deciding, which generally applicable requirements that can be set on a global level.

A number of the international conventions, protocols etc. are, however, merely based on a declaration of intent in accordance with the means at their disposal and their capabilities. Only few international documents are using absolute emission levels. This is the reason why the proposed environmental baseline requirements mainly are based on a few documents.

One of the primary sources for setting globally applicable environmental baseline requirements is the World Bank Group guidelines (Pollution Prevention and Abatement Handbook: Toward Cleaner Production). The handbook is specifically designed to be used in the context of the Bank's environmental policies. It promotes the concepts of sustainable development by focusing attention on the benefits - both environmental and economic - of pollution prevention, including cleaner production and good management techniques. It represents state-of-the-art thinking on how to reduce pollution emissions from the production process. One great advantage of this handbook is that absolute emission levels and other measurable limits have been set.

A detailed comparison with other sources of information on acceptable emission levels has not been made in this study. A few immediate comparisons of specific issues indicate however, that the emission levels are pretty much in line with the requirements set by national and local authorities in Western Europe. The emission levels are thus not representing best available technology, but rather average conditions when good household practices are implemented.

With regard to ozone depletion it is possible to refer to the Montreal Protocol. This protocol is an international agreement that is designed to protect the stratospheric ozone layer. The protocol was originally signed in 1987 and substantially amended in 1990 and 1992. The Montreal Protocol stipulates that the production and consumption of compounds that deplete ozone in the stratosphere (chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform) are to be phased out by 2000 (2005 for methyl chloroform). The Vienna Convention for the Protection of the Ozone Layer (1985), which outlines states' responsibilities for protecting human health and the environment against the adverse effects of ozone depletion, established the framework under which the Montreal Protocol was negotiated.

With regard to chemicals different conventions and protocols exists on the aspect of Persistent Organic Pollutants, which are also known as POPs. The most important of them are listed below. Most of the chemicals covered by these conventions are pesticides:

- The UNECE Protocol on POPs (entered into force 23 October 2003)
- The Stockholm Convention (entered into force 17 May 2004)
- The Rotterdam Convention – Prior Informed Consent Procedure (PIC) (entered into force 1 February 2005/1 January 2006)
- The European Council proposal for amendments to UNECE Protocol and Stockholm Convention

The Stockholm Convention is open to all states and has so far been ratified by 75. It is a global tool that aims to make sure that the substances it lists are no longer produced, used, imported and exported. It also seeks to stop or reduce the releases of POPs that are unintentionally produced. As a first step the Convention is aimed at ending release and use of twelve of the nastiest POPs. Ten of those have commercial uses as pesticides and/or industrial chemicals, while two of them (dioxins and furans) are by-products of combustion or production of other chemicals.

The UNECE Protocol is open to the 55 UNECE members, and has so far been ratified by 20, including the EU. The protocol is more ambitious than the Stockholm Convention. The ultimate objective is to eliminate any discharges, emissions and losses of POPs. Currently it focuses on 16 substances – 11 pesticides, two industrial chemicals and three by-products/contaminants.

The European Council has in August 2004 proposed to add nine chemicals to the two above conventions – the so-called "nine nasty chemicals". Three substances are already mentioned in the UNECE Protocol, but are proposed to be added to the Stockholm Convention as well. Six new substances are proposed to be added to both conventions.

The Rotterdam Convention is a multilateral environmental agreement on international trade of certain hazardous chemicals. The convention enables the world to monitor and control the trade of certain hazardous chemicals. The convention does not recommend banning the global trade, but requires labelling and information of effects on health and the environment if trade takes place.

Annex 1 is a summary of the different chemicals covered by the different conventions. As can be seen by this annex, it is not possible just to use one of the conventions, as there is no convention that covers all the chemicals that the sum of the conventions covers. Therefore, most of the conventions must be refereed to when setting environmental baseline requirements.

In addition to the above mentioned conventions the Pesticide Action Network (PAN) also lists 18 pesticides (known as the dirty dozen), which are considered to be the world's most hazardous pesticides. These pesticides are banned in over 90 countries, but are in spite of this still exported from the US to different countries – even some countries that have prohibited the use (PAN, 1995).

With regard to pesticides, the World Health Organization has classified pesticides by hazard (WHO, 2005). The pesticides are classified in four groups (extremely, highly, moderately and slightly hazardous). It is possible to use these groups to set environmental baseline requirements. The list made by the WHO is longer than any of the above conventions, as the WHO has grouped all pesticides.

5.1 Subject: General principles

5.1.1 Requirement No GG-1: Identification, measurement and recording of certain environmental aspects

Requirement
Certain environmental aspects must be identified, measured and recorded – minimum on a monthly basis. The measurements and recordings must be for the entire organisation, but also significant and natural split-ups (sub-measurements), e.g. for each building of the organisation, must be performed where relevant.

The environmental aspects that must be identified, measured and recorded individually on a monthly basis are:

- Emissions to air (e.g. SO_x, NO_x, CO_2, particulate matter or other relevant emissions)
- Emission to surface waters (e.g. BOD, COD, oil/grease, total suspended solids, different metals)
- Waste by type including treatment method (e.g. glass, metal, paper, plastics, electronic/electrical equipment, different types of hazardous waste)
- Consumptions of raw materials/semi-raw materials by type including amount of materials used that are recycled material or waste
- Consumptions of water – indication on recycling and reuse of water
- Consumptions of energy
- Consumptions of use of hazardous chemicals
- Significant spills of chemicals, oils and fuels (number of spills and volume)

Furthermore some basic non-environmental data must be identified, measured and recorded in order to be able to calculate specific Key Performance Indicators (KPI).[2]

- Production volume/service units
- Number of employees
- Total number of hours worked
- Land use
- Net sales

Scope
This requirement applies for all industrial sectors.

Rationale
The rationale behind this requirement is to ensure that all most common environmental aspects are measured and recorded. An EMS registration today requires that the significant environmental aspects are measured and recorded. The companies must have a system to pinpoint the significant aspects. This requirement ensures that all environmental aspects are measured and recorded.

[2] For some of these data, it will make no sense to perform sub-measurements for e.g. each building connected to the organisation.

Verification
Verification could happen by requiring that certain Key Performance Indicators should be published in the annual environmental performance report. The above-mentioned aspects that are to be measured and recorded make up the basis for calculating the Key Performance Indicators.

Reporting
The measured and recorded aspects could be used for calculating certain Key Performance Indicators that could be published in the annual environmental performance report.

Comments
The most essential environmental aspects are listed in this requirement. It is possible to extend the list of aspects with more of the more specific performance indicators that are mentioned in the "Sustainability Reporting Guidelines" by the Global Reporting Initiative (GRI, 2002).

5.1.2 Requirement No GG-2: Application of the same standards in all business units/subsidiaries of the company

Requirement
All business units/subsidiaries of the company worldwide must fulfil the same highest standards required by law or applied voluntarily in one country.

Scope
In principle, this requirement applies to all industrial sectors, and in the nature of things, it applies globally. Specific, corporate wide standards can be set for all consumption types and all emission types.

Rationale
It is considered good practise to uphold the same high standards throughout the business. Furthermore, this requirement ensures that the same high environmental standards are applied in different countries even though local/regional requirements in one country may be less stringent.

Verification
Verification could happen by making an annual internal benchmark of relevant parameters available to the public.

Reporting
No reporting is necessary.

Comments
This is by no means a straightforward requirement to fulfil for many companies. Many companies are diversified in terms of products and/or services and their activities cannot easily be benchmarked internally. Furthermore, some companies may not be competitive if the same standard should be fulfilled in all countries of operation.

One option could be to demand a reporting of deviations including justifications, if it is not possible for the company to comply with this requirement.

5.1.3 Requirement No GG-3: Application of the same standards for direct suppliers of the company

Requirement
All direct suppliers of the company must fulfil the same highest standards required by law or applied voluntarily in one country.

Scope
In principle, this requirement applies to all industrial sectors.

Rationale
It is considered good practise to uphold the same high standards throughout the life cycle of the product (of which the company have some possibility to influence, i.e. their direct suppliers).

Verification
Verification could happen by making it the task of the company to verify that their suppliers fulfil the requirements.

Reporting
The company could use this as a positive environmental marketing aspect in their environmental performance report.

Comments
This is by no means an easy requirement to fulfil for most companies. For some sectors the number of suppliers will be higher than in others, which of course will make it even more difficult to comply with this requirement.

However, the reason why such a requirement is relevant is that it in principle is possible for companies with an EMS certification to outsource the most environmentally "dirty" processes to suppliers, and thereby still obtain an EMS certification, but the overall environmental performance of their products may not have improved (or actually be worse).

In the existing EMS standards it is mentioned that the certified company should make demands on their suppliers for a certain environmental performance, but only for the activities they can control and influence.

These rather vague demands are, of course, included in order to improve the overall environmental performance of the products the company is producing. Setting environmental baseline requirements for EMS certified companies would improve the general environmental performance for the certified companies, but not necessarily for the products, if suppliers are not obliged to live up to the same requirements.

For this reason the same environmental baseline requirements should apply to the entire supply chain and not just for the company in question, in order to ensure that environmental problems are not just exported to another company or another country. Hence, more strict demands on suppliers are necessary, compared to the existing rather vague demands in the EMS standards.

It is utopian to believe that such a requirement can be set for the entire supply chain. In some sectors the supply chain is long, and the companies may not know of all the suppliers in the supply chain.

It is therefore important to find the correct balance between setting environmental baseline requirements that will improve the overall environmental performance of both companies and products, but ensure that the requirements are not too strict, so that the requirements will not be used at all. This is, however, a more political discussion, which are not exploited in details in this study.

For the purpose of this study, we have suggested that the direct suppliers of the companies should fulfil the same requirements. Hereby, only the first "chain of suppliers", which the companies should be able to influence are included. In principle, this means that this requirement easily can be bypassed with the use of a middleman – if no other requirements for the suppliers exist.

Some companies may not be competitive if the same standard should be fulfilled in all countries of operation. Ethically it can be argued that a company should not be allowed to operate in e.g. a developing country if they do not comply with the legislation in their country of origin. On the other hand, the growth they create in the developing country may result in improved economy etc. for the locals, and hence be of overall benefit, despite only local legislation is maintained. For this reason, it can be discussed whether the requirement in stead "just" should cover a certain percentage of the direct suppliers. It also depends on the strictness of the total amount of requirements that the companies (and therefore also their suppliers) must meet.

Another option could be to demand a reporting of deviations including justifications, if it is not possible for the company to comply with this requirement.

However, this is, as mentioned before, a more political discussion to determine both – how strict the requirements should be and if the requirements should cover the entire production chain or just part of it.

One solution could be to distinguish between requirements set for production processes or for products. Requirements set for products could then apply for the entire product chain, whereas requirements set for the production processes could be limited to the EMS company in question as these requirements may be difficult to fulfil or at least to verify for the entire supply chain.

5.1.4 Requirement No GG-4: Reporting of material/water/energy consumption, emissions and waste

Requirement
The company shall report all relevant material/water/energy consumptions, emissions and waste to the public on a regular basis using appropriate indicators (e.g. kilo/m^3/MJ per production unit (per product or per kilo of product)).

Scope
This simple and general reporting requirement applies to all types of companies across all business sectors. All parameters covered by requirement No GG-1 "Identification, measurement and recording of certain environmental aspects" must be included as a minimum. However, it is recommended to consider using the indicators contained in the GRI (Global Reporting Initiative) Guidelines (GRI, 2002). A new revised version of the reporting guidelines by GRI (G3) is due in 2006.

Rationale
Making environmental records partly or fully available to the public is already standard for many companies in many parts of the world. Doing so adds credibility to the company and allows the public, as well as administrators, to judge environmental performance. Reporting of consumptions, emissions and waste using normalised indicators (Key Performance Indicators) allows for comparison between companies, which leads to benchmarking and thereby hopefully better overall environmental performance for the industry in question.

Verification
All relevant material/water/energy consumptions, emissions and waste – calculated using appropriate indicators – must be verified. Accounting companies or other entities considered an objective and respected third party could do the verification of data and information.

Reporting
The requirement is in itself a reporting requirement.

Comments
To make public reports is not required today for e.g. an ISO 14001 certification, but it seems a reasonable thing to ask for when awarding a company an environmental certificate.

The requirement should be considered an overall requirement that needs to be further specified depending on type industrial sector or even specific company.

Obviously it is neither viable nor relevant to report on all types of emissions and consumptions. The nature of the company will be decisive for which emissions and consumptions are significant and hence relevant to report on a regular basis.

When significant material/water/energy consumptions, emissions and wastes are being selected for sector specific reporting is should also be considered whether absolute and/or relative figures should be reported. In some situations, the absolute figure will be the most relevant piece of information, but in other situations relative figures will be more relevant. Preferably both types of figures should be reported.

Absolute figures provide information about the magnitude of the company's contribution to an overall effect – e.g. the total amount of CO_2 released to air or total amount of pollutant emitted to water. Furthermore, use of absolute figures makes it possible to consistently track data, to add various releases into a total environmental impact (from different companies) and to form other ratios/relative figures than those already reported by the company.

Relative figures make it easier to interpret data by making relationships visible, and furthermore they enable comparison between different scales of operation. Relative figures can be particularly useful for comparing two companies/organisations of different scales. Normalised data (e.g. actual emission of CO_2 per production volume) enables a comparison between the relative efficiency of two companies/organisations in managing certain environmental performances, regardless of differences in size. The companies should calculate and use the normalised data that make sense and that best capture the impacts of their business. (GRI, 2002).

5.2 Subject: Air emissions

5.2.1 Requirement No GG-5: Emissions to air

Requirement
The company must fulfil the maximum air emission requirements set forward for its specific industrial sector as compiled in Annex 2. If no sector specific requirements are available the emission levels shall not exceed those presented in Table 1.

Table 1. Air emission limits for general application

Pollutant/Parameter	Limit mg/m^3	Limit mg/MJ	Comment
Particulate Matter	50		> 50 MWe input
	100		< 50 MWe input
Nitrogen oxides (as NO_2)	750	260	Coal fired
	460	130	Oil fired
	320	86	Gas fired
Sulfur dioxide	< 2000		

Scope
The sector specific requirement is applicable to those industrial sectors mentioned in annex 2.

For sectors without specific requirements the general air emission limits in Table 1 are applicable. The general limits do not take the nature of the sectors into account and the emission levels only refer to facilities generating energy for heating purposes, electricity production or steam generation (including boilers, furnaces, incinerators, electricity generating equipment). Particular emissions that may originate in specific processes should be addressed case by case.

These requirements apply as minimum requirements for the processes mentioned within all industrial sectors across all regions. There may be tougher local or national requirements and there may also be tougher requirements for individual industrial sectors.

Rationale
This requirement is based on General Environmental Guidelines published by the World Bank[3]. They constitute a baseline which all projects sponsored by the World Bank must not exceed. It is explicitly noted that the requirements are general, and that additional requirements pertaining to specific production processes, choice of materials, etc. very often will be set.

Verification
The total emissions to air (measured in mg/m^3) caused by the company must be measured and verified for the above-mentioned pollutants. Monitoring of air quality by an accredited laboratory at intervals sufficiently frequent to demonstrate compliance with the requirement.

Monitoring of stack emissions sufficiently frequent to demonstrate continued compliance. Sulphur content of fuels may be used to demonstrate compliance

[3] World Bank, 1998

with the sulphur dioxide emission limit (liquid fuels with a sulphur content of 0.5% or less; solid fuels with a sulphur content of 0.8% or less and a heat content of minimum 7,000 kcal/kg).

For sources less than 100 million Btu[4]/hr (equals close to 30 MW) compliance with the guidelines for particulate matter may be demonstrated by maintaining the stack opacity below 20%.

Manufacturers' performance guarantees can be used to demonstrate that the emission guidelines for nitrogen oxides are met, in so far as they are verified by an initial performance test after commissioning.

Reporting
Emissions should be reported in the company's environmental performance report with the use of normalised indicators/relative figures (e.g. emissions per production unit), which makes the emissions comparable for benchmarking between companies.

The maximum and average emissions should be reported using appropriate normalisation units (e.g. mass per product/service unit). Industry average and best/worst practise data for comparison should be used where available.

Comments
The World Bank has summarized air emission limit guidelines for 33 specific industrial sectors. These guidelines can be taken as a global "good practise" baseline.

Absolute requirements like this requirement are very transparent which makes compliance easy to evaluate. A problem related to such requirements is that they must be relevant to a variety of processes in order to maintain their general nature. The result is that it may primarily be a matter of type of process or availability of fuel type that determines compliance instead of (strict) environmental management.

The limit values for nitrogen oxides can be roughly compared to the emission factors for combustion plants as presented in the EMEP/Corinair Emission Inventory Guidebook[5]. For coal-powered plants, the World Bank air emission limits correspond to two or three primary measures being implemented, e.g. a combination of any two of the following technologies: Low NO_x Burner (LNB), Staged Air Supply (SAS) and Overfire Air (OFA). The acceptable sulphur content of fuels is in the lower end of the possible range. Coal from some mines has a lower content, down to 0.4%, but is most probably not available to companies in all countries.

The General Environmental Guidelines by the World Bank also sets limits for the concentration of air pollutants immediately *outside* the property boundary of the companies. These concentration limits are presented in Table 2.

[4] Btu is short for British Thermal Units.
[5] EMEP/Corinair Emission Inventory Guidebook. 3rd Edition, September 2004. Can be downloaded from http://reports.eea.eu.int/EMEPCORINAIR4/en/page002.html

Concentration of air pollutants is, however, seldom measured directly outside the company boundary today. In stead the emissions are measured directly at the source of the airborne emissions – the different outlets, and a computer calculation is performed in order to calculate the concentration of airborne emissions outside the company's boundary. Other point sources, such as piles of coal, may still require extraordinary measurements. In spite of this, the computer calculations are considered a more precise method compared to measurements, where background levels and emissions from other companies may interfere. Hence, only a requirement of the direct airborne emissions from the company is set.

Table 2. Ambient air conditions at property boundary, for general application

Pollutant	Measurement conditions	Concentration (micrograms per cubic meter)
Particulate matter	Annual arithmetic mean	50
Particulate matter	Maximum 24-hour average	70
Nitrogen oxides	Maximum 24-hour average	150
Sulfur dioxide	Annual arithmetic mean	50
Sulfur dioxide	Maximum 24-hour average	125

5.2.2 Requirement No GG-6: Total greenhouse gas emissions

Requirement
The company must report the direct and indirect greenhouse gas emissions (in terms of tonnes CO_2-equivalents) to the public on a regular basis using appropriate indicators (normalisation units – e.g. per product/service unit). Industry average and best/worst practise data must be used for comparison where available.

Scope
This requirement applies in principle to all companies that generate global warming emissions across all regions and industrial sectors.

Rationale
The Kyoto Protocol looks to reduce the emission of man made global warming agents such as carbon dioxide. A reporting requirement will force the companies to assess their level of greenhouse gas emission compared to other companies in the same industry.

Verification
The total greenhouse gas emissions (measured in tonnes of CO_2-equivalents per product/service unit) must be verified. Accounting companies or other entities considered an objective and respected third party could do the verification of data and information, e.g. in the form of a statement.

Reporting
This requirement is in itself a reporting requirement.

Comments
It is very difficult to make actual global warming emission limits in the general, non sector-specific case. In that sense it is difficult to convert the Kyoto Protocol to absolute requirements for companies. Therefore, this requirement is made as a reporting requirement in order to force companies to report and benchmark.

5.3 Subject: Liquid effluents

5.3.1 Requirement No GG-7: Emission to surface waters

Requirement
The company must fulfil the maximum process waste water, domestic sewage and contaminated storm water and runoff requirements set forward for its specific industrial sector as compiled in Annex 3. If no sector specific requirements are available the limits presented in Table 3 must be met.

Table 3. Limits for process waste water, domestic sewage, and contaminated storm water discharged to surface waters, for general application.

Pollutant or parameter	Limit (milligrams per litre, except for pH, bacteria and temperature
pH	6-9
BOD	50
COD	250
Oil and grease	10
TSS (Total Suspended Solids)	50
Heavy metals, total	10
Arsenic	0.1
Cadmium	0.1
Chromium, hexavalent	0.1
Chromium, total	0.5
Iron	3.5
Mercury	0.01
Lead	0.1
Nickel	0.5
Selenium	0.1
Silver	0.5
Zinc	2.0
Cyanide, free	0.1
Cyanide, total	1.0
Ammonia	10
Fluoride	20
Chlorine, total residual	0.2
Phenols	0.5
Phosphorous	2.0
Sulphide	1.0
Coliform bacteria	< 499 MPN/100 ml (MPN: Most probable number)
Temperature increase	Maximum 3°C above ambient temperature of receiving waters

Scope
The sector specific requirement is applicable to those industrial sectors mentioned in annex 3.

For sectors without specific requirements the general limits for effluents mentioned in Table 3 are applicable. The general limits do not take the nature of the sectors into account. Particular effluents that may originate in specific processes should be addressed case by case.

These requirements apply as minimum requirements for all processes within all industrial sectors across all regions. There may be tougher local or national requirements and there may also be tougher requirements for individual industrial sectors.

Rationale
This requirement is based on General Environmental Guidelines published by the World Bank[6]. They constitute a baseline which all projects sponsored by the World Bank must not exceed. It is explicitly noted that the requirements are general, and that additional requirements pertaining to specific production processes, choice of materials, etc. very often will be set.

Verification
Monitoring of effluents, preferably by an accredited laboratory, sufficiently frequent to demonstrate compliance with the requirement. The monitoring programme shall reflect the activities on the premises, e.g. monitoring of metals can be excluded if none are expected to be present.

Reporting
Results from the accredited laboratory should be published sufficiently frequent to demonstrate continued compliance.

Comments
Please note that the concentration limits in Table 3 apply to discharges to surface waters for general application. Other pollutants, specific for the type of operation performed, may be equally or more important.

The specific sampling location could either be specified within the requirement or selected by the accredited laboratory.

Table 3 could also include requirements to pesticides, dioxins, furans, PAH and other toxics, the maximum limit being defined as either 100 times the WHO guidelines for drinking water or 0.05 mg/l.

[6] World Bank, 1998

5.3.2 Requirement No GG-8: Capacity of waste water treatment system

Requirement
The company shall present information that the waste water treatment system, which is cleansing the waste water of the company, has the capacity and is managed to adequately treat the liquid effluent from the company.

Scope
This requirement applies to all industrial sectors across all regions. There may be tougher local or national requirements and there may also be tougher requirements for individual industrial sectors.

Rationale
The environment and the local society should not be burdened by dominating companies overexploiting the capacity that are available.

Making environmental records partly or fully available to the public is already standard for many companies in many parts of the world. Doing so adds credibility to the company and allows the public, as well as administrators, to judge environmental performance.

Verification
Verification could be carried out by providing confirmation from a third party expert stating that the waste water of the company is being treated by a state-of-the-art waste water treatment plant.

Reporting
The requirement is in itself a type of reporting requirement. The statement by the third party expert can be documented in parallel with the company's annual report.

Comments
The statement from the third party expert should include a definition of how they interpret adequate treatment.

5.4 Subject: Waste

5.4.1 Requirement No GG-9: Waste minimisation and handling of waste

Requirement
The company shall develop a waste minimisation and waste handling strategy, which prioritise waste management options in the following order:

1. Prevention
2. Reuse
3. Material Recycling
4. Energy recovery
5. Incineration without energy recovery and
6. Land filling.

The waste minimisation and waste handling strategy must be recorded in writing.

Scope
This requirement applies to all industrial sectors across all regions. There may be tougher local or national requirements and there may also be tougher requirements for individual industrial sectors.

Rationale
Besides an obvious wish for less waste, the rationale behind this requirement is linked to the desire for resource protection and energy efficiency. Reduction of waste generation often leads to process and product optimisation as well as energy savings.

The "waste hierarchy" is generally and wide spread accepted as guidance towards lowest ecological footprint from waste handling and disposal.

Verification
Verification is not needed, but may also simply be the written waste strategy.

Reporting
Reporting of this requirement could be to publish the waste minimisation and waste handling strategy/policy of the company, e.g. in the company's environmental performance report.

Comments
In some case the "waste hierarchy" is not representative for good environmental practice. It depends on e.g. the characteristics of the waste, the local infrastructure as well as the technological possibilities within the society where the waste is generated. Therefore deviations from the requirement may be acceptable if the company is able to argue against the hierarchy.

5.4.2 Requirement No GG-10: Waste separation system

Requirement
The company must establish a waste separation system, where the following waste fractions as a minimum are separated:

- Glass
- Metal
- Paper
- Plastics
- Electronic/electrical equipment
- Hazardous waste

The different types of hazardous wastes shall be recorded (as also stated in GG-1) and must be properly disposed of.

The other types of collected waste should be submitted to recycling facilities.

The annually amounts of waste must be reported to the public (see below).

Scope
This requirement applies for all industrial sectors.

Rationale
The rationale behind this requirement is to follow the requirement concerning the waste hierarchy as mentioned in requirement no. GG-9: Waste minimisation and handling of waste. In order to do so, it is necessary to separate the waste that the company generates.

Verification
This requirement can be verified e.g. by invoices from waste collection companies, where it is described, which types of wastes that is being collected from the company and how the wastes are being treated (recycling facilities).

Reporting
The annually amounts of the different types of waste should be described in the company's environmental performance report as described in the requirement no. GG-4: Reporting of material/water/energy consumption, emissions and waste.

5.5 Subject: Noise

5.5.1 Requirement No GG-11: Noise level of the company boundary

Requirement
Noise levels - measured at the company's boundary - must not exceed the maximum levels presented in Table 4 – or increase the background level with more than 3 dB(A).

Table 4. Maximum allowable noise levels

	Maximum allowable log equivalent (hourly measurements, in dB(A)	
Receptor	Day (07:00-22:00)	Night (22:00-07:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Scope
This requirement applies to all industrial sectors across all regions. There may be tougher local or national requirements and there may also be tougher requirements for individual industrial sectors.

Rationale
This requirement is based on General Environmental Guidelines published by the World Bank[7]. They constitute a baseline which all projects sponsored by the World Bank must not exceed. It is explicitly noted that the requirements are general, and that additional requirements may be set.

Verification
Monitoring of noise levels, preferably by an accredited laboratory, sufficiently frequent to demonstrate compliance with the requirement. The monitoring programme shall reflect the activities on the premises.

Reporting
Results from the accredited laboratory should be published sufficiently frequent to demonstrate continued compliance. Furthermore, the company must be ready to report the necessary information demanded by national or regional authorities.

Comments
Noise requirements will most often be an integral part if a company is obliged to have an environmental permit.

[7] World Bank, 1998

5.6 Subject: Consumption of energy in production

5.6.1 Requirement No GG-12: Energy reduction policy and reporting of use of energy

Requirement
The company shall develop an energy reduction policy that must be recorded in writing.

The annual use of energy must be recorded and reported to the public (in line with GG-1 and GG-4) on a regular basis using appropriate indicators (normalisation units). Industry average and best/worst practise data must be used for comparison where available.

Scope
This requirement applies to all industrial sectors across all regions.

Rationale
The requirement originates from a desire to reduce the consumption of fossil fuels as well as air emission causing acidification, global warming etc.

Verification
The energy reduction policy is to be verified. Accounting companies or other more technical entities considered an objective and respected third party could do the verification of data and information. Furthermore, the written policy could be part of the verification.

Reporting
The energy reduction policy as well as the annual consumption of energy must be described in the company's environmental performance report as described in the requirement no. GG-4: Reporting of material/water/energy consumptions, emissions and waste.

The annual consumption of energy must be reported for consecutive years and should be reported by use of normalisation figures that enables a comparison with best/worst practise of industry.

Comment
Another approach could be to set exact energy reduction targets for the company – e.g. 5% energy reduction (measured as e.g. total energy use per production volume) each year. This is in line with EMS as it is today, where an annual improvement each year is required – the difference is, however, that no fixed percentage-wise improvement is required. The problem with this approach is, however, that such a requirement will be easier to comply with for companies with a high use of energy (with larger energy reduction potentials) compared to energy efficient companies that already have reduced their use of energy substantial.

In order to use such an approach, it will therefore be necessary to add to the requirement that the companies must not consume energy over a certain level

(measured e.g. in energy per production volume). This is, however, not possible to set as a requirement on a global level, but could be possible on a sector level. Setting factual energy limits may even be difficult on a sector level for sectors that are not uniform (like e.g. the textile sector). In these cases factual limits must be set on a sub-sector level.

5.7 Subject: Consumption of water in production

5.7.1 Requirement No GG-13: Water reduction policy and reporting of use of water

Requirement
The company shall develop a water reduction policy that must be recorded in writing.

The annual use of water must be recorded and reported to the public (in line with GG-1 and GG-4) on a regular basis using appropriate indicators (normalisation units). Industry average and best/worst practise data must be used for comparison where available.

Scope
This requirement applies to all industrial sectors across all regions.

Rationale
The requirement originates from a desire to reduce the consumption of process/drinking water.

Verification
The water reduction policy is to be verified. Accounting companies or other more technical entities considered an objective and respected third party could do the verification of data and information. Furthermore, the written policy could be a part of the verification.

Reporting
The water reduction policy as well as the annual consumption of water must be described in the company's environmental performance report as described in the requirement no. GG-4: Reporting of material/water/energy consumptions, emissions and waste.

The annual consumption of water must be reported for consecutive years and should be reported by use of normalisation figures that enables a comparison with best/worst practise of industry.

Comments
In line with the previous requirement another approach could be to set exact water reduction targets for the company – e.g. 5% water reduction (measured as e.g. total water use per production volume) each year. The problem with this approach is, however, that such a requirement will be easier to comply with for companies with a high use of water (with larger water reduction potentials) compared to water efficient companies that already have reduced their use of water substantial.

In order to use such an approach, it will therefore be necessary to add to the requirement that the companies must not consume water over a certain level (measured e.g. in water per production volume). This is, however, not possible to set as a requirement on a global level, but could be possible on a

sector level. Setting factual water limits may even be difficult on a sector level for sectors that are not uniform (like e.g. the textile sector). In these cases factual limits must be set on a sub-sector level.

5.8.1 Requirement No GG-14: Reporting of use of dangerous chemicals

Requirement
The amount and use of dangerous chemicals must be registered and reported yearly in the company's environmental performance report.

Scope
This requirement applies for all industrial sectors.

Rationale
It is simply a question about forcing the company to map, record and analyse their use of chemicals.

Verification
The industry declares the amounts they have used of different dangerous chemicals.

Reporting
The requirement is in itself a reporting criterion.

If the company produces consumer products, an addition to the requirement could be that the dangerous chemicals contained in the consumer products (even though they are only impurities) also should be reported.

Comments
This requirement is a precursor for the requirement of having a risk-based approach for use of chemicals, as mapping and recording the use of chemicals is necessary in order to assess the risk of the company's use of chemicals. In this respect, this criterion may not be necessary, even though it still is reasonable to require that the company's use of chemicals must be reported to the public.

5.8.2 Requirement No GG-15: Selection and use of chemicals - Risk-based approach

Requirement
Selection of chemicals and their utilisation mode shall be based on a risk-based approach, ensuring the lowest overall risk and on the principle of substitution of more dangerous substances by less dangerous ones where they exist.

Scope
This requirement applies for all industrial sectors.

Rationale
This requirement is suggested in order to ensure that dangerous substances are not used if safer alternatives exist.

Verification
This requirement is difficult to verify. One approach could be to require openness about the use of chemicals, which is the result of the reporting of this requirement and requirement no. GG-14: Reporting of use of dangerous chemicals.

Reporting
The company shall report its strategy/policy regarding the use of chemicals including the application of the substitution principle and the practical result of it.

Comments
The company shall have guidelines for selection of chemicals, describing the qualitative and or quantitative approach to be taken. The environmental management system shall include procedures as to how the guidelines are applied in everyday's practice.

Due recognition should be given to Community legislation in the selection of chemicals. Negative lists like the EU List 1 (+ candidate substances) and the OSPAR and HELCOM lists can be used to identify unwanted chemicals, and classification tools can be used to establish priorities. National tools like the Danish List of Unwanted Substances, published by the Danish Environmental Protection Agency can also be used to identify unwanted chemicals.

The future EU legislation on chemicals – REACH – operates with the term "chemicals subject to mandatory authorisation", which also can be used as a guide. These chemicals require a special registration and authorisation, because they are the most dangerous substances – e.g. carcinogenic or persistent, bio accumulative and toxic. (REACH, 2005).

Furthermore, the Stockholm Convention has established screening criteria (Annex D), which describes the properties of persistent organic pollutants (POPs). These screening criteria can be used in a process of identifying unwanted chemicals as well.

5.8.3 Requirement No GG-16: Ozone-depleting substances

Requirement
Chemicals classified as ozone-depleting in the Montreal Protocol must not be used.

Scope
This requirement applies for all industrial sectors.

Rationale
The rationale behind this requirement is to follow the Montreal Protocol, which was originally signed in 1987 and substantially amended in 1990, 1992, 1995, 1997 and 1999.

Verification
This requirement can be verified by a declaration of non-use of the ozone-depleting substances mentioned in the Montreal Protocol.

Reporting
The non-use of the ozone-depleting substances mentioned in the Montreal Protocol could be stated in the company's environmental performance report.

Comments
In developing countries the ozone-depleting substances in questions are first to be phased out by 2010, 2015, and 2040 dependant on the type of substance. In developed countries, only HCFCs must be used until 2030. The rest of the substances in question must already be phased out.

Compliance with this requirement will therefore in most industrialised countries only show that national legislation is in effect at the company. For companies in the so-called Article 5-countries (developing countries whose annual calculated level of consumption of the controlled substances is less than 0.3 kilograms per capita) compliance with the requirement may demonstrate that the company already has taken action to reduce its environmental impacts (or that the company simply does not use or need ozone depleting substances in its production).

Using this requirement that none of these substances must be used is therefore, stricter than the Montreal protocol, but seem to be a reasonable requirement for EMS companies that wishes to show a more environmental friendly profile.

Such a requirement will, however, be a disadvantage for developing countries, as the Montreal Protocol states that these substances first are to be phased out by the years 2010, 2015 and 2040 dependant on the type of substances. Introducing e.g. a transitional period for HCFCs until 2020 could soften the requirement. This will soften the requirement for developing countries, but still be stricter than the deadlines put forward in the Montreal Protocol.

5.8.4 Requirement No GG-17: CMR and sensitising substances

Requirement
Substances that are carcinogenic, mutagenic, toxic to reproduction or sensitising must not be used in consumer products.

Carcinogenic, mutagenic substances and substances that are toxic to reproduction are defined as in criteria 22b in the EU Flower eco-labelling of textiles:

Substances that are assigned or may be assigned at the time of application any of the following risk phrases (or combinations thereof):

- R40 Limited evidence of a carcinogenic effect
- R45 May cause cancer
- R46 May cause heritable genetic damage
- R49 May cause cancer by inhalation
- R60 May impair fertility
- R61 May cause harm to the unborn child
- R62 Possible risk of impaired fertility
- R63 Possible risk of harm to the unborn child
- R68 Possible risk of irreversible effects

Sensitising substances may be defined as substances that are assigned or may be assigned at the time of application any of the following risk phrases (or combinations thereof):

- R42 May cause sensitisation by inhalation
- R43 May cause sensitisation by skin contact

Scope
This requirement applies to all companies that produce consumer products.

Rationale
The rationale behind this requirement is simply that the consumers should not be exposed to products containing substances that are carcinogenic, mutagenic, sensitising or toxic to reproduction. Not even if the content in the consumer product is low (0.1% which is the limit used today in legislation for the working environment).

Today consumer products, like e.g. glue, can be found on the market containing e.g. carcinogenic substances. The content of these substances may be below 1% and the carcinogen may be a Carc 3 substance (limited evidence of carcinogenic effect), but why should they be allowed in consumer products?

Verification
This requirement should be verified with a declaration of non-use of such substances. Furthermore, a declaration from the suppliers of the company is needed, if suppliers supply chemicals that are directly added to the produced consumer product.

Reporting
The company can report the non-use of this type of substances e.g. in their company's environmental performance report.

Comments
The reason for this requirement is, as already mentioned, that consumer products today can contain a small amount of CMR substances. The requirement is therefore set in order to "remove" this possibility.

With regard to the sensitising substances, consumer products can be found today containing even a large amount of such substances. One could always argue that the consumer can wear protective gloves and avoid contact with the chemicals (for skin sensitising substances). However, as a requirement for companies that represents "the best environmental league", such a requirement seems reasonable. If another approach should be used, one could choose just to set requirements for substances that are sensitising by inhalation, because they are difficult to avoid for consumers.

Another approach to this overall requirement could be to turn it into a reporting requirement, i.e. if CMR or sensitising substances are contained in the consumer products produced, this must be stated in the company's environmental performance report and on the consumer products to warn the consumers. This may automatically be an incentive for the company to use other chemicals instead.

The EU eco-labelling of textiles operates with a limit of 0.1% w/w, i.e. that substances or preparations may not contain more than 0.1% of the substances in question.

5.8.5 Requirement No GG-18: Persistent Organic Pollutants

Requirement
The persistent organic pollutants (POPs) mentioned by the following parties must not be used, traded or produced:

- The so-called "dirty dozen" pesticides as mentioned by Pesticides Action Network (PAN)
- The Rotterdam Convention (Prior Informed Consent (PIC) Procedure)
- The Commissions proposal for amendments to the Stockholm Convention and the UNECE Protocol.
- The UNECE Protocol.

Scope
This requirement applies for all industrial sectors. Substances that are unintentionally by-products produced due to e.g. incomplete combustion as e.g. dioxins, furans and polycyclic aromatic hydrocarbons (PAH) are, however, exempted from this criterion (by production). The exception is only valid if the substances are produced unintentionally[8]. For this type of substances the company must then take measures to reduce or eliminate the releases.

Rationale
The rationale behind this requirement is to follow the Rotterdam Convention, the UNECE Protocol, and also the European Commission proposal for amendments to the Stockholm Convention and the UNECE Protocol. Furthermore, the rationale is to avoid use of the so-called dirty dozen pesticides as mentioned by PAN.

If these conventions are followed then the Stockholm convention automatically is followed as well.

Verification
This requirement should be verified by a declaration of non-use and non-production by the company. If substances are unintentionally produced, an action plan of their reduction or elimination must be produced.

If consumer products are manufactured by the company another verification procedure could be to measure the level of these pesticides in the product in order to ensure that these substances have not been used. This is, however, a more expensive verification method.

Reporting
With today's technology it is not possible completely to avoid e.g. dioxins and furans as an unintended by-product of e.g. incomplete combustion. The company should, however, if they have emissions of either dioxins or furans report e.g. in their environmental performance report, why they have an

[8] PAHs usually occur naturally, but can also be unintentionally produced due to incomplete combustion.

emission of these POPs, how large the yearly emissions are and what they are doing in order to reduce or eliminate the emissions.

Comments
Different conventions and protocols exist on the aspect of Persistent Organic Pollutants, which are also known as POPs. The most important of them are listed below. Most of the chemicals covered by these conventions are pesticides:

- The UNECE Protocol on POPs (entered into force 23 October 2003)
- The Stockholm Convention (entered into force 17 May 2004)
- The Rotterdam Convention – Prior Informed Consent Procedure (PIC) (entered into force 1 February 2005/1 January 2006)
- The European Council proposal for amendments to UNECE Protocol and Stockholm Convention

The Stockholm Convention is a global tool that aims to make sure that the substances it lists are no longer produced, used, imported and exported. It also seeks to stop or reduce the releases of POPs that are unintentionally produced. As a first step the Convention is aimed at ending release and use of twelve of the nastiest POPs. Ten of those have commercial uses as pesticides and/or industrial chemicals, while two of them (dioxins and furans) are by-products of combustion or production of other chemicals.

The Stockholm convention does not put a total ban on the 12 involved POPs. For some narrowly prescribed purposes some of the substances may still be used, and for one of the POPs in question a total elimination must not be in place before 2028.

The UNECE Protocol is more ambitious than the Stockholm Convention. The ultimate objective is to eliminate any discharges, emissions and losses of POPs. Currently it focuses on 16 substances – 11 pesticides, two industrial chemicals and three by-products/contaminants.

The European Council has in August 2004 proposed to add nine chemicals to the two above conventions – the so-called "nine nasty chemicals". Three substances are already mentioned in the UNECE Protocol, but are proposed to be added to the Stockholm Convention as well. Six new substances are proposed to be added to both conventions.

The Rotterdam Convention is a multilateral environmental agreement on international trade of certain hazardous chemicals. The convention enables the world to monitor and control the trade of certain hazardous chemicals. The convention does not recommend banning the global trade, but requires labelling and information of effects on health and the environment if trade takes place.

Annex 1 is a summary of the different chemicals covered by the different conventions. As can be seen by this annex, it is not possible just to use one of the conventions, as there is no convention that covers all the chemicals that the sum of the conventions covers. Therefore, most of the conventions must be refereed to when setting environmental baseline requirements.

In addition to the above mentioned conventions the Pesticide Action Network (PAN) also lists 18 pesticides (known as the dirty dozen), which are considered to be the world's most hazardous pesticides. These pesticides are banned in over 90 countries, but are in spite of this still exported from the US to different countries – even some countries that have prohibited the use (PAN, 1995).

According to the Pesticides Action Network home page[9] at least 58 millions pounds of these pesticides were still exported from the US between 1991 and 1994, and many to countries that have prohibited the use. Between 1995 and 1996 the number was 3.3 million pounds solely to countries, which have banned the pesticides.

This is over 10 years ago, but as we have not been able to find information that can verify if this is still the case, a requirement has still been made.

This requirement is set stricter than just to follow the conventions, as some conventions talk about gradual phase out of the use of the substances. The reason for this is that it is believed to be reasonable to set stricter requirements for companies that wishes to be EMS certified. An exception is, however, made for the POPs that are unintentionally produced (e.g. dioxins and furans), as it is not possible with today's technologies to completely avoid an emission of these two chemical groups of substances, as they are unitended by-products of e.g. incomplete combustion.

It is a deliberate choice to formulate the requirement as to not use the substances mentioned by the different protocols in stead of just listing the substances. The reason for this is that the list of substances in the protocols may be expanded as time goes by, and in this way the requirement is always up to date.

[9] See reference list for details.

5.8.6 Requirement No GG-19: No use of extremely and highly hazardous pesticides

Requirement
Extremely hazardous and highly hazardous pesticides as defined by the WHO classification of pesticides must not be used.

Scope
This requirement applies for all industrial sectors.

Rationale
The rationale behind this requirement is to use the classification of pesticides as proposed by WHO. It is suggested to ban the use of the first two groups called extremely hazardous and highly hazardous simply because of their effects.

Verification
The company must provide a declaration of non-use of the pesticides in question.

If consumer products are manufactured by the company another verification procedure could be to measure the level of these pesticides in the product in order to ensure that these substances have not been used. This is, however, a more expensive verification method.

Reporting
No reporting is necessary.

Comments
Using these groups of hazardous pesticides by WHO adds about another 75 pesticides to the list of pesticides, which must not be used by EMS companies.

This requirement is a requirement for it self as banning the two groups of hazardous pesticides do not exclude all pesticides as mentioned by the different international protocols. E.g. DDT is "only" grouped as a moderately hazardous pesticide, where it is listed as a persistent organic pollutant under the different conventions.

According to WHO these two groups contain the following substances (WHO, 2005) – listed by their common name:

<u>WHO Class 1A – Extremely hazardous pesticides:</u>
1. Aldicarb
2. Brodifacoum
3. Bromadiolone
4. Bromethalin
5. Calcium cyanide
6. Captafol
7. Chloroethoxyfos
8. Chlormephos

9. Chlorophacinone
10. Difenacoum
11. Difethialone
12. Dephacinone
13. Disulfoton
14. EPN
15. Ethoprophos
16. Flocoumafen
17. Hexachlorobenzene
18. Mercuric chloride
19. Mevinphos
20. Parathion
21. Parathion-methyl
22. Pehylmercury acetate
23. Phorate
24. Phosphamidon
25. Sodium fluoroacetate
26. Sulfotep
27. Tebupirimfos
28. Terbufos

WHO Class 1B – Highly hazardous pesticides:

1. Acrolein
2. Allyl alcohol
3. Azinphos-ethyl
4. Azinphos-methyl
5. Blasticidin-S
6. Butoxcarboxim
7. Butoxycarboxim
8. Cadusafos
9. Calcium arsenate
10. Carbofuran
11. Chlorfenvinphos
12. 3-chloro-1,2-proanediol
13. Coumaphos
14. Coumatetralyl
15. Zeta-cypermethrin
16. Demeton-S-methyl
17. Dichlorvos
18. Dicrotophos
19. Dinoterb
20. DNOC
21. Edifenphos
22. Ethiofencarb
23. Famphur
24. Fenamiphos
25. Flucythrinate
26. Fluoroacetamide
27. Formetanate
28. Furathiocarb
29. Heptenophos
30. Isoxathion
31. Lead arsenate
32. Mecarbam
33. Mercuric oxide

34. Methamidophos
35. Methidathion
36. Methiocarb
37. Methomyl
38. Monocrotophos
39. Nicotine
40. Omethoate
41. Oxamyl
42. Oxydemeton-methyl
43. Paris green
44. Pentachlorophenol
45. Propetamphos
46. Sodium arsenite
47. Sodium cyanide
48. Strychnine
49. Teflutrhin
50. Thallium sulfate
51. Thiofanox
52. Thiometon
53. Triazophos
54. Vamidothion
55. Warfarin
56. Zinc phosphide

5.8.7 Requierment No GG-20: Heavy metals

Requirement
No consumer products with any content of Hg, Pb, Cd or Cr (VI) must be produced.

Scope
This requirement applies for all industrial sectors.

Rationale
This requirement is based on the packaging directive, the End of Life Vehicle (EoLV) directive, and on the directive on Reduction of Hazardous Substances (RoHS).

Verification
The company must provide a declaration on non-use of these heavy metals.

Reporting
No reporting is necessary, but the company could declare in their environmental performance report that these metals are not used.

Comments
The EU's Restriction of Hazardous Substances (RoHS) directive will restrict the use of lead, cadmium, mercury, and chromium from electronic products without specific exemptions by July 1, 2006.

Article 4.1 "Prevention" in the EU Directive on RoHS from 2003 states: "Member States shall ensure that, from 1 July 2006, new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE). National measures restricting or prohibiting the use of these substances in electrical and electronic equipment which were adopted in line with Community legislation before the adoption of this Directive may be maintained until 1 July 2006."

However, in August 2005, maximum concentration values were established as follows (EU Commission Decision on MCV in electronic equipment 2005): "For the purposes of Article 5(1)(a), a maximum concentration value of 0,1 % by weight in homogeneous materials for lead, mercury, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) and of 0,01 % by weight in homogeneous materials for cadmium shall be tolerated".

In other areas than electronic and electrical equipment the use of these heavy metals is also restricted – e.g. in packaging materials. In the Directive on end-of life vehicles (2000) the same heavy metals are also restricted: "Member States shall ensure that materials put on the market after 1 July 2003 do not contain lead, mercury, cadmium or hexavalent chromium other than in the cases listed in Annex II under the conditions specified therein".

As these metals are restricted in several areas the non-use of the heavy metals is made as a general requirement even though it may be a too strict requirement for certain industries (e.g. for some special types of coatings, for some types of batteries, copper alloys containing lead, galvanized steel products). As an alternative approach, some products could be exempted from this requirement (as in the case of the WEEE directive), but that is out of the scope of this study and will have to be subject to a detailed investigation and discussion.

One could also discuss if the maximum concentration values as used by the EU Directive should be used in the requirement as well.

6 Textile sector specific requirements

6.1 Introduction

Production and manufacturing of textiles is characterised by applying a wide range of raw materials, additives and auxiliaries to a number of processes, many of which are tailored to meet specific technical requirements and create a high quality level of the finished products.

The textile industry is known to be relatively demanding on the environment, having a large consumption of water and energy, generating emissions to air and water with a significant content of toxic substances, and generating large amounts of solid waste, also with a potentially large amount of toxic substances.

The textile industry has for many years faced increasingly stronger environmental regulations, especially in Northern Europe. Many abatement technologies have been identified and implemented in the industry, but the increasing demands in combination with the possibility of finding cheap labour in Eastern Europe and Asia have caused a decrease in the number of textile companies in most countries in Western Europe.

Moving the production facilities to countries with less stringent environmental requirements may increase the rentability in the short term on the expense of the environment. In a world where environmental issues are becoming an important parameter in the competition between different suppliers and manufacturers, documentation of the environmental performance, e.g. by publishing environmental reports, can however become a decisive factor when a customer has to choose.

But what kind of knowledge is needed to distinguish good and bad manufacturers (and good and bad products) from each other? For products, the answer is relatively simple. Internationally recognised ecolabelling systems like the EU Flower, the Nordic Swan and the Swedish Bra Miljöval have developed strict criteria for the award of the ecolabel to products, and the common consumer has the option of purchasing textile products that are of a high environmental standard. However, some of the ecolabel criteria and the documentation requirements are difficult to comply with for many manufacturers, perhaps primarily because the supply chain is very long and information has to be collected throughout the chain in order to provide the necessary documentation. As a consequence, the amount of ecolabelled products on the market is rather limited.

Establishing benchmarks and criteria for good environmental performance is an important step in the process of making good manufacturers recognizable. The main challenge in this is to create benchmarks and criteria that are applicable to all manufacturers within a given sector, in this case the textile sector. As stated above, the textile industry and its products is very

heterogeneous and accordingly, the ecolabel criteria have to address a wide range of environmentally relevant issues. For textile manufacturers to provide documentation of the environmental performance of the whole production may prove to be equally difficult, if the performance shall be compared to that of other companies.

The following examples show how some environmental aspects can be handled on a scale common to all companies. They also indicate the difficulties encountered when trying to go into detail with production processes and use of raw materials and auxiliaries.

The examples are derived from sources, described briefly in the following sections. The sources cover national guidelines, developed specifically for the textile sector, EU eco-labelling criteria for textile products, the Oeko-Tex standards for textiles and for textile companies, the Pollution Prevention and Abatement Handbook, and IPPC Reference Document on Best Available Techniques for the textiles Industry.

6.1.1 Pollution Prevention and Abatement Handbook 1998

In 1998 The World Bank published the "Pollution Prevention and Abatement Handbook 1998 – Towards Cleaner Production". The Handbook is specifically designed to be used in the context of the World Bank Group's environmental policies and the guidelines apply to all World Bank-funded projects approved after July 1, 1998.

The guidelines, which are available for almost 40 industrial sectors, including the textile industry, represent state-of-the-art thinking on how to reduce pollution emissions from the production process, and they also provide numerical targets for reducing pollution as well as maximum emission levels that are normally achievable through a combination of cleaner technology and end-op-pipe treatment.

The World Bank Guidelines can therefore be used to propose emission limit values, which to a large extent reflect the results from use of cleaner technologies. Seen in the context of documenting Best Environmental Practice, however, it should be borne in mind that the guidelines and suggested emission limit values do not necessarily provide a basis for distinguishing between "best, "good" and "bad" practices, but rather provides a baseline which should be achievable for all companies with concern for the environment, not least those with an environmental management system in place.

6.1.2 IPPC Reference Document on Best Available Techniques for the textiles industry

The extensive IPPC[10] Reference Document on Best Available Techniques for the Textiles Industry[11] gives a detailed overview of emission reduction and other techniques that are considered to be most relevant for determining BAT and BAT-based permit conditions.

[10] IPPC = Integrated Pollution Prevention and Control

[11] European Commission, Integrated Pollution Prevention and Control (IPPC), Reference Document on Best Available Techniques for the Textiles Industry, July 2003. Found at http://eippcb.jrc.es/pages/FActivities.htm.

This document is one of several Best Available Techniques Reference Documents – the so-called BREF's – that exist for several industrial sectors.

The main part of the BREF document is a thorough description of different techniques to consider in the determination of the best available technique for each textile process. Finally, the document lists the best available techniques for each step of textile processing.

The document also contains a description of the environmental aspects of the different process steps in textile processing (so-called finishing processes). Furthermore, some emission levels of environmental aspects and consumption levels of energy, water and some chemicals are also presented. The levels presented illustrate levels, which are being considered achievable by using the Best Available Techniques mentioned in the document.

However, the document does not propose actual emission limit values. The actual determination of appropriate permit conditions will involve taking account of local, site-specific factors such as the technical characteristics of the installation concerned, its geographical location and the local environmental conditions.

Therefore, the BREF document cannot be used directly as requirements. The BREF documents are extensive descriptive documents that must be converted into usable requirements. However, the IPPC BREF-document is suited for establishing requirements that address specific measures that can be taken by individual companies, irrespective of site-specific factors and geographical location, so-called "Generic BATs".

In the BREF document "Generic BATs" is defined as general BAT applicable to all types of textile operations, regardless of the processes they use or the products they produce (IPPC, 2003). This specific type of BAT has been used in this study, and has been converted to specific requirements.

An example used in this study is that the BREF document states that "it is BAT to install automated dosing and dispensing systems, which meter the exact amount of chemicals and auxiliaries required and deliver them directly to various machines through pipework without human contact" (IPPC, 2003). This has, in this study, been converted into the requirement: "Automated dosing and dispensing systems shall be installed where relevant, metering the exact amounts of chemicals and auxiliaries required and delivering them directly to the various machines through pipework without human contact."

The BREF document also offers the possibility of establishing requirements relating to specific processes and selection of chemicals. Implementing such requirements in a general framework like EMAS or ISO 14001 is, however, difficult as the actual range of processes and products determines the relevance of most of the requirements. Some examples with specification of both requirements and verification are given in this report, along with additional examples of process-specific requirements but without suggestions for verification procedures (see section 6.12 Additional examples).

The examples demonstrate that it is possible to establish requirements at this level of detail. It must, however, be borne in mind that in order to cover the

textile industry as a whole, many requirements of this kind (non-generic and process specific) are needed.

6.1.3 Eco-labelling

Numerous eco-labelling schemes exist for textile products. The most comprehensive eco-labelling schemes within this area are (in order of number of licenses):

1. The Oeko-tex 100 (not an actual eco-label, as it only focuses on chemicals in the final product, but is used in this context anyhow)
2. The EU Flower
3. Good environmental choice (Sweden)
4. The Nordic Swan

Common for the EU Flower, the Nordic Swan and the Swedish Good Environmental Choice is that they include both process and product related criteria. Oeko-tex 100 exclusively concentrates on product related criteria that can be measured and verified in the finished textile product.

During 2004, a study has been performed for the Consumer Council at the Austrian Standards Institute – "Environmental baseline requirements for textiles" (Poulsen PB, 2004). The aim of the study was to set environmental baseline requirements for all textile products on the market. The environmental baseline requirements were established so that the criteria are less stringent than the eco-label criteria but sufficiently stringent to lead to an improvement of the environmental situation, e.g. a significant percentage of the products on the market cannot comply with them (10-20%).

In that respect, these environmental baseline requirements are not directly suitable for the use for requirements for environmental management systems as the requirements are not strict enough. The surrounding world automatic have higher expectations to companies with implemented environmental management systems, for which reason the requirements should be set more strict, e.g. as the requirements used for eco-labelling of textiles. Therefore, the environmental baseline requirements set for textiles, in the above mentioned project, is used as requirements for environmental management systems in this project – the actual limit values are however replaced with the limit values used in eco-labelling. In some cases, nevertheless, the limit values will be the same, as the limit values set by eco-labelling was used directly as baseline requirement for textiles.

The limit values used are the values used in the EU Flower or in Oeko-Tex 100, as these are the most used and most extensive criteria. The approaches of the two eco-labelling systems are however different, as Oeko-Tex 100 solely focuses on what can be measured and verified in the final textile product. Whereas the EU Flower primarily focuses on process specific requirements.

6.1.4 Oeko-Tex 1000

The Oeko-tex Association has established an Oeko-Tex 1000 Standard, which aims to provide an accreditation system for environmental friendly production. It is a standard for environmental management systems like ISO

14001, but is specifically adapted for the textile industry. Only about 30 companies have an Oeko-Tex 1000 certification today.

In contrast to ISO 14001 or EMAS, Oeko-Tex 1000 has set up criteria and limit values for the environmental performance of the company, i.e. a minimum environmental standard is required. The Oeko-Tex 1000 product certification requires that 90% of the production site must be certified.

Oeko-Tex 1000 contains two parts. Part A, which contains the requirements for certification of production sites and Part B, which covers the requirements for the labelling of textile products. Manufacturing sites satisfying a strict set of limit value criteria are licensed to carry the label *'Environmentally Friendly Manufacturing Site'*. A finished product, which fulfills the requirements of the Oeko-Tex 100 and is produced on sites carrying the Oeko-Tex 1000 license, can be labeled *'Oeko-Tex Standard 100 plus'*. At least 30% of the produced textile products have to be certified according to the Oeko-Tex 100 standard.

One could argue that a possible requirement could be simply to live up to the criteria set by the Oeko-Tex 1000 standard. However, for certain aspects (especially with regard to chemicals) there is an overlap between the Oeko-Tex 1000 standard and the other eco-labelling schemes. It is therefore chosen to spell out the individual requirements that could be used for environmental management systems.

The Oeko-Tex 1000 standard sets specific limit values for emissions to waste waters (for metals, AOX and COD) and for emissions to air (for carbon monoxide, dust, sulphur dioxide, and nitrogen oxides). However, for these specific mentioned emissions *five* different limit values are listed, each value represents a grade in the Oeko-Tex 1000 standard grading system, as listed in the table below. The grading varies between –3 and +1, where the limit values under grading –3 are the highest limit values (higher emissions are allowed), where the limit values under grading +1 are the lowest limit values.

Illustration of the grading system used in the Oeko-Tex 1000 standard for emissions to waste waters and to air.

Grading	-3	-2	-1	0	+1
Emissions to waste waters	highest limit values				lowest limit values
- different metals					
- AOX					
- COD					
Emissions to air					
- carbon monoxide					
- dust					
- sulphur dioxide					
- nitrogen oxides					

In the application process, the applicants must fill in a comprehensive questionnaire, and the answers from this decide, which grading the company must fulfil. The idea with the grading system was that some production sites might have higher emissions (a lower grading), whereas other production sites may have lower emissions (a higher grading). The emissions listed for grade 0 was meant to be the target as starting point (continuous improvements are still required). However, in practise an individual evaluation is performed.

For the purpose of using the limit values in the Oeko-Tex 1000 standard, the emission level listed as grade 0 is used directly as a requirement. Some overlap exists between the World Bank Handbook and the Oeko-Tex 1000 standard with regard to effluent discharged directly to surface waters. The grade 0

values from Oeko-Tex 1000 are comparable to the limit values from the World Bank Handbook with respect to emissions of metals.

6.1.5 Discussion

One of the ideas with this study is to transform the environmental management system into an eco-label for companies. The following are examples of what can be used as measurable requirements for companies with EMS. Some requirements are process specific requirements and others are product related. All requirements are valid and usable in an eco-label of companies, but in order to link the two approached – eco-labelling of companies and eco-labelling of products, it is necessary with a requirement that states, which amount of products that are supposed to comply with the product related requirements.

It may be a too strict requirement to believe that all the produced products must comply with the product related criteria. If the percentage should be 30, 50 or 90% is, however, more of a political discussion, and it is subject of a political process to determine the exact level of ambition.

It is stressed that not all the mentioned requirements should be used if the goal is to get as many companies to use the requirements as possible. If too many and/or too strict requirements are set, this will result in that fewer companies will meet the requirements. This is known from eco-labelling of textiles, where some of the criteria are difficult to comply with, partly because the textile industry is complex with regard to the number of suppliers, and number of sub-processes involved.

For this reason, the following should be regarded as examples, from which specific requirements should be carefully picked to obtain a perfect balance between achieving a large enough environmental effect and getting as many companies as possible to use and meet the set of requirements.

6.2 Subject: General principles

6.2.1 Requirement No TE- 1: Organic cotton

Requirements
A minimum amount of x% (w/w) of the cotton used shall be organically grown cotton.

Scope
This requirement applies to all companies and production sites that base their production on textile fibres, yarn or fabric made of cotton.

Rationale
This requirement is suggested because using such a requirement will reduce the amount of pesticides used in the processing of cotton. Furthermore, this requirement is used in a similar form in the EU eco-label the Flower for textiles.

Verification
The amount (weight) of organically grown cotton is to be verified. Verification can be performed by listing the weight of cotton received from all used suppliers together with verification of, which of the suppliers that grow organic cotton. On the basis of the total weight of cotton used by the company the percentage of the organic cotton can be calculated. A third party should check verification.

Reporting
In the company's environmental performance report they could report how large a percentage of the total amount of used cotton that are organic cotton.

Comments
This requirement is developed especially for the textile industry. However, it is possible to make a general requirement, where preference should be given to organic products.

Market conditions (availability and prices) for organically grown cotton are known to fluctuate significantly. It is therefore not an operational option to demand that organically grown cotton is always used. However, use of organically grown cotton can make the verification of the requirement of no pesticides used for cotton both easier and cheaper.

No fixed percentage has been stated. This figure must be fixed following additional research to make sure that it stimulates demand, but does not lead to an excessive demand of organic cotton, which cannot be fulfilled.

In the EU eco-labelling of textiles, a use of 50% of organically grown cotton excepts the applicant from the rule of analysing the content of certain pesticides in the cotton fibres. (EU Flower eco-labelling, 2002).

6.3 Subject: Air emissions

6.3.1 Requirement No TE- 2: Emission of CO, SO_2, and NO_x

Requirement
The exhaust air of firing plants and steam plants must not contain more carbon monoxide, sulphur dioxide and nitrogen oxides than stated below in the table.

Emission levels of carbon monoxide, sulphur dioxide and nitrogen oxides.

	Maximum value in mg/m^3					
Parameter	CO		SO_2		NO_x	
Thermal value of plant	2-50 MW	>50 MW	2-50 MW	>50 MW	2-50 MW	>50 MW
Use of solid fuel	200		1500	1200	450	
Use of liquid fuel	150					
Use of gaseous fuel	150					

For NO_x nitrogen monoxide and nitrogen dioxide is measured as NO_2.

Scope
This requirement applies to all companies and production sites that have firing plants or steam plants with a thermal value exceeding 2 MW.

Rationale
This is a requirement in the Oeko-Tex 1000 standard.

Verification
The total emissions to air (measured in mg/m^3) caused by the company must be measured and verified for the above-mentioned pollutants. Monitoring of air quality by an accredited laboratory at intervals sufficiently frequent to demonstrate compliance with the requirement. E.g. by use of half-hour mean values (as is required in the Oeko-Tex 1000 standard). For larger plants (exceeding a thermal value of 50 MW) continuous emission measurements of the parameters must be carried out.

Reporting
In the company's environmental performance report they could report e.g. monthly or yearly mean values for the different emission parameters. The emission levels could be compared to local or national emission level requirements.

Comments
The values used are the limit values listed under grading 0 in the Oeko-Tex 1000 standard. If the purpose is to lower the limit values or to make the values stricter, then other limit values from the other gradings can be used.

For comparison and as an example the limit values for the grading –1 are listed in the table below. All these limit values are hence higher than the limit values suggested as the requirement.

Examples of other emission levels of carbon monoxide, sulphur dioxide and nitrogen oxides (represents the grading of –1 in the Oeko-Tex 1000 standard).

	Maximum value in mg/m³					
Parameter	CO		SO_2		NO_x	
Thermal value of plant	2-50 MW	>50 MW	2-50 MW	>50 MW	2-50 MW	>50 MW
Use of solid fuel	500		2000	1700	600	
Use of liquid fuel	250					
Use of gaseous fuel	250					

All limit values for carbon monoxide given for the five different gradings in the Oeko-Tex 1000 standard ranges between 80 and 1500 mg/m^3 depending on the type of fuel used. For SO_2 the limit values for the different gradings ranges between 400 and 3000 mg/m^3 depending on the thermal value of the plant. For NO_x the limit values for the different gradings ranges between 300 and 1200 mg/m^3.

6.3.2 Requirement No TE- 3: Dust

Requirement
The exhaust air of firing plants above 10 MW must not emit more than 50 mg/m^3 of dust.

Scope
This requirement applies to all companies and production sites that have firing plants above 10 MW. The requirement applies for all types of fuels.

Rationale
This is a requirement in the Oeko-Tex 1000 standard.

Verification
The concentration of dust in the exhaust air of firing plants is to be verified. Regular measurements are required in order to show compliance. E.g. by use of half-hour mean values (as is required in the Oeko-Tex 1000 standard). For larger plants (exceeding a thermal value of 50 MW) continuous emission measurements must be carried out.

Reporting
In the company's environmental performance report they could report e.g. monthly or yearly mean values for the emission of dust. The emission levels could be compared to local or national emission level requirements.

Comments
The values used are the limit values listed under grading 0 in the Oeko-Tex 1000 standard. If the purpose is to lower the limit values or to make the values stricter, the other limit values from the other gradings can be used.

As an example the limit value for the grading –1 is a maximum emission of 80 mg/m^3 of dust. All limit values given in the Oeko-Tex 1000 standard ranges between 30 and 150 mg/m^3 for the different gradings.

6.3.3 Requirement No TE- 4: VOC emissions

Requirement
VOC emissions shall be less than 1 kg carbon per metric ton of fabric, or 20 milligrams per normal cubic meter.

Scope
This requirement is developed especially for the textile industry. The scope is to reduce the VOC emissions, which primarily are emitted in larger quantities during the polymerisation process of polyester.

Rationale
The requirement is stated by the World Bank Handbook, but a similar requirement is a criterion in the European eco-label of textiles (the EU Flower)[12]. Here the requirement is 1.2 g/kg (equal to 1.2 kg/ton) produced polyester resin.

Verification
Total VOC emissions (measured as carbon per metric ton of fabric) are to be verified. Reports showing compliance with the requirement, e.g. by using accredited measurements as the basis for calculations of carbon emissions per kg fabric.

Reporting
In the company's environmental performance report they could report their monthly or yearly emissions of VOC's per tonne of fabric. This number could be used as a key parameter, which is used to compare the emissions year for year.

Comments
The World Bank Handbook does not give an indication of whether this requirement is relevant to all process steps in textile production and manufacturing.

It is mentioned that the Irish EPA in their Batneec guidance note for textile finishing[13] sets the emission limit for VOC (as C, excluding formaldehyde) to 50 mg/m^3, and supplements this value with specific limits for formaldehyde (20 mg/m^3), isocyanates (0.1 mg/m^3, as NCO) and particulates (50 mg/m^3).

[12] Commission Decision of 15 May 2002 establishing the ecological criteria for the award of the Community eco-label to textile products and amending Decision 199/178/EC. 2002/371/EC.
[13] Environmental Protection Agency (1997). Integrated Pollution Control Licensing. Batneec Guidance Note for Textile Finishing. Ardcavan, Wexford.

6.4 Subject: Liquid effluents

6.4.1 Requirement No TE- 5: Effluent to surface waters

Requirement
The effluent discharged from the company directly to surface waters shall not exceed the levels presented in the table below

Emission levels for effluent discharged to surface waters

Parameter	Maximum value (mg/l, except for pH, temperature and bacteria)
pH	6-9
BOD	50
COD	250
AOX	8
TSS	50
Oil and grease	10
Pesticides (each)	0.05
Chromium (total)	0.5
Cobalt	0.5
Copper	0.5
Nickel	0.5
Zinc	2
Phenol	0.5
Sulfide	1
Mercury	0 (shall not be used)
Temperature increase	< 3°C
Coliform bacteria	400 MPN/100 ml

Scope
This requirement applies to all companies and production sites that manufacture products or semi products within the textile industry.

Rationale
This requirement is based on the limit values from the World Bank guidelines. For some parameters the limit values are stricter in the Oeko-Tex 1000 standard (for the grading of 0).

Verification
Total emissions levels to surface waters for the abovementioned parameters are to be verified. Regular measurements are required in order to show compliance. Monitoring of water quality by an accredited laboratory at intervals sufficiently frequent to demonstrate compliance with the requirement.

Reporting
In the company's environmental performance report they could report e.g. monthly or yearly mean values for the emission to surface waters. The emission levels could be compared to local or national emission level requirements.

Comments
The World Bank guidelines state that only those metals that are detected or are suspected to be present should be monitored. If the presence of the heavy metals such as arsenic, cadmium, lead, mercury and nickel is suspected, those substances should be included in the monitoring programme and treated to achieve the levels mentioned in the "Generally Applicable Guidelines".

The Irish EPA has in its Batneec Guidance Note for Textile Finishing specified emission limit values for more parameters than the World Bank, and it also specified other values for some of the compounds. Most notably, the limit value for COD is 160 mg/l (World Bank: 250 mg/l) and for AOX (Adsorbable organic halogen compounds) the limit value is 0.5 mg/l (World Bank: 8 mg/l). Small emissions of mercury are allowed (0.001 mg/l), whereas mercury must not be present according to the World Bank guidelines. The limit values for metals and heavy metals otherwise corresponds to the limits used by the World Bank, either in the requirements specific for the textiles industry or in the General Industry Guidelines.

The Oeko-Tex 1000 standard has also specified emission limit values for effluents to waters. These are listed in the table below beside the World Bank guidelines for comparison. Only the parameters for which Oeko-Tex 1000 have set limit values are listed.

Parameter (measured in mg/l)	World Bank guidelines Maximum value	Oeko-Tex 1000 Maximum value
pH	6-9	6.5-9.0
COD	250	180
AOX (as Cl)	8	0.4
Chromium (total)	0.5	0.4
Cobalt	0.5	0.4
Copper	0.5	0.4
Nickel	0.5	0.4
Max. effluent temperature	Max. temperature increase < 3°C	35 °C

As for the Batneec Guidance Note for Textile finishing from the Irish EPA, the limit values for COD and AOX are stricter in the Oeko-Tex 1000 standard (for the grading of 0) compared to the World Bank guidelines. The other limit values are however, comparable. It could therefore be discussed if the limit values for COD and AOX should be lowered when used as a requirement for the textile industry.

Emission levels for effluent discharged to surface waters. The variation represents the different gradings of the Oeko-Tex 1000 standard.

Parameter	Maximum value (mg/l, except for pH and temperature)
pH value	5.5 – 10.0
Chromium total (as Cr)	0.1 – 2.0
Cobalt (as Co)	0.1 – 2.0
Copper (as Cu)	0.1 – 2.0
Nickel (as Ni)	0.1 – 2.0
AOX (as Cl)	0.1 – 5.0
TOC (as C)	40 – 200
COD (as O_2)	120 – 400

The values used for comparison under this requirement are the limit values listed under grading 0 in the Oeko-Tex 1000 standard. As described these limit values under grading 0 are in some cases stricter than the used limit

values from the World Bank guidelines. However, the limit values listed under grading -3 and -2 in the Oeko-Tex 1000 standard are generally higher than the used values form the World Bank guidelines – except for AOX. All limit values given in the Oeko-Tex 1000 standard for the different gradings ranges between the levels listed (in the table) for the different parameters.

Requirement No TE- 6: Effluent to public sewage treatment plant

Requirement
The effluent discharged from the company to a public sewage treatment plant shall not exceed the levels presented in the table below.

Emission levels for effluent discharged to public sewage treatment plant

Parameter	Maximum value (mg/l, except for pH, temperature and TOC/COD)
pH value	6.5 – 9.0
Max. insertion temperature	40 °C
Chromium total (as Cr)	0.4
Cobalt (as Co)	0.4
Copper (as Cu)	0.4
Nickel (as Ni)	0.4
AOX (as Cl)	0.4
AOX (as Cl) for antifelt finishing of wool	4
TOC or COD reduction by recycling and cleaning	85%

Scope
This requirement applies to all companies and production sites that manufacture products or semi products within the textile industry.

Rationale
This is a requirement in the Oeko-Tex 1000 standard.

Verification
Total emissions levels to surface waters for the abovementioned parameters are to be verified. Regular measurements are required in order to show compliance. Monitoring of water quality by an accredited laboratory at intervals sufficiently frequent to demonstrate compliance with the requirement.

Reporting
In the company's environmental performance report they could report e.g. monthly or yearly mean values for the emission to the public sewage treatment plant. The emission levels could be compared to local or national emission level requirements.

Comments
The values used are the limit values listed under grading 0 in the Oeko-Tex 1000 standard. If the purpose is to lower the limit values or to make the values stricter, the other limit values from the other gradings can be used.

All limit values given in the Oeko-Tex 1000 standard for the different gradings ranges between the levels listed in the table for the different parameters.

Emission levels for effluent discharged to public sewage treatment plant. The variation represents the different gradings of the Oeko-Tex 1000 standard.

Parameter	Maximum value (mg/l, except for pH, temperature and TOC/COD)
pH value	5.5 – 10.0
Max. insertion temperature	35 – 55 °C
Chromium total (as Cr)	0.1 – 2.0
Cobalt (as Co)	0.1 – 2.0
Copper (as Cu)	0.1 – 2.0
Nickel (as Ni)	0.1 – 2.0
AOX (as Cl)	0.1 – 5.0
AOX (as Cl) for antifelt finishing of wool	1 – 20
TOC or COD reduction by recycling and cleaning	70 – 90%

6.5 Subject: Waste

For the subject of waste we refer to the generally applicable requirements.

6.6 Subject: Noise

For the subject of noise we refer to the generally applicable requirements.

6.7 Subject: Consumption of energy in production

For the subject of consumption of energy in production we refer to the generally applicable requirements.

6.8 Subject: Consumption of water in production

6.8.1 Requirement No TE- 7: Washing

Requirement
Counter-current washing techniques shall be used in order to reduce energy and water consumption.

Scope
This requirement applies to all companies and production sites that manufacture products or semi products within the textile industry, and that uses water to wash fibres, yarn or fabric in the production.

Rationale
The requirement is taken from the IPPC BREF document.

Verification
A written statement – or a paragraph in the environmental report – showing that the company complies with the requirement, and uses counter-current washing techniques when appropriate.

Reporting
In the company's environmental performance report they could report e.g. that they use water reducing washing techniques, and their yearly water consumption.

Comments
Counter-current washing is one of several techniques to reduce water and energy consumption. Also reduction of carry-over (e.g. by using vacuum extractors) and installation of heat recovery equipment on a continuous washer are simple and effective measures. The requirement could therefore be extended to include other relevant abatement techniques.

6.9 Subject: Harzardous and harmful substances

6.9.1 Requirement No TE- 8: Non-use of pesticides in cotton

Requirement
Cotton fibres shall not contain pesticides and other hazardous substances listed on the PIC-list[14].

Scope
This requirement applies to all companies and production sites that base their production on textile fibres, yarn or fabric made of cotton.

This requirement does not apply,
- where more than 50% of the cotton content is organically grown.
- and if documentary evidence can be presented that establishes the identity of the farmers producing at least 75% of the cotton used in the final product (together with a declaration from these farmers that pesticides have not been applied to the fields or cotton plants producing the cotton in question or to the cotton it self).

Rationale
This is a general requirement in the following eco-labelling schemes: EU Flower, the Swan, and Oeko-Tex 100. Is also based on the Rotterdam Convention.

Verification
It is suggested to use the same verification methods as in criterion 2 in the EU eco-labelling scheme:

Verification must be carried out in one of these ways:
1. The company must provide proof of organic certification.
2. The company must provide documentation relating to the non-use by the farmers.
3. The company must provide documentation in form of a test report stating the measured values of the different pesticides (sensibility of the test methods is 0.05 ppm).

Reporting
In the company's environmental performance report they could report how large a percentage of the total amount of used cotton that are organic cotton, or how large a percentage of the total amount of used cotton that are fabricated without the use of pesticides.

[14] PIC stands Prior Informed Consent. *The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade* aims to provide an efficient method for exchanging information about a small number of banned or severely restricted industrial chemicals and pesticides between participating countries.

Comments
This requirement is difficult to fulfil, unless many resources or money is used for verification. It can be argued that most of the pesticides and other hazardous substances on the PIC-list are not used in today's cotton farming and will therefore not be found when testing. On the other hand, testing is the only way to verify that the raw materials are of acceptable environmental quality, a point that is very important to most environmentally conscious consumers.

A way to avoid this expensive verification is to use organically grown cotton or to have statements from the cotton suppliers that pesticides have not been used (as described in criterion 2 in the EU eco-labelling scheme).

6.9.2 Requirement No TE- 9: Non-use of pesticides in wool

Requirement
Wool used as raw material shall not contain pesticides listed in the PIC-list[15]

Scope
This requirement applies to all companies and production sites that base their production on textile fibres, yarn or fabric made of wool.

This requirement does not apply if documentary evidence can be presented that establishes the identity of the farmers producing at least 75% of the wool used in the final product (together with a declaration from these farmers that pesticides have not been applied to the fields or animals concerned).

Rationale
A similar requirement can be found in the EU eco-labelling scheme The Flower, where some pesticides are banned.

Verification
Verification must be carried out in one of these ways:

1. The company must provide documentation relating to the non-use of pesticides by the farmers.
2. The company must provide documentation in form of a test report stating the measured values of the different pesticides (sensibility of the test methods is 0.05 ppm).

Reporting
In the company's environmental performance report they could report how large a percentage of the total amount of used wool that is fabricated without the use of pesticides.

Comments
As for cotton, testing for absence of pesticides is rather costly, especially as every batch should be tested. The IPPC BREF-document mentions that a number of organisations maintain information on the pesticides content of greasy and scoured wool. Manufactures can use this information to minimise at source any legally used pesticides such as organo-phosphate (OP) and synthetic pyrethroid (SP) ectoparasiticides and to avoid processing wool contaminated with the most hazardous chemicals, such as organo-chlorine (OC) pesticides.

It can therefore be considered to make a requirement for wool-processing textile companies that the concentration of each of the relevant pesticides should be below a specified limit, e.g. 0.05 mg/l as suggested by the World Bank or 0.003 mg/ml (as Cl) for OC pesticides and 0.0003 mg/ml (as P) for OP pesticides as suggested by the Irish EPA.

[15] PIC = Prior Informed Consent. For explanation see the previous footnote.

6.9.3 Requirement No TE- 10: Treatment of fibres

Requirement
The selected fibers shall be treated with low-emission and biodegradable/bioeliminable preparation agents.

Scope
This requirement applies to all companies and production sites that process textile fibres within the textile industry.

Rationale
It is a requirement in the EU eco-labelling scheme that preparation agents are sufficiently biodegradable. Furthermore, this is an aim in the Oeko-Tex 1000 standard for sizes, as well as sizes not being bioaccumulative.

Verification
Preparation agents (sizes, spinning solution additives, spinning additives and preparation agents for primary spinning) shall fulfil the requirements in the EU eco-labelling scheme for textiles, criterion 10a and 10b.

Reporting
Oeko-Tex 1000 operates with a declaration requirement for sizes, conserving agents and spinning oils. The company has to notify the amount and substances used. A similar approach could be used.

Comments
According to a report to the Austrian Consumer Council[16], many applicants for the EU-ecolabel for textiles claim that this criterion is difficult to comply with, as one or more of the chemical formulations used are not sufficiently biodegradable.

The requirement may therefore be seen as difficult to comply with by some companies. It should, however, be borne in mind that environmental management systems already have requirements for a dialogue between a certified company and its suppliers and customers. The specific requirement is in this context an example of how the dialogue and information exchange can be focused on subjects that are important not only for the company itself but throughout the product chain.

[16] Poulsen PB (2004). Environmental Baseline requirements for textiles. Study for the Consumer Council at the Austrian Standards Institute.

6.9.4 Requirement No TE- 11: Dosing and dispensing of chemicals

Requirement
Automated dosing and dispensing systems shall be installed where relevant, metering the exact amounts of chemicals and auxiliaries required and delivering them directly to the various machines through pipework without human contact.

Scope
This requirement applies to all companies and production sites that manufacture products or semi products within the textile industry, but can also be used as a more general requirement.

Rationale
This is an example of a generic BAT, derived from the IPPC BREF-document. The requirement is relevant as it may save up to 20% on the use of chemicals[17] and – equally important – a corresponding amount of chemicals in liquid effluent.

Verification
A signed statement from the manufacturer, showing compliance with the requirement. If possible the statement should include an estimate of the reduction in consumption of chemicals achieved by implementing automated dosing and dispensing system.

Reporting
No reporting is necessary, but the calculated estimate of the reduction in consumption of chemicals achieved by implementing automated dosing and dispensing systems could be reported in the company's environmental performance report.

[17] Kalliala E, Talvenmaa P (2000). The Finnish Background Report for the EC documentation of Best Available Techniques for Wet Processing in Textile Industry. The Finnish Environment No. FE 426.

6.9.5 Requirement No TE- 12: Biodegradability of detergents, fabric softeners and complexing agents

Requirement
At least 95% by weight of detergents, at least 95% by weight of fabric softeners and at least 95% by weight of complexing agents used shall be sufficiently biodegradable or eliminable in waste water treatment plants.

The definition of "sufficiently biodegradable" as used in EU eco-label criteria for textiles, criterion 10.

Scope
This requirement is developed especially for the textile industry. The requirement applies for each wet-processing site.

Rationale
The requirement is criterion no. 15 in EU eco-label criteria for textiles.

Verification
Compliance must be shown for all detergents, fabric softeners and complexing agents used. Documentation in the form of safety data sheets and test reports indicating test methods and results.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report e.g. how large a percentage of their used chemicals that are easily biodegradable.

Comments
According to a report to the Austrian Consumer Council[18], many applicants for the EU-ecolabel for textiles claim that this criterion is difficult to comply with. Often the chemicals used are just not sufficiently biodegradable.

The requirement may therefore be seen as difficult to comply with by some companies. It should, however, be borne in mind that environmental management systems already have requirements for a dialogue between a certified company and its suppliers and customers. The specific requirement is in this context an example of how the dialogue and information exchange can be focused on subjects that are important not only for the company itself but throughout the product chain.

[18] Poulsen PB (2004). Environmental Baseline requirements for textiles. Study for the Consumer Council at the Austrian Standards Institute.

6.9.6 Requirement No TE- 13: Prohibited chemicals - Non-use of azo dyes

Requirement
The company shall not use azo-dyes that may cleave to one of 22 potentially carcinogenic aromatic amines (i.e. those listed in e.g. the EU eco-label criteria for textiles).

Scope
This requirement is developed especially for the textile industry. The requirement applies for all textiles that are dyed.

Rationale
Is listed as criteria 21 "Azo dyes" in the EU eco-label of textiles, and as part of the prohibited chemicals in Oeko-Tex 1000 (section 6.2.1).

Verification
The company shall provide a declaration of the non-use of these dyes.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report that azo-dyes have not been used in the production of the textile products.

Comments
Although the use of such azo-dyes is banned according to the 19. Amendment of Directive 76/769/EWG on dangerous substances, there are still more than 100 dyes on the market with the potential of forming carcinogenic amines.

This requirement is an integral part of the ecolabel criteria for textiles. Companies that can provide adequate documentation for the non-use of the specified chemicals will not only have a better environmental performance but they will also be able to help subsequent links in the product chain to a better performance, including the possibility of applying for the EU ecolabel for a textile product.

It is mentioned that the requirement could be elements in a system for selection and use of chemicals, as suggested in section 6.9.5.

6.9.7Requirement No TE- 14: Prohibited chemicals - Non-use of dyes that are carcinogenic, mutagenic, toxic to reproduction or potentially sensitising

Requirement
The company shall not use dyes that are carcinogenic, mutagenic, toxic to reproduction or potentially sensitising as defined in the EU eco-label criteria for textiles, Criterion 22 and 23.

Scope
This requirement is developed especially for the textile industry. The requirement applies for all textiles that are dyed.

Rationale
Is listed as criteria 22 and 23 in the EU eco-label of textiles, and as part of the prohibited chemicals in Oeko-Tex 1000 (section 6.2.1).

Verification
The company shall provide documentation for the non-use of such dyes, corresponding to the verification requirements in the EU eco-label scheme.

Reporting
In the company's environmental performance report they could report that dyes that are carcinogenic, mutagenic, toxic to reproduction or potentially sensitising have not been used in the production of the textile products.

Comments
This requirement is an integral part of the ecolabel criteria for textiles. Companies that can provide adequate documentation for the non-use of the specified chemicals will not only have a better environmental performance but they will also be able to help subsequent links in the product chain to a better performance, including the possibility of applying for the EU ecolabel for a textile product.

It is mentioned that the requirement could be elements in a system for selection and use of chemicals, as suggested in section 6.9.5.

6.9.8 Requirement No TE- 15: Prohibited chemicals - Non-use of biocides for storing and transportation

Requirement
Use of pesticides for storing and transportation is not allowed, as defined in the EU eco-label for textiles, criteria 11.

Scope
This requirement is developed especially for the textile industry. It is only valid during transportation and/or storage of products and semi-manufactured products (yarn, fabric, and final product).

Rationale
This is a criterion in different eco-labelling schemes (EU Flower, the Swan, Good Environmental choice) and in Oeko-Tex 100 and Oeko-Tex 1000.

Verification
The company shall provide a declaration of non-use.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report that biocides have not been used.

Comments
Oeko-Tex 1000 operates with pesticides in general, which are not allowed during transportation and storage, whereas the other eco-labelling schemes operate with restrictions for specific compounds.

6.9.9 Requirement No TE- 16: Prohibited chemicals - Non-use of biocides in the use phase of the textile product

Requirement
Use of biocides/biostatics is not to be applied to products so as to be active during the use phase, as defined in the EU eco-label for textiles, criteria 11.

Scope
This requirement is developed especially for the textile industry. It is only valid for the use phase of textile products and semi-manufactured textile products (yarn, fabric, and final product).

Rationale
This is a criterion in the EU eco-labelling scheme the Flower and in Oeko-Tex 100.

Verification
The company shall provide a declaration of non-use.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report that biocides have not been used.

6.9.10 Requirement No TE- 17: Prohibited chemicals - Non-use of specific flame retardants

Requirement
Use of brominated flame retardants, flame retardants containing the metals antimony or arsenic, and flame retardants with chloroparaffines or fluorides is not allowed, as described in Oeko-Tex 1000 standard, chapter 6.2.1.

Scope
This requirement applies to all companies and production sites that manufacture products or semi products within the textile industry.

Rationale
It is a requirement in most eco-labelling schemes that certain flame retardants must not be used. Some eco-labelling schemes do, however, have longer lists than others.

Verification
The company should provide a declaration of non use of these specific flame retardants or describe which flame retardants that have been used.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report e.g. that flame retardants have not been used at all or that certain flame retardants have not been used for the textile products.

Comments
The Oeko-Tex standards (100 and 1000) both list certain flame retardants that must not be used, as well as other eco-labeling schemes. The EU eco-labelling scheme, however, chooses a different approach based on risk phrases, where no flame retardant substances or preparations must be used if more than 0.1% by weight of the substances are assigned with certain risk phrases. The approach by the EU eco-labelling scheme is more heavy with respect to the verification, but has it advantages as the requirement do not need to be updated, if new information becomes available.

This requirement is an integral part of the ecolabel criteria for textiles. Companies that can provide adequate documentation for the non-use of the specified chemicals will not only have a better environmental performance but they will also be able to help subsequent links in the product chain to a better performance, including the possibility of applying for the EU ecolabel for a textile product.

It is mentioned that the requirement could be elements in a system for selection and use of chemicals, as suggested earlier.

6.9.11 Requirement No TE- 18: Prohibited chemicals - Non-use of chlorinated organic carriers

Requirement
Chlorinated organic carriers must not be used, as described in Oeko-Tex 1000, chapter 6.2.1.

Scope
This requirement applies to all companies and production sites that manufacture products or semi products within the textile industry.

Rationale
This is a criterion, which is used in the EU eco-labelling scheme, and in both Oeko-Tex standards, even though the form is somewhat different.

Verification
The company must provide a declaration of non-use.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report e.g. that no chlorinated organic carriers have been used.

Comments
In the EU eco-labelling scheme this criterion covers all halogenated carriers and not only chlorinated. In contrast, the criterion is only valid for polyester, whereas it is stated as a general requirement in the Oeko-Tex 1000 standard.

6.9.12 Requirement No TE- 19: Prohibited chemicals - Non use of specific tensides and softeners

Requirement
APEOs, LAS, EDTA, DTPA, DTDMAC, DSDMAC and DHTDMAC must not be part of any preparation used, as described in EU eco-labelling scheme, criterion 14.

Scope
This requirement applies to all companies and production sites that manufacture products or semi products within the textile industry.

Rationale
It is a criterion that is used in the EU eco-labelling scheme, the Swan, Good environmental choice, and Oeko-Tex 1000. However, of these, only the EU eco-labelling scheme covers DADMAC, DTDMAC and DSDMAC. In Oeko-Tex 1000 avoidance of these three substances are only mentioned as a goal.

Verification
The company must provide a declaration of non-use.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report e.g. that these substances have not been used in any formulation used for the processing of textile products.

Comments
According to a report to the Austrian Consumer Council[19], many applicants for the EU-ecolabel for textiles claim that this criterion is difficult to comply with. One of the biggest problems is no content of APEO (alkylphenolethoxylates) and EDTA (ethylene diamine tetra acetate) in any preparations or formulations used. When the applicants examine their auxiliary chemicals it often turns out that many of them contain small amounts of APEO, and they are therefore forced to replace these auxiliary chemicals.

The requirement may therefore be seen as difficult to comply with by some companies. It should, however, be borne in mind that environmental management systems already have requirements for a dialogue between a certified company and its suppliers and customers. The specific requirement is in this context an example of how the dialogue and information exchange can be focused on subjects that are important not only for the company itself but throughout the product chain.

[19] Poulsen PB (2004). Environmental Baseline requirements for textiles. Study for the Consumer Council at the Austrian Standards Institute.

6.9.13 Requirement No TE- 20: Non-use of chrome for dyeing

Requirement
Chrome (dichromate) must not be used for dyeing.

Scope
This requirement applies to all companies and production sites that dye products or semi products (fibres, yarn or fabric) within the textile industry.

Rationale
The EU eco-labelling scheme uses a requirement of prohibiting chrome mordant dyeing (use of dichromate) (criterion 19), and Oeko-Tex 1000 prohibits the use of dichromate as oxidising agent to improve colour fastness (chapter 6.2.2).

Verification
The company must provide a declaration of non-use.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report that chrome has not been used for dyeing of their textile products.

6.9.14 Requirement No TE- 21: Restriction on the bleaching process

Requirement
Except for flax and bast fibres, bleaching shall be performed by using hydrogen peroxide as the bleaching agent, combined with techniques for minimising the use of hydrogen peroxide stabilisers or using biodegradable/bioeliminable complexing agents. Flax and bast fibres shall be bleached with a two-step hydrogen peroxide-chlorine dioxide bleaching process, in which it is ensured that elemental chlorine-free chlorine dioxide is used.

Scope
This requirement applies to all companies and production sites that bleach products or semi products (fibres, yarn or fabric) within the textile industry.

Rationale
This requirement is mentioned as BAT for the bleaching process of textiles in the IPPC Reference Document on Best Available Techniques for the textiles Industry[20].

Verification
A written declaration from the company, stating that hydrogen peroxide is the preferred (or only) bleaching agent used.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report that hydrogen peroxide is the preferred (or only) bleaching agent used.

Comments
The verification only concerns the bleaching agent and not its stabilisers or complexing agents. It is mentioned that hydrogen peroxide is not suitable for bleaching of all fibre types and some companies may therefore find it difficult to comply with the requirement, unless qualified exemptions are acceptable.

[20] European Commission, Integrated Pollution Prevention and Control (IPPC), Reference Document on Best Available Techniques for the Textiles Industry, July 2003. Found at http://eippcb.jrc.es/pages/FActivities.htm.

6.9.15 Requirement No TE- 22: No plastisol-based (PVC-based) printing

Requirement
Plastisol-based printing is not allowed.

Scope
This requirement applies to all companies and production sites that are printing their textile products or semi products.

Rationale
The EU eco-labelling scheme uses this requirement (criterion 25b), the Swan bans the use of phthalates in general and the Oeko-Tex 100 sets a limit value of 0.1% of different phthalates in the finished textile product.

Verification
The company must either provide a declaration that no printing has been made or provide other appropriate documentation together with a declaration of compliance.

Reporting
In the company's environmental performance report they could report that they do not use plastisol-based printing, and that their textile products are free from phthalates.

Comments
Another way to verify this requirement is to measure for the content of certain phthalates in the finished textile product, according to Oeko-Tex 100.

6.9.16 Requirement No TE- 23: No printing with heavy benzine

Requirement
Printing systems based on heavy benzine is not allowed.

Scope
This requirement applies to all companies and production sites that are printing their textile products or semi products.

Rationale
The Oeko-Tex 1000 standard uses this requirement (chapter 6.2.2). The EU eco-labelling scheme uses a somewhat similar but stricter criterion, where printing pastes may not contain more than 5% VOC's.

Verification
The company must either provide a declaration that no printing has been made or provide other appropriate documentation together with a declaration of compliance.

Reporting
No reporting is necessary, but in the company's environmental performance report they could report that they do not use heavy benzene for printing.

Comments
A requirement of limiting the VOC emissions from the company has also been made. However, such a requirement may to some extent restrict the use of heavy benzine for printing.

6.9.17 Requirement No TE- 24: No chlorinated organic solvents in open systems

Requirement
Chlorinated and fluorochlorinated organic solvents may not be used in open systems.

Scope
This requirement applies to all companies and production sites that manufacture products or semi products within the textile industry.

Rationale
The Oeko-Tex 1000 standard uses this requirement (chapter 6.2.2).

Verification
The company must provide a declaration of non-use or a declaration that states that chlorinated and fluorochlorinated organic solvents are not used in open systems.

Reporting
No reporting is necessary, but in the company's environmental performance report they could e.g. report that such substances have not been used.

6.9.18 Requirement No TE- 25: Metal content in the finished textile product

Requirement
The level of metals in the finished textile product must not exceed the following levels:

Metal	Limit value (ppm)	Limit value (ppm) for baby textiles
Antimony (Sb)	30	30
Arsenic (As)	1	0.2
Lead (Pb)	1	0.2
Cadmium (Cd)	0.1	0.1
Chromium (Cr)	2.0	1
Cobalt (Co)	4	1
Copper (Cu)	50	25
Nickel (Ni)	4	1
Mercury (Hg)	0.02	0.02

Scope
This requirement is developed especially for the textile industry, and is only valid for the textile end product.

Rationale
The metal content in the finished textile products is a criterion in Oeko-Tex 100 and in the Swan. The Swan, however, only sets limit values for the end product for the metals arsenic, cadmium and lead.

Verification
The total ppm levels of the abovementioned metals in the finished textile product is to be verified. The company must show a test report with measurements of the metal content in their finished textile product in order to show compliance with the requirement. The metal content must be measured as the extractable content in finished textile products.

Reporting
In the company's environmental performance report they could e.g. report that they ensure that the content of metals in the finished textile product is lower than normal for textile products, and is under control because the content is measured regularly.

Comments
Only the Swan and Oeko-Tex 100 have set criteria for the extractable content of metals in the finished textile product. The EU eco-labelling scheme restricts the metal impurities in pigments and dyes in stead.

The Swan has only set limit values for the metals arsenic, cadmium and lead, and the limit value is as high as 100 ppm as the detection limit of the measurement method is 100 ppm. Therefore the limit values used in the Oeko-Tex 100 are used.

The Oeko-Tex 100 operates with four different product classes and for each product class a limit value has been set for each metal. The four classes are:

1. Baby products
2. Textile products with direct contact with skin
3. Textile products with no direct contact with skin
4. Decoration materials

For the content of metals in the finished textile product the limit values four the product classes 2, 3 and 4 are exactly the same, except for antimony where no limit value has been set for decoration materials. Therefore, only two sets of limit values have been presented for this requirement, i.e. for textiles in general and for baby clothes, where the limit values in general are much lower, because babies will absorb a large amount of the metals when they suck on their clothes.

One could argue that using two sets of limit values for different textiles may be more complicated to handle. However, studies show that it is relevant to have lower limit values for textiles to babies as there for some metals in fact is a health risk when babies suck on their clothes with too large amounts of metals[21].

[21] See the following study for further details: Poulsen PB (2004). Environmental Baseline requirements for textiles. Study for the Consumer Council at the Austrian Standards Institute.

6.9.19 Requirement No TE- 26: Formaldehyde content in the finished textile product

Requirement
The formaldehyde content in finished textile products with skin contact must be below 30 ppm, and below 300 ppm for finished textile products with no skin contact.

Scope
This requirement is developed especially for the textile industry. It is only valid for finished textile products, i.e. not intermediate products.

Rationale
The requirement is as described in the EU eco-labelling of textiles, criteria 26.

Verification
The total formaldehyde content (measured in ppm) in the finished textile products is to be verified. The company must either provide a declaration that formaldehyde-containing products have not been used or provide a test report according to test method EN ISO 14184-1.

Reporting
In the company's environmental performance report they could e.g. report that they ensure that the content of formaldehyde in the finished textile product is lower than normal for textile products, and is under control because the content is measured regularly.

Comments
The formaldehyde limit levels listed are also used in the eco-label Good Environmental Choice. However, the Good Environmental Choice operates with a third category called outdoor clothes where the limit level is 100 ppm. Oeko-Tex 100 has in contrast a higher limit value for skin contact textiles (75 ppm), but has set a low limit value (20 ppm) for another category of baby clothes.

It can be discussed which limit values that should be used. The EU eco-labelling or Oeko-Tex 100 is however, the most widespread labelling systems. The EU criteria are stricter with regard to skin contact textiles, but the Oeko-Tex 100 sets a special lower limit value for baby textiles. A combination of the two labelling systems limit values will set stricter limit values if this is the goal.

According to a report to the Austrian Consumer Council[22], many applicants for the EU-ecolabel for textiles claim that this criterion is not that difficult to comply with. In general the companies do not have problems with fulfilling this requirement if modern dyes and chemicals are used.

[22] Poulsen PB (2004). Environmental Baseline requirements for textiles. Study for the Consumer Council at the Austrian Standards Institute.

6.10 Subject: Consumption of energy, water, etc. by products

6.10.1 Requirement No TE- 27: Amounts of waste water from textile production

Requirement
Waste water emissions shall be less than 100 cubic meters per metric tonne of fabric.

Scope
This requirement applies to all companies and production sites that manufacture products or semi products within the textile industry.

Rationale
The requirement is based on the World Bank guidelines.

Verification
The total amount of waste water (in m^3 per metric tonne of fabric) is to be verified. Reports showing compliance with the requirement. Accounting companies or other entities considered an objective and respected third party could do the verification of data and information.

Reporting
In the company's environmental performance report they could report their monthly or yearly use of waste water per tonne of fabric. This number could be used as a key parameter, which is used to compare the consumption year for year.

Comments
In the World Bank guidelines it is stated that waste water load levels up to 150 m^3 are considered acceptable.

6.11 Subject: Product quality

6.11.1 Requirement No TE- 28: Dimensional change

Requirement
The dimensional change of the textile product must be labelled clearly on the product (care label).

Scope
This requirement is developed especially for the textile industry. It is only valid for textile end products, and does not apply to fibres or yarn, products clearly labelled "Dry clean only" and furniture fabrics that are not removable and washable.

Rationale
This is a requirement in the EU eco-labelling of textiles. However, here the criterion states that labelling of the dimensional change only is necessary if the dimensional change is larger than certain percentages for certain textile products.

Verification
The dimensional change of the product (in percentage) is to be verified. The company must provide test reports using the following test method: ISO 5077, modified as described in the EU eco-labelling criterion 34.

Reporting
In this case reporting of the performance of the textile product will be reported on the end product itself.

Comments
One could argue that quality requirements of the finished textile products are not directly environmental requirements and should therefore not be included. However, first of all good quality products are a necessary image for environmental friendly companies, and secondly poor quality products have a direct impact on the environment, as a new textile product must be bought as the poor quality product – in worst case – is so not usable after washing (e.g. shrank too much).

According to a report to the Austrian Consumer Council[23], many applicants for the EU-ecolabel for textiles claim that it is difficult to live up to certain limit values for shrinkage of the finished textile product, for which reason the latest revision of the EU eco-labelling scheme included an easing of this requirement. Today the dimensional change must be stated on the textile product if the dimensional change exceeds certain limit values for specific types of textiles.

[23] Poulsen PB (2004). Environmental Baseline requirements for textiles. Study for the Consumer Council at the Austrian Standards Institute.

6.11.2 Requirement No TE- 29: Colour fastness to washing

Requirement
The colour fastness to washing must be at least a level 3 to 4 (for colour change and staining).

Scope
This requirement is developed especially for the textile industry. It is only valid for textile end products, and does not apply to products clearly labelled "Dry clean only", to white products or to products that are neither dyed nor printed or to non-washable furniture fabrics.

Rationale
This is a requirement in the EU eco-labelling of textiles and in the Oeko-Tex 100 standard. However, the limit value in Oeko-Tex 100 is a level 3.

Verification
The colour fastness to washing of the products is to be verified. The company must provide test reports using the following test method: ISO 105-C06.

Reporting
No reporting is necessary, but in the company's environmental performance report they could e.g. report that they ensure that the finished textile product is of good quality as certain quality parameters are measured regularly and have to be of a certain quality.

Comments
One could argue that quality requirements of the finished textile products are not directly environmental requirements and should therefore not be included. However, first of all good quality products are a necessary image for environmental friendly companies, and secondly poor quality products have a direct impact on the environment, as a new textile product must be bought as the poor quality product – in worst case – is so not usable after washing (e.g. loose all its colour).

According to a report to the Austrian Consumer Council[24], many applicants for the EU-ecolabel for textiles claim that this criterion is difficult to comply with, especially for black products.

The requirement may therefore be seen as difficult to comply with by some companies. It should, however, be borne in mind that environmental management systems already have requirements for a dialogue between a certified company and its suppliers and customers. The specific requirement is in this context an example of how the dialogue and information exchange can be focused on subjects that are important not only for the company itself but throughout the product chain.

[24] Poulsen PB (2004). Environmental Baseline requirements for textiles. Study for the Consumer Council at the Austrian Standards Institute.

6.11.3 Requirement No TE- 30: Colour fastness to perspiration

Requirement
The colour fastness to perspiration (acid and alkaline) must be at least a level 3 to 4 (for colour change and staining), as described in the EU eco-labelling of textiles, criterion 36.

Scope
This requirement is developed especially for the textile industry. It is only valid for textile end products, and does not apply to white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar textiles intended for interior decoration.

Rationale
This is a requirement in the EU eco-labelling of textiles and in the Oeko-Tex 100 standard.

Verification
The colour fastness to perspiration of the products is to be verified. The company must provide test reports using the following test method: ISO 105-E04.

Reporting
No reporting is necessary, but in the company's environmental performance report they could e.g. report that they ensure that the finished textile product is of good quality as certain quality parameters are measured regularly and have to be of a certain quality.

Comments
One could argue that quality requirements of the finished textile products are not directly environmental requirements and should therefore not be included. However, first of all good quality products are a necessary image for environmental friendly companies, and secondly poor quality products have a direct impact on the environment, as a new textile product must be bought as the poor quality product – in worst case – is so not usable after washing (e.g. loose all its colour).

6.11.4 Requirement No TE- 31: Colour fastness to wet rubbing

Requirement
The colour fastness to wet rubbing must be at least a level 2 to 3. A level of 2 is allowed for indigo dyed denim, as described in the EU eco-labelling of textiles, criterion 37.

Scope
This requirement is developed especially for the textile industry. It is only valid for textile end products, and does not apply to white products or to products that are neither dyed nor printed.

Rationale
This is a requirement in the EU eco-labelling of textiles.

Verification
The colour fastness to wet rubbing of the products is to be verified. The company must provide test reports using the following test method: ISO 105-X12.

Reporting
No reporting is necessary, but in the company's environmental performance report they could e.g. report that they ensure that the finished textile product is of good quality as certain quality parameters are measured regularly and have to be of a certain quality.

Comments
One could argue that quality requirements of the finished textile products are not directly environmental requirements and should therefore not be included. However, first of all good quality products are a necessary image for environmental friendly companies, and secondly poor quality products have a direct impact on the environment, as a new textile product must be bought as the poor quality product – in worst case – is so not usable after washing (e.g. loose all its colour).

6.11.5 Requirement No TE- 32: Colour fastness to dry rubbing

Requirement
The colour fastness to dry rubbing must be at least a level 4, as described in the EU eco-labelling of textiles, criterion 38.

Scope
This requirement is developed especially for the textile industry. It is only valid for textile end products, and does not apply to white products, to products that are neither dyed nor printed or to curtains or similar textiles intended for interior decoration.

Rationale
This is a requirement in the EU eco-labelling of textiles and in the Oeko-Tex 100 standard.

Verification
The colour fastness to dry rubbing of the products is to be verified. The company must provide test reports using the following test method: ISO 105-X12.

Reporting
No reporting is necessary, but in the company's environmental performance report they could e.g. report that they ensure that the finished textile product is of good quality as certain quality parameters are measured regularly and have to be of a certain quality.

Comments
One could argue that quality requirements of the finished textile products are not directly environmental requirements and should therefore not be included. However, first of all good quality products are a necessary image for environmental friendly companies, and secondly poor quality products have a direct impact on the environment, as a new textile product must be bought as the poor quality product – in worst case – is so not usable after washing (e.g. loose all its colour).

6.11.6 Requirement No TE- 33: Colour fastness to light

Requirement
The colour fastness to light must be at least a level 5 for furniture, curtains and drapes. For all other textile products the colour fastness to light must be at least a level 4, as described in the EU eco-labelling of textiles, criterion 39.

Scope
This requirement is developed especially for the textile industry. It is only valid for textile end products, and does not apply to mattress ticking, mattress protection or underwear.

Rationale
This is a requirement in the EU eco-labelling of textiles.

Verification
The colour fastness to light of the products is to be verified. The company must provide test reports using the following test method: ISO 105-B02.

Reporting
No reporting is necessary, but in the company's environmental performance report they could e.g. report that they ensure that the finished textile product is of good quality as certain quality parameters are measured regularly and have to be of a certain quality.

Comments
One could argue that quality requirements of the finished textile products are not directly environmental requirements and should therefore not be included. However, first of all good quality products are a necessary image for environmental friendly companies, and secondly poor quality products have a direct impact on the environment, as a new textile product must be bought as the poor quality product – in worst case – is so not usable after washing (e.g. loose all its colour).

According to a report to the Austrian Consumer Council[25], many applicants for the EU-ecolabel for textiles claim that this criterion is difficult to comply with, especially for light colour products.

The requirement may therefore be seen as difficult to comply with by some companies. It should, however, be borne in mind that environmental management systems already have requirements for a dialogue between a certified company and its suppliers and customers. The specific requirement is in this context an example of how the dialogue and information exchange can be focused on subjects that are important not only for the company itself but throughout the product chain.

[25] Poulsen PB (2004). Environmental Baseline requirements for textiles. Study for the Consumer Council at the Austrian Standards Institute.

6.12 Additional examples

Table 5 gives a number of examples of requirements relevant to specific processes. No efforts have been devoted to development of verification procedures, the primary aim being to demonstrate the heterogeneity of textile finishing processes and their associated possibilities for implementation of BAT.

Table 5. Process-specific requirements, derived from the IPPC BREF-document on textiles.

Process	Requirement
Wool scouring with water	"Recovery loops for grease and dirt shall be implemented"
Wool scouring with organic solvent	"Scouring with organic solvent shall be implemented, together with all measures to minimise fugitive losses and prevent any possible contamination of groundwater arising from diffuse pollution and accidents
Removal of knitting lubricants from fabric	"The company shall do one of the following: – Select knitted fabric that has been processed using water-soluble and biodegradable lubricants – Carry out the thermofixation step before washing and treat the air emissions generated from the stenter frame by dry electrofiltration systems that alow energy recovery and separate collection of the oil – Remove the non-water soluble oils using organic solvent washing, with all measures to minimise fugitive losses and prevent any possible contamination of groundwater arising from diffuse pollution and accidents"
Desizing	"The company shall do one of the following: – Select raw materials processed with low add-on techniques (e.g. pre-wetting of the warp yarn) and more effective bioeliminable sizing agents, combined with the use of efficient washing systems for desizing and low F/M waste water treatment techniques – Adopt the oxidative route when it is not possible to control the source of raw material – Combine desizing/scouring and bleaching in one step – Recover and re-use the sizing agents by ultrafiltration "
Bleaching	See section 6.9.14. If the company manufacture products where a high whiteness is to be achieved, the following requirement applies: "The company shall limit the use of sodium hypochlorite only to cases in which a high whiteness has to be achieved and to fabrics that are fragile and would suffer depolymerisation. Sodium hypochorite bleaching shall in these cases be carried out in a two-step process in which peroxide is used in the first step and hypochlorite in the second"
Mercerising	"The company shall either Recover and re-use alkali from mercerising rinsing water as described in section 4.5.7 in the IPPC BREF-document, or Re-use the alkali-containing effluent in other preparation treatments"
Dyeing (dosing and dispensing of dyes)	"The company shall – Reduce the number of dyes, e.g. by using trichromatic systems – Use automated system for dosage and dispensing of dyes"
Batch dyeing	"The company shall use machinery fitted with automatic collectors of fill volume, temperature and other dyeing cycle parameters, indirect heating and cooling systems, hoods and doors to minimise vapour losses" "The company shall re-use rinse water for the next dyeing or reconstitution and re-use the dye bath when technical considerations allow."
Continuous dyeing	"The company shall use low add-on liquor application and minimise volume capacity of the dip though when using pad dyeing techniques" "The company shall use dispensing systems where the chemicals are dispensed on-line as separate streams, being mixed only immediately before being fed to the applicator"

Process	Requirement
Dyeing of PES and PES blends with disperse dyes	"The company shall use non-carrier dyeable polyester fibres when market considerations allow" An other way of ensuring that unwanted carrier are not used is to have companies comply with Criterion No. 24 in the EU ecolabelling scheme for textiles: "Halogenated carriers shall not be used"
Pigment printing	"The company is to use printing pastes that fulfil the following requirements: – Printing paste thickeners shall be with low emission of volatile organic carbon (or not coatain any volatile solvent at all) – Printing paste shall be APEO-free and with a high degree of bioeliminability – Printing pastes shall have a reduced ammonia content /emission limit value: 0.6 g NH_3/kg textile, assuming 20 m^3 air/kg textile.
Washing	See section 6.8.1. Additional requirements can be derived from the IPPC BREF-document, e.g. "When halogenated solvent cannot be avoided, full closed-loop washing equipment shall be used".
Sludge disposal	"The company shall secure that sludge is appropriately recycled, e.g. in brick-making, or incinerated with energy recovery, taking the necessary measures to control emissions of SO_x, NO_x and dust and to avoid emissions of dioxins and furans."

6.13 Discussion

World Bank Guidelines, IPPC BREF-documents, national BAT-guidelines and eco-label criteria all provide meaningful suggestions for requirements to companies in the textiles industry wishing (or needing) to demonstrate an environmental performance that is better than average – or at least to document that Best Available Technology or Best Environmental Practice has been implemented to a large degree.

The World Bank Guidelines gives the possibility of benchmarking emissions against emission levels that are judged to be acceptable from an environmental point of view. The emission limits probably corresponds to the emission levels required in environmental permits in EU-15 and most companies will accordingly not find it difficult to comply with them or provide the necessary documentation. Stricter emission limits could be developed as requirements for companies with an environmental management system.

If stricter emission limits are targeted, each of the parameters should be carefully considered with respect to the possibility of achieving the necessary reduction. It is outside the scope of the present report to give more detailed suggestions, other than both the IPPC BREF-document and national reports give numerous examples of what can be achieved by using specific techniques. In general EU eco-labelling sets stricter requirements, which can be used.

The IPPC BREF-document gives a detailed assessment of which technologies can be considered to be the best available, and why. Because of the heterogeneity of the textile industry with respect to raw materials, process chemicals and processes, the recommendations are primarily generic and qualitative as indicated in the examples in this chapter. This means in other words that they can only seldom be used for benchmarking, but on the other hand also that they are closely related to management systems for quality and environment as wells as to the economic performance of the company.

It is stressed that the suggestions for requirements in this chapter only are examples. Many more suggestions can be made based on the IPPC BREF-document and national documents, but they will in most cases be very narrow in their scope and therefore only applicable to a limited fraction of companies within the textiles sector.

The same is valid for the examples given by use of EU eco-labelling and the Oeko-Tex 1000 standard. Some requirements given are related to more specific processes and cannot be used as very general overall requirements for all companies in the textile sector. However, this is primarily because the textile sector is very heterogenous, and it is therefore difficult to set requirements that apply to every step in the textile supply chain.

Furthermore, it is important to find the balance between the number of requirements used in order to improve the environment and environmental performance versus too many requirements may lead to a much lower use of the requirements because they are too time consuming or too difficult to live up to.

7 Conclusions and recommendations for further work

The overall result of this study is that a transformation of EMSs into systems of excellence is feasible using the available information sources (BREF, Eco-labelling, different conventions, World Bank Group Guidelines, etc.).

It has not been a task in this study to verify and qualify if the level of the proposed requirements is stringent enough. We have merely leaned on emission levels or levels of other measurable values from known and globally/regionally approved sources. It will be an enormous task in it self to ensure that the level of the requirements is set correctly.

To find the correct level (strictness) of the requirements also necessitates that one has discussed and decided on a percentage of the companies that should be able to fulfil the requirements. This is, however, a political discussion that should be carried out in the different standardisation committees.

It has been a purpose of this study just to show the principle of a possible approach, as this study has had limited funding, and thereby a limited scope. For this reason, it has been a deliberate choice not to include parameters such as radiation, biodiversity, land use, transport, workers protection, social aspects, etc.

Further elaborations and refinements are therefore necessary, and must be carried out in order to convert the ideas of this study to something that will function in practise. It is therefore suggested that a more comprehensive study should be commissioned to elaborate both on the general requirements suggested in this study, but also on the aspects that has been omitted in this study. In addition, such a comprehensive study should develop a complete proposal for one sector (such as the textile sector). Such a study should, furthermore, look at the performance levels in details and perform an evaluation of how many companies (how large a percentage) that will be able to live up to the requirements with the suggested number of requirements, emission levels, etc. A balanced multi-stakeholder panel should accompany the study in order to gain broad acceptance.

The general requirements that have been suggested in this study are meant to be used at both the European level and at the global level. It would be desirable to have a higher level in Europe, but this was not possible to develop within the frame of this study. It should therefore be investigated further in the future, if general (and non-sector specific) requirements, which involve a higher environmental level, can be developed on a European level. This should be the practical result of a political process aimed at implementing this concept.

8 References

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Annex 1: Conventions on POPs

Persistent Organic Pollutants are dealt with in several different conventions or proposals for conventions. This table presents an overview.

It must be mentioned that PAN is not a convention. The Pesticide Action Network merely lists the dirty dozen pesticides, which are considered to be the world's most hazardous pesticides.

In order to follow all the mentioned substances, one must follow PAN list, and the conventions of Rotterdam and the Commission proposal for amendments (to the Stockholm convention and to the UNECE Protocol).

Substances involved	UNECE Protocol	Stockholm convention	Pesticides Action Network (PAN)	Rotterdam convention (PIC)	Commission proposal for amendments
2,4,5-T			X	X	
Aldrin	X	X	X	X	X
Aldicarb			X		
Binapacryl				X	
Captafol				X	
Chlordane	X	X	X	X	X
Chlordimeform			X	X	
Chlorobenzilate				X	
Chlorodecone	X				X
DBCP			X		
DDT	X	X	X	X	X
Dieldrin	X	X	X	X	X
Dinitro-ortho-cresol (DNOC)				X	
Dioxins	X	X			X
EDB			X	X	
Endrin	X	X	X		X
Ethylene dichloride				X	
Fluoroacetamide				X	
Furans	X	X		X	X
Heptachlor	X	X	X	X	X
Hexabromobiphenyl	X				X
Hexachlorobenzene (HCB)	X	X		X	X
Hexachlorobutadiene					X
HCH/BHC	X		X	X	X
Lindane	X		X	X	X
Mercury compounds				X	
Methamidophos (soluble liquid formulations)				X	
Methylparathion			X	X	
Mirex	X	X			X
Monocrotophos				X	
Octobromodiphenyl ether (octaBDE)					X
Paraquat			X		
Parathion			X	X	
Pentabromodipheylether (pentaBDE)					X
Pentachlorobenzene					X
Pentachlorophenol (PCP)			X	X	
Phosphamidon (soluble liquid formulations)				X	
Polybrominated biphenyls (PBB)				X	
Polychlorinated biphenyls (PCB)	X	X		X	X

Substances involved	UNECE Protocol	Stockholm convention	Pesticides Action Network (PAN)	Rotterdam convention (PIC)	Commission proposal for amendments
Polychlorinated naphtalenes					X
Polychlorinated terphenyls (PCT)				X	
Polycyclic aromatic hydrocarbons (PAH)	X				X
Short-chained chlorinated paraffins					X
Tetraethyl lead				X	
Tetramethyl lead				X	
Tris (2,3-dibromopropyl) phosphate				X	
Toxaphene	X	X	X	X	X
Special mixtures of benomyl, thiram and carbofuran				X	
Special asbestos types				X	

Annex 2: Maximum air emission limits for different industries

Air emission limits for different industries. All values in mg/m^3, unless otherwise stated (based on World Bank, 1998)

Parameter	Aluminium smelting	Base metal and iron ore mining	Breweries	Cement	Chlor-alkali	Coal mining	Coke production
Particulate matter	30			50		50	
Hydrogen fluoride	1						
Total fluoride	2						
Chlorine					3		
VOCs	20						
Sulphur oxides				400			
Nitrogen oxides				600			
Hydrogen chloride							
Phosphine							
Arsine							
Lead and cadmium (total)							
Other heavy metals (total)							
Arsenic							

Continued

Parameter	Dairy industry	Electronics manufacturing	Dye manufacturing	Electroplating	Foundries	Fruit and vegetable processing	Glass manufacture
Particulate matter	50				20/50 (with/without toxic metals present)		20/50 (with/without toxic metals present)
Hydrogen fluoride		5					
Total fluoride							5
Chlorine			10				
VOCs		20	20	90% reduction			
Sulphur oxides							700 (gas fired); 1800 (oil fired)
Nitrogen oxides							1000
Hydrogen chloride		10					50
Phosphine		1					
Arsine		1					
Lead and cadmium (total)							5
Other heavy metals (total)							5
Arsenic							1

CONTINUED

Parameter	Copper smelting	Iron and steel manufacturing	Lead and zinc smelting	Mini steel mills	Mixed feritiliser plants Nitrophosphate	Mixed feritiliser plants Mixed-acid process	Nickel smelting and refining
Particulate matter	20 (smelter) 50 (other sources)	50	20	20 (toxic metal present) 50 (other cases)	0.3 kg/ton 50	0.2 kg/ton 50	20
Hydrogen fluoride							
Total fluoride		5			0.02 kg/ton as fluoride 5	kg/ton as fluoride 5	
Chlorine							
VOCs							
Sulphur oxides	1000	500 (sintering)	400	2000			2 kg/t sulfuric acid
Hydrogen sulphide							
Nitrogen oxides		750		750	0.2 kg/ton 500	70	
Hydrogen chloride							
Ammonia (NH_3 as N)					0.3 kg/ton		
Ammonia nitrogen (NH_4-N)						0.01 kg/ton	
Urea							
Phosphine							
Arsine							
Lead and cadmium (total)							
Other heavy metals (total)							
Arsenic	0.5		0.1				
Cadmium	0.5		0.05				
Copper	1		0.5				
Lead	0.2		0.5				
Nickel							1
Mercury	0.05		0.05				
Zinc			1				

CONTINUED

Parameter	Nitrogeneous fertilizer plants	On-shore oil and gas development	Pesticide formulation
Particulate matter	50		20 5 (with very toxic compounds present)
Hydrogen fluoride			
Total fluoride			
Chlorine			5
VOCs		20	20
Sulphur oxides		1000 (for oil production)	
Hydrogen sulphide		30	
Nitrogen oxides	300	320 (gas fired) 460 (oil fired)	
Hydrogen chloride			
Ammonia (NH_3 as N)	50		
Ammonia nitrogen (NH_4-N)			
Urea	50		
Phosphine			
Arsine			
Lead and cadmium (total)			
Other heavy metals (total)			
Arsenic			
Cadmium			
Copper			
Lead			
Nickel			
Mercury			
Zinc			

CONTINUED

Parameter	Pesticide manufacturing	Petrochemical manufacturing	Petroleum refining	Pharmaceutical manufacturing
Particulate matter	20 5 (with very toxic compounds present)	20	50	20
Hydrogen fluoride				
Total fluoride				
Chlorine	5			
VOCs	20			
Sulphur oxides		500	150 (sulphur recovery units) 500 (others)	
Hydrogen sulphide			152	
Total sulfur				
Nitrogen oxides		300	460	
Hydrogen chloride		10		
Benzene		5 0.1 ppb at plant fence		5
1,2-dichloroethane		5 1ppb at plant fence		5
Vinyl chloride		5 0.4 ppb at plant fence		5
Class A substances[a]				20
Class B substances[a]				80
Active ingredients (each)				0.15
Nickel			2 (incl. Vanadium)	

[a]: Class A substances are those that may cause significant harm to human health and the environment. Class B compounds are organic compounds of less environmental impact than Class A compounds. See World Bank (1998), p. 397 for better definition)

CONTINUED

Parameter	Phosphate fertilizer production			Printing	Pulp and paper mills	Vegatable oil processing	Wood preserving
	Fertilizer	Sulphuric acid	Phosphoric acid				
Particulate matter	50		50		100 (recovery furnace)	50	
Hydrogen fluoride							
Total fluoride	5		5				
Chlorine				10 (incl. chlorinated HC's)			
VOCs				20			20
Sulphur oxides		2 kg SO_2/t 0.15 kg SO_3/t acid					
Hydrogen sulphide					15 (lime kilns)		
Total sulfur					1.5 kg/t ADP (sulfite mills) 1 kg/t ADP (kraft & others)		
Nitrogen oxides					2 kg/t ADP		
Hydrogen chloride							
Benzene							
1,2-dichloroethane							
Vinyl chloride							
Class A substances[a]							
Class B substances[a]							
Active ingredients (each)							
Nickel							

[a]: Class A substances are those that may cause significant harm to human health and the environment. Class B compounds are organic compounds of less environmental impact than Class A compounds. See World Bank (1998), p. 397 for better definition)

Annex 3: Maximum water emission limits for different industries

Emission limit values for different industries. All values in mg/l, except for pH, coliform bacteria, and temperature increase. (based on World Bank, 1998).

Parameter	Aluminium smelting	Base metal and iron ore mining	Breweries	Cement	Chlor-alkali, diaphragm	Coal mining
PH	6-9	6-9	6-9		6-9	6-9
TSS	50	50	50	50	20	50
Fluoride	20					
Aluminium	0.2					
Iron						3.5
BOD			50			
COD	150	150	250		150	
AOX					0.5	
Hydrocarbons	5					
Sulphites					1	
Oil and grease		10	10			10
Chlorine					0.2	
Phosphorous			5			
Ammonia nitrogen (NH_4-N)			10			
Nitrogen, total						
Phenol						
Trichloroethane						
Trichloroethylene						
Toxic organics (such as benzidine, each)						
Cyanide		1				
Cyanide, free		0.1				
Cyanide, WAD		0.5				
Arsenic		0.1				
Cadmium		0.1				
Chromium, hexavalent		0.1				
Chromium, Total						
Copper		0.5				
Iron		3.5				
Lead		0.2				
Mercury		0.01				
Nickel		0.5				
Zinc		2				
Tin						
Silver						
Antimony						
Total metals		10				10
Coliform bacteria						
Temperature increase	< 3°C	< 3°C				

CONTINUED

Parameter	Dairy industry	Electronics manufacturing	Dye manufacturing	Electroplating	Foundries	Fruit and vegetable processing	Glass manufacture
PH	6-9	6-9	6-9	7-10	6-9	6-9	6-9
TSS	50	50	50	25	50	50	50
Fluoride		20		20			20
Aluminium							
Iron							
BOD	50	50	30			50	
COD	250		150			250	150
AOX			1				
Hydrocarbons							
Sulphites							
Oil and grease	10	10	10		10	10	10
Chlorine							
Phosphorous	2	5		5		5	
Ammonia nitrogen (NH_4-N)		10					
Nitrogen, total	10					10	
Phenol			0.5				
Trichloroethane				0.05			
Trichloroethylene				0.05			
Toxic organics (such as benzidine, each)			0.05				
Cyanide		1					
Cyanide, free		0.1		0.2			
Cyanide, WAD							
Arsenic		0.1		0.1			0.1
Cadmium		0.1		0.1			
Chromium, hexavalent		0.1	0.1	0.1			
Chromium, Total				0.5			
Copper		0.5	0.5	0.5	0.5		
Iron							
Lead		0.1		0.2			0.1
Mercury		0.01		0.01			
Nickel		0.5		0.5			
Zinc			2	2	2		
Tin		2					
Silver				0.5			
Antimony							0.5
Total metals		10		10			10
Coliform bacteria	400 MPN/100 ml						
Temperature increase					< 3°C		

CONTINUED

Parameter	Coke production	Copper smelting	Iron and steel manufacturing	Lean and zinc smelting	Meat processing and rendering	Mini steel mills
PH		6-9	6-9	6-9	6-9	6-9
TSS		50	50	20	50	50
Fluoride						
Aluminium						
Iron						
BOD	30				50	
COD	150		250		250	
AOX						
Hydrocarbons						
Sulphites						
Oil and grease			10		10	10
Chlorine						
Phosphorous					5	
Ammonia nitrogen (NH_4-N)						
Nitrogen, total					10	
Phenol			0.5			
Trichloroethane						
Trichloroethylene						
Toxic organics (such as benzidine, each)						
Cyanide			0.5			
Cyanide, free			0.1			
Cyanide, WAD						
Arsenic		0.1		0.1		
Cadmium		0.1	0.1	0.1		0.1
Chromium, hexavalent						0.1
Chromium, Total			0.5			0.5
Copper		0.5		0.5		0.5
Iron		3.5		3.5		
Lead		0.1	0.2	0.1		0.1
Mercury		0.05	0.01	0.01		
Nickel						0.5
Zinc		1	2	2		
Tin						
Silver						
Antimony						
Total metals		10		5		
Coliform bacteria					400	
Temperature increase		< 3°C	< 3°C	< 3°C		< 3°C

CONTINUED

Parameter	Mixed fertiliser plants, nitrophosphate	Mixed fertiliser plants, mixed-acid	Nickel smelting and refining	Nitrogeneous fertilizer plants	On-shore oil and gas development
PH	6-9	6-9	6-9	6-9	6-9
TSS	50	50	50	50	50
Fluoride	0.05 kg/ton (as fluorine) 20 mg/l	0.05 kg/ton (as fluorine) 20 mg/l			
Aluminium					
Iron					
BOD					50
COD					
AOX					
Hydrocarbons					
Sulphites					
Sulfide					1
Oil and grease					20
Chlorine					
Phosphorous	5	5			
Phosphate	0.06 kg/ton				
Ammonia nitrogen (NH_4-N)	0.012 kg/ton 10 mg/l	0.012 kg/ton 10 mg/l		10	
Nitrate nitrogen (NO_3 - N)	0.03 kg/ton				
Nitrogen, total					
Urea				1	
Phenol					1
Trichloroethane					
Trichloroethylene					
Toxic organics (such as benzidine, each)					
Organochlorines					
Nitroorganics					
Pyrethroids					
Phenoxy compounds					
Active ingredients					
Cyanide					
Cyanide, free					
Cyanide, WAD					
Arsenic					
Cadmium	0.1	0.1			
Chromium, hexavalent					
Chromium, Total					
Copper					
Iron			3.5		
Lead					
Mercury					
Nickel			0.5		
Zinc					
Tin					
Silver					
Antimony					
Total metals	10	10	10		5 (“toxic metals” as defined by the WB)
Coliform bacteria					
Temperature increase				< 3°C	

CONTINUED

Parameter	Pesticide formulation	Pesticide manufacturing	Petrochemicals manufacturing	Petroleum refining	Pharmaceuticals manufacturing	Phosphate fertilizer production
PH	6-9	6-9	6-9	6-9	6-9	6-9
TSS	20		30	30	10	50
Fluoride						20
Aluminium						
Iron						
BOD		30	30	30	30	
COD	150	150	150	150	150	
AOX	1	1				
Hydrocarbons						
Sulphites						
Sulfide			1	1		
Oil and grease	10	10	10	10	10	
Chlorine						
Phosphorous						5
Phosphate						
Ammonia nitrogen (NH_4-N)						
Nitrate nitrogen (NO_3 - N)						
Nitrogen, total			10	10		
Urea						
Phenol			0.5	0.5	0.5	
Benzene			0.05	0.05		
Vinyl chloride			0.05			
Trichloroethane						
Trichloroethylene						
Toxic organics (such as benzidine, each)						
Benzo(a)pyrene				0.05		
Organochlorines	0.05					
Nitroorganics	0.05					
Pyrethroids	0.05					
Phenoxy compounds	0.05					
Active ingredients	0.05 (each)	0.05 (each)			0.05 (each)	
Cyanide						
Cyanide, free						
Cyanide, WAD						
Arsenic	0.1	0.1			0.1	
Cadmium			0.1		0.1	0.1
Chromium, hexavalent	0.1	0.1	0.1	0.1	0.1	
Chromium, Total				0.5		
Copper	0.5	0.5	0.5			
Iron						
Lead				0.1		
Mercury	0.01	0.01			0.01	
Nickel						
Zinc						
Tin						
Silver						
Antimony						
Total metals						
Coliform bacteria						
Temperature increase			< 3°C			

CONTINUED

Parameter	Printing	Pulp and paper mills						
		Kraft & CTMP	Sulfite	Mech. And recycle.	Paper mills	Old	Retrofit	New
PH	6.5-10	6-9	6-9	6-9	6-9	6-9	6-9	6-9
TSS	50							
Fluoride								
Aluminium								
Iron								
BOD	30							
COD	150	300 15 kg/t	700 40 kg/t	10 5 kg/t	250			
AOX						40 2 kg/t	8 0.4 kg/t	4 0.2 kg/t
Hydrocarbons								
Sulphites								
Sulfide								
Oil and grease	10							
Chlorine								
Phosphorous		0.05 kg/t	0.05 kg/t	0.05 kg/t	0.05 kg/t	0.05 kg/t	0.05 kg/t	0.05 kg/t
Phosphate								
Ammonia nitrogen (NH_4-N)								
Nitrate nitrogen (NO_3 - N)								
Nitrogen, total		0.4 kg/t	0.4 kg/t	0.4 kg/t	0.4 kg/t	0.4 kg/t	0.4 kg/t	0.4 kg/t
Urea								
Phenol								
Benzene								
Vinyl chloride								
Trichloroethane								
Trichloroethylene								
Toxic organics (such as benzidine, each)								
Benzo(a)pyrene								
Organochlorines								
Nitroorganics								
Pyrethroids								
Phenoxy compounds								
Active ingredients								
Cyanide								
Cyanide, free								
Cyanide, WAD								
Arsenic								
Cadmium	0.1							
Chromium, hexavalent	0.1							
Chromium, Total	0.5							
Copper	0.5							
Iron								
Lead								
Mercury								
Nickel								
Zinc	2							
Tin								
Silver	0.5							
Antimony								
Total metals								
Coliform bacteria								
Temperature increase								

CONTINUED

Parameter	Sugar manufacturing	Tanning and leather finishing	Vegetable oil processing	Wood preserving
PH	6-9	6-9	6-9	6-9
TSS	50	50	50	50
Fluoride				20
Aluminium				
Iron				
BOD	50	50	50	
COD	250	250	250	150
AOX				
Hydrocarbons				
Sulphites				
Sulfide		1		
Oil and grease	10	10	10	10
Chlorine				
Phosphorous	2			
Phosphate				
Ammonia nitrogen (NH4-N)	10			
Nitrate nitrogen (NO_3 - N)				
Nitrogen, total			10	
Urea				
Phenol				0.5
Benzene				
Vinyl chloride				
Trichloroethane				
Trichloroethylene				
Toxic organics (such as benzidine, each)				
Benzo(a)pyrene				
Organochlorines				
Nitroorganics				
Pyrethroids				
Phenoxy compounds				
Active ingredients				
PAH (each)				0.05
Dioxins/furans				0.0005
Pesticides (each)				0.05
Arsenic				0.1
Cadmium				
Chromium, hexavalent		0.1		0.1
Chromium, Total		0.5		0.5
Copper				0.5
Iron				
Lead				
Mercury				
Nickel				
Zinc				
Tin				
Silver				
Antimony				
Total metals				
Coliform bacteria		400 MPN/100 ml		
Temperature increase	< 3°C		< 3°C	