Miljøministeriet
Miljøstyrelsen

Background data for Annex XV dossier - DEHP, BBP, DBP and DIBP

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Miljøprojekt Nr. 1362 2011

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Preface

This report contains background information developed for the Danish Environmental Protection Agency to promote initiatives directed at further strengthening of Danish and international regulation aimed at minimizing the use and thereby human exposure of certain phthalates as DEHP, DBP, BBP and DIBP.

The project was carried out during and summer of 2010, while the report has been finally edited in September 2010. The project has been supervised by a steering committee consisting of

- Frank Jensen, Danish EPA
- Lars Fock, Danish EPA
- Shima Dobel, Danish EPA
- Elisabeth Paludan, Danish EPA
- Erik Hansen, COWI

The report has been prepared by Linda Høibye, Jakob Maag and Erik Hansen, COWI A/S.

Executive summary

For a number of product groups, for which significant direct or indirect exposure of humans could be anticipated, key information has been collected on plasticizers and concentrations used, alternatives available, substitution trends and costs of substitution .

The information collected shows that classified phthalates are still in use for selected product groups, but also that alternatives are available for all groups including other phthalates, non-phthalate plasticizers and other materials than plasticised PVC.

For many applications voluntary phasing out of classified phthalates and/or phthalates in general has already taken place, or is in the process. However, several companies will not introduce changes unless stricter regulation is introduced.

Costs of substitution differ depending on product group and vary from marginal price increases to significant increases. The least expensive option appears to be substitution to non-classified phthalates as DINP and DIDP.

Background and objectives

The Danish Environmental Protection Agency is considering launching initiatives aimed at further restriction of the use of the phthalates: DEHP, DBP, BBP and DIBP. The background for this anticipated action is a belief that several applications apart from children toys and children care articles already covered by restrictions may cause exposure to the classified phthalates, especially to children.

Currently DEHP, DBP and BBP are on ECHA's list of substances recommended for inclusion in Annex XIV, e.i. subject to authorisation, whereas DIBP is on the list of draft recommendations for inclusion in Annex XIV currently in consultation. The authorisation does however only target the use of the chemicals in production within the EU, whereas imports in products (articles) are not affected, and it is for the time being not clear whether DIBP will be recommended for inclusion in Annex XIV.

The overall objective of the present study was to gather additional information on plasticizers and concentrations used, alternatives available, substitution trends and costs of substitution for selected product groups, supporting such initiatives.

Study methodology

The application fields studied has in all cases been products groups, for which direct exposure of humans can be assumed, either via skin contact as when small children touching vinyl by fingers etc., or as indirect exposure by evaporation or dust formation to the indoor climate.

The study methodology adopted was to combine statistical data of EU production and import to EU of the applications in question with expert assessments and estimates obtained from European trade organisation and European companies on the types and quantities of plasticisers being utilized.

In this respect contacts has been made to the key European industry and trade organisations with relevance for plasticisers and the product groups covered in the study..

The organisations were asked to assist in providing information relevant for this study - i.e. data on plasticizers and concentrations used, alternatives available, substitution trends and costs of substitution for selected product groups - and some of them have kindly initiated surveys among their members. As indicated in the report some information has been obtained from these organisations, but in general only limited data has been provided. Therefore, an alternative strategy of data collection was adopted with more emphasis on contacts directly to Danish and European companies. A potential weakness of focusing on companies present on the Danish market is the risk that the data obtained may not fully represent the European situation.

Statistical data on the EU level (import and in particular EU manufacturing) are seldom sufficiently detailed to specific products. Therefore estimates of plasticiser consumption in articles, based on statistical data for import and manufacture in the EU of the covered product groups, are associated with substantial uncertainty, and for some investigated product groups such estimation has not been possible.

Conclusions

A condensed summary of the information obtained is presented in table 1 for the product groups studied.

The plasticizers used cover classified phthalates as well as other phthalates and non-phthalate plasticizers. The available information show that classified phthalates DEHP, BBP, DBP are still in use in vinyl flooring, wires and cables, tablecloth etc. , footwear, pool covers, erasing rubber and lacquers for furniture and flooring, as well as in balls in concentrations below 1%. For other investigated applications, no evidence has been found that the three phthalates are still in use. For these applications the classified phthalates appear to have been substituted by other phthalates such as DINP and DIDP, as well as by non-phthalate plasticisers. No information on use of the classified DIBP has, however, been reported in this study. DIBP has however been reported in the literature as one of the alternatives employed for DBP.

For bags, brief-/suitcase and similar no examples of phthalates usage have been identified. This may however partly be explained by the fact that the data available are mainly retrieved on the Danish market, and may as such not necessarily be valid for the rest of EU. It cannot be ruled out that classified phthalates are still used in similar products marketed in other countries in EU.

Data on plasticizers used in imported products are scarce or lacking for products where manufacturing in EU dominates (e.g. flooring of vinyl), as it has not been possible to identify the companies responsible for the import. For the products where import by EU based brands dominate, however, it must be assumed that the material composition of the imported product is

determined by the importing company and thus most likely will not differ significantly from products manufactured in EU.

The data available has not enabled a full quantification of the classified phthalates and other plasticizers present in imports and EU manufacture of the products covered. Varying information regarding quantities and concentrations are available for different plasticizers in the different fields of application, and for such data reference is made to the report sections 2.1 - 2.11.

Table 1
Summary of information obtained

Fields of application	Plasticisers in use	Significance of import to supply	Alternatives available	Trends and perspectives	Costs of substitution for product
Flooring of vinyl	DEHP, DBP, BBP, DINP, DIDP, DIHP, DIOP[1]	Low	DINP, DIDP, DIHP, COMGHA, dibenzoates	Use of classified phthalates decreasing - alternatives also used outside EU	Sub. to DINP increase by 1-3%. Sub. to COMGHA increase by 25%
Cable and wire	DEHP, DINP, DIDP, DPHP, TOTM	Low	DINP, DIDP, DPHP, TOTM, adiapates Other materials: PE, silicon rubber	Use of DEHP decreasing	Sub. to DIDP increase by 1-5%. Sub. to oth. material: ~ increase 7% of product with DINP
Bags, brief-/suitcases and similar	no examples of phthalates usage identified [*2]	Equals EU production	Alternatives available for materials and plasticisers. Little knowledge of actual alternatives used	Phthalates and/or PVC substituted for schoolbags. Other items: Sub. depends on regulatory demands	Products without phthalates reported by some traders to be 30% more expensive
Tablecloth, curtains, shower curtains and similar	DEHP, DBP, BBP, DINP, ATBC, DINCH, DOA, ESBO	Low	ATBC, DINCH, DOA, ESBO. Other materials: Polyester, EVA, PEVA	Sub. of DEHP below average of flexible PVC products. No future trend identified	Products using non-phthalate plasticizers estimated to be 5-50 % more expensive
Carpet tiles/squares	DINP	Low	DINP, DOTP, DIHP, DINCH	Substitution seems accomplished already	No specific data
Water beds and air mattresses	DINP, ASE, unspecified phthalates	High	DINP, ASE	Sub. of high-end products. No definite general trend identified	Increase due to use of alternatives seems marginal
Wallpaper /tapestry	DINP, DOTP, DOA, TXIB and maybe DEHP and BBP	Low	DINP, DOTP, DOA, DINCH	Substitution seems accomplished already	Alternative plasticisers 5-30% more expensive. Increase for product only few percent.
Footwear	DEHP, DBP, DNOP, DINP, DIDP	Equals EU production	DINCH, ATBC etc.	Mix between phasing out PVC and/or phthalates, and no changes without regulation	Sub. of DEHP with DINP increase by 1-3 %, Substituting PVC with PU increase by 25%.
Bathing equipment	DEHP, DINP	? [*3]	DINCH, DOTP	No changes unless stricter regulation	Sub. to alternative plasticizers increase by 5-20 %

Balls for playing and physical exercises	DINP, DIDP, DIOP, ATBC, other non-phthalates? DEHP and DBP in conc. <1%,	High	DINP, DIDP, DIOP, ATBC, other non-phthalates?	PVC, phthalates, classified phthalates are being phased out	Sub. to alternative plasticizers increase by 5-20 %. Substituting PVC with PU increase by 75%.
Others - erasing rubber	DEHP, DINP, DIDP[*1]	No data	DINP, DIDP	No data	No data
Others - lacquers for wooden furniture and flooring	DEHP, DBP, BBP, DOA[*1]	No data	DOA	No data	No data

For all fields of application considered, alternatives to classified phthalates are available on the market. The alternatives available may include other plasticizers as well as other types of materials. No examples have been identified of products for which alternatives are not available.

The dominant alternatives to classified phthalates reported used for the covered product groups are DINP and DIDP. For most application however, non-orthophthalate plasticizers such as DOTP, and other plasticisers types such as DINCH, ASE, ATBC, COMGHA and dibenzoates are actually in use, or being considered by manufactures as realistic alternatives to ortho-phthalates.

As shown in the table, the trend regarding the use of the classified phthalates and other plasticizers that can be observed in case no further restrictions are introduced differ between the fields of application studied - reference is made to table 1. Generally the following main company positions/strategies dominates:

- Phthalates (in particular classified phthalates) and PVC are phased out as a matter of company policy.
- No changes in present use of phthalates and PVC without further regulation

For many fields of application voluntary phasing out of classified phthalates and/or phthalates in general has already taken place, or is in the process. The picture presented in table 1 may, however, not necessarily be representative for all markets within EU and for all companies operating in EU. This is because the information obtained may be dominated by the key companies on the market, which may in many cases be relatively advanced (front-runners), and perhaps more willing to supply information than smaller companies with older technology.

Regarding costs of substitution, substitution of classified phthalates to DINP/DIDP seems generally to be the least expensive option, as these phthalates to the best of knowledge can substitute directly for DEHP with no major changes in the production. Based on the costs differences of the plasticizers, such substitution is estimated to imply increased production costs of the product in the range of 1-5%.

Substitution to non-phthalate plasticizers as TBC, DINCH, DOA, ESBO and COMGHA may imply extra costs typically in the range of 5-50 % depending on the product and the alternative chosen.

Substitution to other materials may differ considerably depending on application. For balls substitution to PU, the price of the product was reported to increase by 75 %, while substitution of cord insulation plasticised with DINP to non-PVC material (for example PE) raised the price of cord by 7% - meaning that substitution from PVC with DEHP to non-PVC-material would likely raise price of cord by about 10%.

The data presented in this report seems to indicate that in those cases classified phthalates are eliminated by substitution to other plasticizers, costs of raw materials will normally be the dominant cost element to be considered, while cost elements like a change of manufacturing process and changes in production equipment seems to be of less significance for the products groups covered. This does not necessarily mean that these cost elements are insignificant, but could be taken as an indication of that costs related to change of manufacturing process and production equipment in this context generally are not to considered an important constraint to substitution.

Abbreviations and acronyms

ASE	Sulfonic acids, C10 – C18-alkane, phenylester
ATBC	Acetyl tributyl citrate
BBP	Butyl benzyl phthalate
CEC	European Confederation of the Footwear Industry
CEFIC	The European Chemical Industry Council
CEPE	European Council of producers and importers of paints, printing inks and artists' colours
COMGHA	Mixture of COMGHA 1 and COMGHA 2 (marketed as "Soft-n-safe")
COMGHA 1	12-(Acetoxy)-stearic acid, 2,3-bis(acetoxy)propyl ester
COMGHA 2	Octadecanoic acid, 2,3-(bis(acetoxy)propyl ester.
DBP	Di-n-butyl phthalate
DBTP	Di-butyl terephthalate
DEHA	Bis(2-ethylhexyl) adipate
DEHP	Di(2-ethylhexyl) phthalate (also designates DOP)
DEHT	Di (2-ethyl-hexyl) terephthalate (same as DOTP)
DGD	Dipropylene glycol dibenzoate
DIBP	Diisobutyl phthalate
DIDP	Diisodecyl phthalate
DINA	Diisononyl adipate
DINCH	Di-isononyl-cyclohexane-1,2dicarboxylate
DINP	Diisononyl phthalate
DNOP	Di-n-octyl phthalate
DOA	Di-octyl adipate; di-ethylhexyl adipate; (same as DEHA)
DOP	Di-octyl phthalate (same as DEHP)
DOTP	Di(2-ethylhexyl) terephthalate (same as DEHT)
DPHP	Di-(2-propyl heptyl) phthalate
DTDP	Ditridecyl Phthalate
ECHA	European Chemicals Agency
ECBL	Europacable
ECPI	European Council for Plasticisers and Intermediates
ERFMI	European Resilient Flooring Manufacturers
ESBO	Epoxidized soy bean oil
EU	European Union
EuPC	European Plastic Converters
EVA	Ethylene Vinyl Acetate
FAIR	Footwear Association of Importers and Retail Chains
OEM	Original equipment manufacturers
PE	Polyethylene
PEVA	Polyethylene Vinyl Acetate
PVC	Polyvinyl chloride
RAR	Risk Assessment Report
REACH	EU Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals
TBC	Tributyl citrate
TEHTM	Tri-(2-ethylhexyl)-trimellitate (same as TOTM)
TOTM	Tris- (2-ethyhexyl) trimellitate (same as TEHTM)
TPX	4-methylpentene-1 based polyolefin
TXIB	Trimethyl pentanyl diisobutyrate

1 Introduction

1.1 Background and objectives

The Danish EPA is of the opinion that several applications apart from children toys and children care articles may cause exposure of especially children but also adults to phthalates used as plasticizers in thes articles. The phthalates in focus for this project are DEHP, BBP, DBP and DiBP. Currently DEHP, DBP and BBP are on ECHA's list of substances recommended for inclusion in Annex XIV, e.i. subject to authorisation, whereas DiBP is on the list of draft recommendations currently in consultation.

For these reasons the Danish Environmental Protection Agency are considering to take initiatives aimed at further restriction of the use of the phthalates: DEHP, DBP, BBP and DIBP.

The overall objective of the present report is to develop information supporting such initiatives.

The report is focused on a number of product groups or fields of application causing exposure by significant evaporation of phthalates to the indoor environment or by direct exposure of children, e.g. by skin contact or by appealing to be chewed or sucked on by children.

More precisely the report is dealing with the following fields of applications for phthalates:

- PVC flooring (and heavy wall covering).
- PVC insulation on wires and cables.
- PVC coated fabric and film/sheets used for bags and brief/suitcases and similar items.
- PVC coated fabrics and film/sheets used for tablecloth, curtains, shower curtains and similar items (not industrial uses).
- Carpet tiles/squares produced with PVC-foam as back cover.
- PVC water- and air mattresses.
- Wallpaper/tapestry made of or coated with PVC.
- PVC footwear.
- PVC bathing equipment (swim-coats/wings/belts and pools - inflatable and others).
- Balls of PVC for playing and physical exercises
- Others: Lacquer for floors and furniture made of wood; Erasing rubber

For each field of application the following types of information has been collected and presented to the extent data has been available:

1. The products produced within the EU or imported to the EU containing the phthalates in question?

2. The extent to which these products are based on the phthalates in question, other phthalates or other plasticisers?

3. The concentration of phthalates or other plasticisers typically used in the products?

4. The trends regarding the use of the phthalates in question and other plasticisers that can be assumed in case no further restrictions are introduced?

5. The alternatives to the phthalates in question available on the market, and employed by the industry in EU today?

6. The products for which no alternatives to the phthalates in question are currently available?

7. Costs of alternatives compared to the phthalates in question?

It may be noted that the following fields of application was originally included in the investigation, but has been left out due to lack of reliable data:

- PVC coated fabric and film/sheets used for furniture.
- Textiles (T-shirts and similar items) with PVC-print.

1.2 Organisation of the study

To obtain reliable figures on the use and quantity of plasticisers in the import and EU production of selected fields of application can be a complicated task i.a. due to number of companies involved in such activities in EU. In this project the strategy was adopted of combining statistical data of EU production and import to EU of the application areas in question with expert assessments and estimates obtained from European trade organisation and European companies on the types and quantities of plasticisers being utilized.

In this respect contacts has been made to a number of European trade organisations including:

European Plastic Converters (EuPC)

European Council for Plasticisers and Intermediates, (ECPI) - represents the majority of European manufacturers of plasticisers, a part of The European Chemical Industry Council, (CEFIC)

European Resilient Flooring Manufacturers (ERFMI)

European Council of producers and importers of paints, printing inks and artists' colours (CEPE)

Europacable (ECBL)

European apparel and textile confederation (Euratex)

Fachverband Wasserbett, Germany

These organisations cover a broad range of the products included in this study.

The organisations were asked in to assist in providing information relevant for this study (reference is made to the study questionnaire attached as Annex 2), and some of them have kindly initiated surveys among their members. In this context inter alia a meeting with ECPI and EuPC was held on the 22. March 2010 in Brussels.

As indicated in the report some information has been obtained, in particular via CEPE on the issue of wallpaper, via ERFMI on the issue of vinyl flooring, via Eurocable on the issue of wires and cables and via Fachverband Wasserbett on the issue of water beds.

The consortium of DEHP manufacturers preparing data files for the registration of DEHP under the REACH regulation (DEHP REACH Consortium) has also been contacted, and they have responded as part of a joint response with EuPC and ECPI, see below.

The joint response of EuPC, ECPI and the DEHP Consortium have kindly supplied general overall trends data and a number of indicative data on specific product types. Except for the information given separately by EuPC [2010], the organisations have requested confidentiality [EuPC, ECPI and DEHP REACH consortium, 2010b], and therefore the information cannot be cited in this report.

Besides that, none of the organisations have been able to provide the detailed data types requested in the study questionnaire (reference is made to Annex 2).

An alternative has been to develop the required information based on contact to individual Danish and international companies. This approach has been adopted for the majority of the applications areas investigated. The approach, however, have some weaknesses discussed below in section 1.3.

The following organisations have been contacted, but have not responded

Footwear Association of Importers and Retail Chains (FAIR)

The European Confederation of the Footwear Industry (CEC)

The only European producer of BBP, has been contacted, but has not responded.

Currently there are two producers of DBP in the EU, one planning a continued production and REACH registration and another company which will stop production by the end of 2010 and will not register its use under REACH. The first company has kindly provided information to this study.

Considering the need for confidentiality, certain specific data from individual companies in this report have not been given with specific reference to the source. Instead, the contact to relevant companies has been documented by listing the contacted companies' names by the end of each product specific sub-section.

In addition to the listed companies, a number of companies have been contacted, but have not responded.

1.3 Comments to the study

The approach of developing the information required based on contact to individual Danish and international companies may to some extent suffer from difficulties in obtaining information that can be regarded as representative for European companies.

In this context, attention must be paid to that the information collected and presented here represents either Danish companies or international companies operating in many countries. The information is not necessarily representative for all markets within EU and for all companies operating in EU.

This has some impact on, e.g. quantification of consumption of phthalates and other plasticizers within the different fields of application. While it seems possible for most product groups based on statistical data to present a reasonable estimate indicating the relevant order of magnitude for the total consumption of plasticizers within the product group considered, the data available generally does not allow for reliable estimates of the consumption of individual plasticizers. This assessment also pays respect to the fact that the statistical data on the EU level (considering import and in particular EU manufacturing) are seldom correlated precisely with the application areas investigated.

Considering these limitations, the choice has been made to not to summarize the estimates of consumption of phthalates made in the different sections and thus not to present these estimates as very reliable. The statistics and information available is, however, presented in the relevant sections and may be utilised with due respect.

It should also be noted that statements indicating that classified phthalates have already been more or less substituted will reflect the general trend within the EU but not necessarily be valid for all markets and companies within EU. It may well be so that several smaller companies serving primarily national markets may still use classified phthalates although the general picture available is that these compounds have be substituted.

The issue of the representativeness of the data is less relevant to consider discussing availability of alternatives and trends and perspectives, as these issues does not depend on the state of art of the individual companies. However, as noted on trend and perspectives in section 3.3, the picture presented here may be dominated by companies being relatively advanced (frontrunners).

The general way of overcoming the study weaknesses mentioned above will normally be to develop a detailed knowledge of the markets in question based on inter alia a close collaboration with the trade organisation active on the these markets . As explained above in section 1.2 the assistance received from European trade organisations, however, been limited and not sufficient to compensate for the study weaknesses presented above.

Costs of substitution.
The costs elements to be considered in assessing substitution costs consist mainly of costs of raw materials, research and development and investments in new tools and techniques. Research and development will include adjustment of polymer formulation and adaptation of processing conditions.

The general picture seems to be that well established markets exist for many dominant alternatives to classified phthalates inclusive of DINP and DIDP and non-phthalate plasticisers as ASE, DINCH, and DEHT. With adjustments of the polymer/plasticiser formulations, and in some cases processing adjustments, these alternative plasticisers perform suitably as general purpose PVC plasticisers [COWI, 2009]. The plasticiser producers will normally be involved in the substitution, because they act as advisors for the processors and formulators in the formulation of the polymer/plasticiser system [COWI, 2009].

Table 1.1 shows price examples of DEHP and selected alternatives. As shown, DINP, DIDP and DEHT had comparable or slightly higher prices than DEHP, while DINCH and ASE had somewhat higher prices. Many PVC products are sold in highly competitive markets, and PVC processing industry is sensitive to even minor price changes on raw materials [TURI, 2006].

Table 1.1
Examples of comparative prices of DEHP and selected alternatives (from COWI, 2009)

Substance	Price,	Relative price to DEHP, %	Substitution factor	Effective relative price, %	Remarks
DEHP (2006)	0.70 USD/Lb	100%	-	-	TURI (2006)
DEHP (2006-2009)	≈0.8-1€/kg	100%	-	-	ExxonMobil (2009), Arbeitsgemeinschaft PVC (2006)
DINP (2006)	0.73 USD/Lb	104%	1.06	111%	TURI (2006)
DIDP (2006)	0.77 USD/Lb	110%	1.10	121%	TURI (2006)
ASE (2009)	1,75 €/kg	175% *1	NA	NA	Lanxess (2009)
DEHT (2006)	0.74 USD/Lb	106%	1.03	109%	TURI (2006)
DINCH (2006)	0.91 USD/Lb	130%	NA	NA	TURI (2006)

Notes: *1: DEHP price in 2006-2009 ≈0.8-1€/kg; 1€ is used for calculations. NA = Not available for this study.

Detailed data for estimation of other substitution costs than changed plasticiser prices have not been available. However, considering the price increases for the alternative plasticisers shown in table 1.1 above, the data presented in this report seems to indicate that in those cases classified phthalates are eliminated by substitution to other plasticizers, costs of raw materials will normally be the dominant cost element to be considered. The research and development costs of substituting DINP for DEHP are assumed to be relatively low. The costs of shifting to the less costly non-phthalate plasticisers may more likely imply higher costs of research and development as well as adjustment/adaptation of processing equipment and conditions. The costs may decrease over the years as result of a larger market for the alternatives.

Substituting PVC by other materials as e.g. PU requires different manufacturing equipment and frequently change of subcontractor or polymer supplier.

2 Data on selected products

This section presents the information available for each of the fields of application in focus. The presentation is organised according to the outline of the issues given in section 1.1.

Application fields as lacquer for flooring and furniture and erasing rubber has not been investigated to the same level of detail as other areas. Relevant available knowledge has, however, been briefly presented in a final subsection.

2.1 Flooring of vinyl and heavy style wall covering

2.1.1 Definition of the product group

Flooring and heavy style wall covering made of PVC are vinyl materials with and without textile or PUR backing material. Flooring may be delivered in rolls or tiles, while the qualities used for wall coverings are typically delivered in rolls only. The thickness of the material will generally be in the range of 1-3 mm. The products may be used for covering of ceilings as well.

Several different qualities of flooring are marketed for different customer segments according to contacted vinyl flooring producers. So-called heterogeneous and homogenous types are mainly marketed to professional users requiring high wear resistance. For the private market, mainly the softer type "cushioned vinyl" is marketed. Cushioned vinyl consists of plasticised foamed PVC with an integral smooth surface (skin), or of a plasticised PVC film upper, backed by foamed PUR. Cushioned vinyl is most likely the quality which is also sometimes used for wall covering in bathrooms, etc.

To the extent the materials contain phthalates these substances may be released by evaporation and bound to dust in indoor environment. Phthalates present on the surface of wall covering and flooring may be a source for intake for small children touching the vinyl with fingers etc. Phthalates present on the surface of wall covering and flooring may be removed by washing and thereby be disposed of with residues from the washing process e.g. washing water directed to sewer systems.

2.1.2 Import to and production of products in EU

Import of wall covering and flooring materials to EU27 is registered by Eurostats database on external trade (CN8) [Eurostat 2010a], while production in EU27 is registered in Eurostats PRODCOM - database [Eurostat 2010b].

Extra-EU Import and EU production registered by Eurostat for the year 2008 are shown in table 2.1.1.

Table 2.1.1 Import and manufacturing of flooring; 2008

Import to EU 27			
Position *[1]	Tonnes	Value (1000 Euro)	Comments
39181010	52,024	77,089	PVC with backing (textile etc)
39181090	59,685	89,416	PVC only (no backing)
Import - total	111,709		
Manufacturing in EU27			
22231155	982,730*[2]	1,456,206	PVC with backing (textile etc)
22231159	453,627*[2]	679,593	PVC only (no backing)
Manufacturing-total	1,436,357		

Notes:
* 1 For import the position number stated is referring to Eurostats database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostats PRODCOM - database.
*2 Estimate based on value of manufacturing and value/tonnage of import.

From the figures stated in table 2.1.1 it may be noted that the import is small compared to the quantity manufactured in EU27, as the import counts for less than 10% of the quantity manufactured. The dominance of EU production was confirmed via contact to producers in the EU. Import from the Far East was, however, also mentioned.

2.1.3 Plasticisers in use

The European industry association on these products is the European Resilient Flooring Manufacturers Institute, ERFMI. ERFMI has provided data on the content of DEHP, BBP, DBP and DIBP in average vinyl flooring products in the European market around 2005. The data are shown in table 2.1.2

Total plasticiser concentrations or concentrations of other plasticisers could not be provided. As total plasticiser concentrations generally are in the range of 10-30%, a plausible explanation may be that other plasticisers are used in the production of flooring. ERFMI informed that they were not in a position to provide other data requested in the questionnaire (Annex 2), and forwarded the questionnaire to their members (with no resulting response) [ERFMI, 2010b]).

The Danish Trade organisation for flooring "Gulvbranchen" has earlier informed that since 2000 only DINP and DIDP are used in PVC flooring and wall covering marketed in Denmark [Christensen et al 2007].

The major European producers, contacted for this study have reported that they only use DINP as plasticiser in flooring products, except for one product range with a non-phthalate plasticiser (see below), and one company that has provided some information, but has not reported which plasticisers they use. Plasticiser concentrations vary quite extensively depending on flooring type. 10-20% plasticiser content, depending on product type, has been mentioned for products for the professional market, while higher concentrations, 25-30%, have been mentioned for low-price cushioned vinyl for the private marked. The private market is larger than the professional marked in Europe according to producers. None of the contacted producers had an overview of the average usage of DEHP, BBP, DBP and DIBP in flooring and wall covering products on the European market.

Table 2.1.2 Concentrations of selected phthalates in average flooring products (2005 data) [ERFMI, 2010a][*1]

	DEHP %	BBP %	DIBP %	Other unspecified phthalates
Homogeneous PVC	0.57			
Heterogeneous PVC	3.0	0.89	1.59	
PVC with foam Backing		0.44	0.65	
Laminated PVC	None	None	None	None
Cushioned PVC	1.36	0.64	5.71	
Safety PVC				1.40
Semi Flexible PVC	1.54			

Notes:
*1 Products will frequently contain 2 or more different plasticizers.

One major European producer has introduced a phthalate-free PVC flooring product marketed as such. The plasticiser is the castor-oil (plant oil) derivative COMGHA (marketed as "soft-n-safe").

German investigations performed in 2003 [Stiftung Warentest, 2003] revealed a rather complex picture regarding plasticiser usage. PVC flooring marketed in Germany contained all the following phthalates: DIBP, DBP, BBP, DEHP, DINP, DIDP, DIHP and DIOP. DINP and DIDP were found in significant concentrations. A total of 25 different products were analysed. The total concentration of phthalates registered in the products was in the range of approx. 6.3% to 36.5%.

The content of the individual phthalates was registered as follows: DIBP: ≤6.9%, DBP: 1.3%, BBP: ≤6.8%, DEHP: ≤13.6%, DIHP: ≤33.0%, DIOP: ≤1.1%, DINP: ≤22.0% and DIDP: ≤1.9% [Stiftung Warentest, 2003].

Most products contained a mixture of different phthalates. Considering only concentrations of 0.1% and higher, DIHP was registered to be present in 16 products. DINP was similarly present in 15 products, while DEHP and DIDP each were present in 14 products. BBP was present in 12 products, and DIOP, DIBP and DBP was present in 5, 4 and 3 products respectively [Stiftung Warentest, 2003].

Focussing on the use of classified phthalates, DIBP was mainly present as a co-plasticiser in small concentrations together with mainly DIHP. However, in a single sample DIBP was used as the dominant plasticiser with mainly DIHP as co-plasticiser. DBP was used as a co-plasticiser together with DINP, DIHP and DIDP. BBP was used as a co-plasticiser primarily with DEHP but in some cases also with DIHP. DEHP was used mainly as the dominant plasticiser in some products assisted by DINP, DIHP and/or BBP. However

DEHP was in a number of products also used as co-plasticiser to mainly DINP and in single case also DIHP [Stiftung Warentest, 2003]. Confidential industry information has confirmed a possible continued use of DBP in PVC flooring products.

These German results are in line with the consumption data from the ECHA reports on DEHP, BBP and DBP [ECHA, 2009a, ECHA, 2009b, ECHA, 2009c]; see below. The discrepancy between these data and the information provided by major European producers from this study may be caused by a continued trend away from DEHP, BBP and DBP over the last few years, or this trend may be most clearly expressed for some major European producers, whereas other EU producers and imports may not have changed their plasticiser usage similarly.

The total consumption of DEHP for flooring vinyl products has been estimated at 30,200 tonnes per year in 2007, based on updated DEHP production statistics in combination with partly older consumption distribution estimates and import/export statistics. EU-manufacture dominated this application of DEHP. Similarly, at total consumption of 10,100 tonnes per year was estimated for "wall covering" [ECHA, 2009a]. However, the term "wall covering" more likely refer to PVC wall paper, but both these product types may contribute to this consumption estimate. Based on similar considerations, the total consumption of EU-produced BBP for flooring products was estimated at 4,290 tonnes per year for 2007. Here, import/export were however not included in the estimation process. Flooring was considered the dominant application of BBP, as about half of the BBP produced in the EU was used for this application [ECHA, 2009b]. The similar ECHA report [ECHA, 2009c] on DBP mentions flooring as one of the product types where DBP may be used, but does not provide specific estimates of the consumption for this application.

Based on the import and production statistics provided in table 2.1.1, and the plasticiser concentrations mentioned above, the total plasticiser consumption for EU produced flooring is expected to be within the range of 140,000 - 430,000 tonnes per year. Based on the mentioned statements from manufacturers, most of this is presumably DINP. Similarly, the plasticiser consumption in imports is expected to be in the range of 11,000 - 34,000 tonnes per year. In imports, the frequency of DEHP usage may be larger, as DEHP is still the dominant general plasticiser globally (50% of total phthalates consumption in 2007 across all applications according to ECPI [ECPI, 2010].

The importance of DEHP as plasticizer may also be assessed as follows: Assuming that DEHP is the only plasticiser used in the products with DEHP and that total plasticiser concentration is 10-30%, the 2007 DEHP consumption estimated at 30,200 tonnes per year in 2007 in EU production, corresponds to a flooring product amount of some 100,000 to 300,000 tonnes per year, or 7 - 21% of the total EU production. This seems to be in accordance with the general market share of DEHP in Europe across all phthalates of around 17% [ECPI, 2010], but is somewhat contradictory to the numbers provided by ERFMI. However, this indicates that DEHP may still be used in some flooring products. It cannot be ruled out however that the DEHP usage for flooring may have changed further since 2007.

2.1.4 Alternatives available

DINP, DIDP, DIHP, DIOP, castor oil derivatives (COMGHA), dibenzoates like DGD (a secondary plasticiser [Maag et al, 2009]) are used in PVC flooring products.

According to a producer, the usage of the plant oil derivative COMGHA did not cause any changes in the product quality, as this alternative plasticiser performed similarly to the phthalates otherwise used.

2.1.5 Trends and perspectives

For the EU production of flooring and wall covering vinyl, the movement away from DEHP, BBP, DBP and DiBP is expected to continue. The case for imports is unknown except that alternative plasticisers are now also used for example in China for various other product types.

Additionally, it can be mentioned that a major European producer represented on the Danish market has informed that Danish positions regarding phthalates had influenced the choice of plasticisers in flooring on the European market in general.

2.1.6 Costs of substitution

Except for an example of phthalate-free flooring, the contacted producers have not provided information on additional costs from substitution of DEHP, BBP, DBP or DiBP.

In the case of the flooring plasticised with DINP as an alternative to DEHP, no data on the changes in costs were provided by producers contacted. With a plasticiser content of 10-30%, an additional cost of DINP of about 10% compared to DEHP (effective 2005-prices considering 6% extra DINP needed for same flexibility; [TURI, 2006]), and anticipating no extraordinary investments (beyond regular re-formulation), the extra cost can be estimated at 1-3% for the finished flooring vinyl.

In the case of the phthalate-free flooring product plasticised with COMGHA, the producer reported that plasticiser itself was more expensive than equivalent phthalates, and that the future availability of adequate amounts of the plasticiser was a concern. The phthalate-free flooring vinyl was reported to be approximate 25% more expensive than similar products plasticised with DINP. This was however a campaign price, meaning that it may perhaps not fully reflect the costs, according to the producer. The plasticiser itself (COMGHA) has been reported to cost around 3.5 times the price of DEHP [Maag et al, 2009].

2.1.7 Companies contacted regarding this product group

Tarkett, Sweden

Forbo, Switzerland

Armstrong, USA

Beaulieu/Beauflor, Belgium

2.2 PVC insulation on wires and cables

2.2.1 Definition of the product group

The product group consists of isolated electrical wires and cables, as well as optical fibercables, of types used in homes and offices. PVC is in reality used as insulation as well a coating material. Cable and wire types used in the homes include flexible cables used for connecting electrical devises, construction cables for low voltages, 230 and 400V, low voltage cables used inside electrical and electronic devices, and optical cables.

Consumers can be exposed to phthalates by direct contact with the wires and cables and when phthalates evaporates to indoor air.

2.2.2 Import to and production of products in EU

Import of cables to EU27 is registered by Eurostats database on external trade (CN8) [Eurostat 2010a], while production in EU27 is registered in Eurostats PRODCOM - database [Eurostat 2010b].

Extra-EU Import and EU production registered by Eurostat for the year 2008 are shown in table 2.2.1.

Table 2.2.1
Import to and manufacturing of insulated wire and cable in EU27 in 2008

Import to EU 27			
Position *1	Tonnes	Value (1000 Euro)	Comments
85442000	91,938	489,024	Co-axial cables, insulated
85444210	31,157	359,798	Electric conductors, telecom., ≤1000 V, insulated
85444290	170,045	1,608,173	Electric conductors, ≤1000 V, insulated, with connectors
85444920	64,390	308,536	Conductors, Electric, <= 80 V, insulated, telecom.
85444991			No plastic
85444993	34,095	249,914	Conductors, Electric, <= 80 V, insulated,
85444995	108,464	553,135	Conductors, Electric, 80 V ≥, <= 1000 V, insulated,
Import - total	500,089		
Manufacturing in EU27			
27321200	192,298	1,452,894	Co-axial cables, insulated
27321340	1,110,644	5,247,577	Electric conductors, ≤1000 V, insulated, with connectors
27321380	1,630,409	9,018,429	Electric conductors, ≤1000 V, insulated, not with connectors
Manufacturing- total	2,933,351		

Notes:
* 1 For import the position number stated is referring to Eurostats database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostats PRODCOM - database.

From the figures stated in table 2.2.1 it may be noted, that the import is small compared to the quantity manufactured in EU27, as the import counts for less than 20% of the quantity manufactured.

2.2.3 Plasticisers in use

Based on detailed data from a cable catalogue of a European producer, the average PVC content of regular PVC insulated wires and cables is around 30% for single solid copper conductor wire (used for 230-400V installations), whereas it is around 65% for 2-3 conductors flexible connecting cords used in the home or office, and around 70% for 3- and 5-conductors construction cables (230-400V installations).

Based on information from cable manufacturers DIDP, DINP and DEHP are likely the main plasticisers used for cables in the EU. According to one manufacturer, DIDP constitutes about 80% of the current plasticiser consumption for cables in the EU. Confidential industry information has indicated a possible continued use of DBP as secondary plasticiser in wire and cable.

Typical plasticiser concentrations in the PVC insulation are 20-30% according to a European producer.

According to producers, other plasticisers in use for cables are DPHP and TOTM. Adipates are sometimes used in specialty cables, for example for low temperature use.

Halogen-free cables with PE insulation (without plasticisers) are gaining terrain in some parts of the European market, notably in construction cables where the slightly lower flexibility is not important. For the Danish market, one producer estimates a market share of around 50% for halogen-free cables.

Flexible connection cables for homes and offices, and for use inside electronics, are also available in halogen-free PE and silicon rubber qualities, but consumers and original equipment manufacturers (OEM) hesitate because of the slightly lower flexibility, and because machines for cutting of insulation for cables in electronics manufacture are currently not designed for such insulation qualities.

BBP, DBP and DiBP are not reported used in cable and wire, probably due to their high volatility. Cables are heated during use and this increases the volatilisation.

The total consumption of DEHP for cable and wire used indoors has been estimated at 52,600 tonnes per year in 2007. The total DEHP consumption including for outdoor cables was estimated at 64,100 tonnes per year in 2007. EU-manufacture dominated this application of DEHP, while imports were of less significance [ECHA, 2009a].

Based on the import and production statistics provided in table 2.2.1, the plasticiser concentrations and PVC insulation shares mentioned above and a relatively low share of non-PVC construction cables in the supply, the total plasticiser consumption for EU produced cable is expected to be within the range of 190,000 - 550,000 tonnes per year. Based on the above mentioned statements from EU producers, the majority of this may be DIDP. Similarly, the consumption in imports is expected to be in the range of 30,000 - 100,000 tonnes per year. In imports, the frequency of DEHP usage may be larger, as DEHP is still the dominant general plasticiser globally (50% of total phthalates consumption in 2007 across all applications according to [ECPI, 2010].

Assuming that DEHP is the only plasticiser in the product, that total plasticiser concentration is 20-30% and that insulation constitutes 30-70% of the average cable, the 2007 DEHP consumption estimated at 64,100 tonnes per year in 2007 in EU production, corresponds to a cable and wire product amount of some 300,000 to 1,100,000 tonnes per year or 10 - 36% of the total EU production of these cable and wire types. This seems realistic as the general market share of DEHP in Europe across all phthalates uses was 17% in 2007 according to ECPI [2010], and roughly in line with the mentioned EU manufacturer statement that DIDP today constitutes about 80% of the consumption.

The standard questionnaire for this study has been presented to Europacable, The European Confederation of National Associations of Manufacturers of Insulated Wire and Cable. Europacable did not have any specific information to provide, but established contacts to a number of manufacturers via their environment committee.

2.2.4 Alternatives available

PVC insulation is plasticised with DIDP, DINP, DPHP, TOTM and adipates. PVC-free cables are available with insulation made of PE or silicon rubber.

According to contacted producers there are no uses of indoor cable types for which DEHP cannot be substituted.

2.2.5 Trends and perspectives

Manufacturers stated that there is a continued trend away from DEHP (BBP, DBP and DiBP are not used). The case for imports is unknown except that alternative plasticisers are now also used for example in China for various other product types.

2.2.6 Costs of substitution

One manufacturer, now not using DEHP anymore, stated that DIDP had been introduced gradually as customers had requested it, and that extra costs for substitution had therefore not been assessed on an overall company level.

In the case of the cable insulation plasticised with DIDP as an alternative to DEHP, approximate cost increases can be estimated as follows. With a plasticiser content of 20-30% in the PVC, PVC 30-70% of cable weight, an additional cost of DIDP of about 21% compared to DEHP (effective 2005-prices considering 10% extra DIDP needed for same flexibility; [TURI, 2006], and assuming no extraordinary investments (beyond regular re-formulation), the extra cost can be estimated at 1-5% for the finished cable.

According to a European producer a lamp cord, by way of example, cost about 7% more in halogen-free (PVC-free and phthalate-free) quality than the comparable quality insulated with PVC plasticised with DINP. No data on costs of substitution from DEHP to DINP was available.

As regards potentials for minimisation of substitution costs through integration in regular development and maintenance activities, a major European manufacturer reported that re-formulation of the insulation polymer blend is done frequently (monthly). Dies and extruder nipples are worn and therefore changed regularly; dies last a year or longer; nipples last a

month or longer. Whole production lines generally last long, in the range of some 10-30 years.

2.2.7 Companies contacted regarding this product group

Draka, the Netherlands

Prysmian, Italy

NKTCables, Denmark

2.3 Bags, brief-/suitcases and similar items

2.3.1 Definition of the product group

The product group covers plasticised PVC parts on bags, brief- and suitcases and similar items. The PVC parts in questions includes thin PVC film typically used inside the bags and cases, PVC coated fabrics and leather-look, and PVC marks, figures, profiles sewn, welded or otherwise attached to the outer surface or bottom of the bags and cases.

To the extent these materials contain phthalates, these substances may be released by evaporation to indoor air. Special situations of concern could be bags for school and kinder garden purposes. Phthalates present on the surface of the PVC material may be a source for exposure for small children touching the vinyl with fingers etc. Phthalates may also be released to indoor air in homes, kinder gardens and schools.

2.3.2 Import to and production of products in EU

Import of bags, brief-/suitcases and similar items to EU27 is registered in Eurostats database on external trade (CN8) [Eurostat 2010a], while production in EU27 is registered in Eurostats PRODCOM - database [Eurostat 2010b].

Extra-EU Import and EU production registered by Eurostat for the year 2008 are shown in table 2.3.1.

The figures stated in table 2.3.1 indicate that the import is slightly smaller than the quantity manufactured in EU27. It must, however, be recognised that the definition of products used in the PRODCOM-database is broader (including more materials) than the definitions used for external trade, and the content of the databases for this reason not fully comparable, as the figures presented in the PRODCOM database should be expected to be higher than the figures for import.

Bags in general

There are numerous bag producers with each their choice of design. It has not been possible to identify a European trade organisation able to provide an overview of the main trends in the market. Euratex - the European apparel and textile confederation has no knowledge on bags [Euratex 2010]. Thus the choice has been made to focus on the Danish market and use data on this market as representative for the European market. The overall picture is motley and it is not possible to give a clear view of the main stream of the bag market.

A dominant vendor of bags in Denmark informs that approx. 20% of their bags contain PVC. According to this vendor the content of PVC in bags varies from bags made entirely or almost entirely of PVC to bags containing only small fractions of PVC, as PVC in these cases is used mainly for decorations and similar purposes. In the last case the content of PVC in bags is to be in the range of 1-5%. According to the vendor, the choice of materials is the same all over EU. No production of bags made of plastics is taking place in Denmark, and no exact data on the quantity of bags consisting entirely or almost entirely of PVC versus bags containing only fractions of PVC are available. However, based on observations in Danish shops it must be anticipated that most bags contains only fractions of PVC.

Assuming that 20% of all bags contains PVC, and that 70-90% of these bags contains in the range of 1-5% PVC, while the remainder is made entirely of PVC, the quantity of PVC in bags imported to EU may based on the figures presented in table 2.3.1, be roughly estimated to 15,000 - 46,000 tonnes. Production in EU may similarly be estimated to 20,000 - 63,000 tonnes PVC. It is emphasized that these estimates should be taken as an indication of the probable order of magnitude only.

Table 2.3.1
Import to and manufacturing of bags, brief-/suitcases and similar items in EU27- 2008 figures

Import to EU 27			
Position *[1]	Weight (tonnes)	Value (1000 Euro)	Comments
39232910	18,845	52,714	Sacks/bags of PVC
42021110	52,703	66,990	Briefcases, school satchels etc - outer surface of leather, composition or patent leather
42021211	6,918	31,558	Briefcases, school satchels etc - outer surface of plastic sheeting
42021250	32,477	129,874	Trunks, suitcases, briefcases, school satchels - outré surface of moulded plastic
42021291	38,725	201,194	Briefcases, school satchels etc - outer surface of plastic or textile fibres
42021990	22,213	70,210	Briefcases, school satchels etc - other cases?
42022210	111,742	696,353	Handbags - outer surface of plastic sheeting
42022290	81,413	676,025	Handbags- outer surface of textile materials
42022900	7,924	61,390	Handbags- outer surface of or mainly of vulcanised fibres, paperboard or paper
42029211	16,313	109,770	Bags (travelling, toilet, sports), rucksacks - outer surface of plastic
42029215	1,846	10,264	Musical instrument cases - outer surface of plastic
42029219	55,072	265,995	Bags (travelling, toilet, sports), rucksacks - outer surface of textile
42029291	146,855	857,369	Bags (travelling, toilet, sports), rucksacks - outer surface of textile
42029298	118,548	645,321	Bags (food, beverage, shopping, cameras etc.) - outer surface of textile
42029900	30,343	183,118	Bags etc. -outer surface of vulcanised fibres or paperboard
Import - total	689,233		
Manufacturing in EU27			
22221200	497,772	1,792,209	Plastic sacks and bags (not PE)
15121210		320,000	Trunks, Briefcases, school satchels etc - of leather, composition or patent leather
15121220		2,821,119	Handbags - all materials
15121250		490,152	Cases and containers
Manufacturing-total*[2]	936,581*[2]		

Notes:
*1 For import the position number stated is referring to Eurostats database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostats PRODCOM - database.
*2 Estimate based on value of manufacturing and value/tonnage of import.

Assuming that 20% of all bags contains PVC, and that 70-90% of these bags contains in the range of 1-5% PVC, while the remainder is made entirely of PVC, the quantity of PVC in bags imported to EU may based on the figures presented in table 2.3.1, be roughly estimated to 15,000 - 46,000 tonnes. Production in EU may similarly be estimated to 20,000 - 63,000 tonnes PVC.

It is emphasized that these estimates should be taken as an indication of the probable order of magnitude only.

School bags
Dominant suppliers of school bags in Denmark include JEVA and LEGO. Furthermore, a minor part of the market is the brands which are sold in book stores. These brands include Depesche, Euromic etc.

It is estimated by producers, that approx. 100,000 - 110,000 school bags is sold per year in Denmark. No precise data on the number of school bags sold in EU is available. Assuming a population of EU27 of approx. 500 mil. inhabitants and a population of Denmark of approx. 5.5 mil. inhabitants [Eurostat 2010] the total number of school bags sold in EU may roughly be estimated to 9-10 mio. bags yearly.

Many school bags do, however, not contain PVC. For Denmark it is known that bags produced by JEVA, LEGO and Euromic are all free of PVC [JEVA, 2010; Juniorbusiness, 2010; miljoeogsundhed, 2010]. Together these brands should be assumed to dominate the Danish market for school bags. Although the exact market share for each of these brands is not known, together they may well cover more than 80% of the Danish market.

2.3.3 Plasticizers in use

Bags in general
It has not been possible to obtain information about the specific plasticizers used, due to confidentiality. The actual producers of the PVC bags are also regarded as confidential, leaving no ways to obtain further information about the production.

Furthermore, test reports showing the composition of the bags made of plastics has not been available either, as these bags are not within the scope of the present regulation of phthalates.

School bags and similar
A dominant Danish importer of bags for children informs that their bags are manufactured in China and does not contain phthalates. No information on the actual plasticizers being used has been available.

The same picture has been found in Germany. A test of 12 school bags revealed that all bags were free of phthalates [Stiftung Warentest, 2009]. The content of PVC in the tested bags is not known as this information has not been registered.

It must be concluded that it has not been possible to find evidence for the use of phthalates in school bags in Denmark.

2.3.4 Alternatives available

Producers and suppliers to the Danish market informs that alternatives are available for all parts of bags.

A Danish producer informs that PVC in reflexes on bags has been substituted with TPX (polymethylpentene) within the latest 2-3 years.

The Danish importer of children's bags made in China informs that they are guarantied by their supplier, that phthalates are not used. Apart from that

PVC is still the material used, no information has been provided about the choice of plasticisers adopted.

2.3.5 Trends and perspectives

According to a dominant vendor on the Danish market the trend for ***bags in general*** is that no changes occur without regulation. Therefore, the PVC and phthalates will not be substituted unless rigorous legislation is implemented.

Regarding school bags, the picture is slightly different as the general concern related to PVC and phthalates has already motivated the dominant Danish manufacturers to develop PVC free products. The trend in other EU countries is not known.

It is not known to what extend minor manufacturers of school bags and similar still using PVC and/or phthalates has planned to adopt alternatives in the near future.

2.3.6 Costs of substitution

According to a main vendor in Denmark the main reason for the use of phthalates is the low price. It is estimated by the vendor that products without phthalates will be approx. 30% more expensive for the consumers than similar products without phthalates.

Substitution of PVC for reflexes on bags with TPX, raised the price for this single item increased by 100%.

2.3.7 Companies contacted regarding this product group

Neye, Denmark

JEVA, Denmark

Bilka, Denmark

Føtex, Denmark

K.E. Mathiasen, Denmark

TOP TOY A/S, Denmark

2.4 Tablecloth, curtains, shower curtains and similar items (not industrial uses)

2.4.1 Definition of the product group

The product group covers tablecloth, curtains, shower curtains and similar items made of PVC film or coated fabrics for home and office purposes but not for industrial purposes. .

To the extent the materials contain phthalates these substances may be released by evaporation to indoor air. Phthalates present on the surface of tablecloth and curtains etc. may be a source for exposure when touching the vinyl with fingers etc.

2.4.2 Import to and production of products in EU

Import of tablecloth, curtains, shower curtains etc. to EU27 is registered by Eurostats database on external trade (CN8) [Eurostat 2010a], while production in EU27 is registered in Eurostats PRODCOM - database [Eurostat 2010b].

Extra-EU Import and EU production registered by Eurostat for the year 2008 are shown in table 2.4.1. For plates, sheets, film , foil and strip only items containing ≥6% of plasticiser and with a thickness ≤1 mm are assumed relevant to consider.

Table 2.4.1
Import to and manufacturing of tablecloth, curtains, shower curtains etc. in EU27-2008 figures

Import to EU 27			
Position *[1]	Tonnes	Value (1000 Euro)	Comments
59031010	5,941	21,276	Textile fabrics impregnated with PVC
59031090	22,245	66,035	Textile fabrics covered, coated or laminated with PVC
39204310	23,939	58,886	Plates, sheets, film, foil and strip, of PVC, containing ≥ 6 % of plasticiser, thickness <= 1 mm
39211200	32,203	82,083	Plates, sheets, film, foil and strip, of cellular PVC,
Import - total	84,328		
Manufacturing in EU27			
13961400	938,255*[2]	2,906,337	Textile fabrics, impregnated, coated, or covered n.e.c.
22213035 *[3]	389,167	1376,883	Plates, sheets, film, foil and strip, of PVC, containing ≥ 6 % of plasticiser, thickness ≤ 1 mm
22214130	170,864	522,315	Cellular plates, sheets, film, foil and strip of PVC
Manufacturing- total	1,498,286		

Notes:
*1 For import the position number stated is referring to Eurostats database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostats PRODCOM - database.
* 2 Estimate based on value of manufacturing and value/tonnage of import.
*3 The data text stating "≤ 6 % of plasticiser" is assumed to be wrong. The correct phrase is assumed to be "≥ 6 % of plasticiser".

From the figures stated in table 2.4.1 it may be noted that the import is small compared to the quantity manufactured in EU27, as the import counts for less than 6% of the quantity manufactured.

However, as the quantity manufactured is estimated partly based on import data, the estimated quantity manufactured could be biased.

The statistical positions quoted in table 2.4.1 may contain significant amounts of items used for other purposes than tablecloth, curtains, shower curtains, etc. Such other items could include for example PVC film and sheet used for industrial purposes.

2.4.3 Plasticisers in use

The EuPC [2010] has reported that the use of DEHP may be more widespread than the average 15% (or so) DEHP share in plasticizer use in Europe for the application “flexible PVC film products”. EuPC estimated that about 50% of such products would contain DEHP, whilst the actual use would vary from company to company. The applications which reported a high use were stationary (office supply), tapes, shower curtains and then those applications where technical or legal requirements impose the use of DEHP such as medical applications.

Several producers of flexible PVC film for these purposes have been contacted, but only on company has supplied information. According to this company, the use of DEHP, DBP and BBP is widespread for these applications. The company does however not use them themselves, and front-end producers, mainly in the EU, are now working at reducing and/or substituting these substances with others non-SVHC plasticisers. The company informs that PVC table cloth with textile backing (often non-woven textiles) contains around 90% plasticised PVC and 10% backing material.

A Danish survey of selected non-toy products which could cause exposure to children included a PVC shower curtain containing 26% DEHP, a dish mat with 11% DEHP, and a transparent table cloth (PVC film) with 14% DEHP and 3,2% DiNP [IMS, 2009].

European retailers are marketing PVC-free plastic coated table cloths (oil cloth style), for example coated with acrylics.

European producers inform that phthalates-free table cloth/covers of PVC film and PVC-coated textile are available on the European market. Plasticisers used include, among others, "TBC (tributyl citrate) " (probably actually ATBC, often used for PVC for food contact), DINCH, DOA and ESBO. Some consumer segments and retailer chains prefer phthalate-free product qualities.

No other data on plasticisers in use has been obtained. The data available does not allow for estimates on the total consumption of different plasticisers in import and European production to be developed.

2.4.4 Alternatives available

Alternative plasticisers reported in use for tablecloth/cover: ATBC, DINCH, DOA in combination with ESBO.

Based on a limited internet search, various alternatives to PVC shower curtains are available at low costs. Many market synthetic, woven textile, for example of polyester, but also plastic film curtains of EVA/PEVA are marketed [IKEA 2010].

2.4.5 Trends and perspectives

No general trend has been identified for EU-production. The case for imports is unknown except that alternative plasticisers are now also used for example in China for various other product types.

2.4.6 Costs of substitution

European producer inform that phthalates-free table cloth/covers of PVC film are available on the European market. Product qualities plasticised with TBC or DINCH are about 50% more expensive than with DEHP, whereas qualities plasticised with a combination of DOA and ESBO are about 5% more expensive than with DEHP.

2.4.7 Companies contacted regarding this product group

The companies contacted have requested to remain anonymous.

2.5 Carpet tiles/squares with PVC-foam as backing

2.5.1 Definition of the product group

The product group covers carpet tiles and squares produced with PVC, foamed or not, as back cover. The market is today dominated by carpet tiles with other backing materials than PVC.

To the extent this material contain phthalates, these substances may be released by evaporation to indoor air.

Table 2.5.1
Import to and manufacturing of carpet tiles produced with PVC-foam as back cover in EU27- 2008 figures

Import to EU 27			
Position *[1]	Tonnes	Value (1000 Euro)	Comments
57032012	212	773	Tiles of polyamides, ≤ 1m^2
57032092	1,012	2,695	Tiles of polyamides, printed, ≤ 1m^2
57033012	2,679	5,104	Tiles of polypropylene, ≤ 1m^2
57033082	671	1,925	Tiles of textile materials excl. PA and PP, ≤ 1m2
57039020	788	2,669	Tiles of vegetable textile materials and animals hair ≤ 1m^2
57041000	265	664	Tiles of felt ≤ 0,3m^2
Import - total	5,924		
Manufacturing in EU27			
13931300	1,424,000*[2]	3,500,000	Tufted carpets and other tufted textile floor coverings
Manufacturing- total	1,424,000		

Notes:
*1 For import the position number stated is referring to Eurostats database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostats PRODCOM - database.
*2 Estimate based on value of manufacturing and value/tonnage of import.

2.5.2 Import to and production of products in EU

Import of carpet tiles to EU27 is registered by Eurostats database on external trade (CN8) [Eurostat 2010a], while production in EU27 is registered in Eurostats PRODCOM - database [Eurostat 2010b].

Extra-EU Import and EU production registered by Eurostat for the year 2008 are shown in table 2.5.1.

As stated in table 2.5.1 no figures on manufacturing of carpet tiles in EU27 are available. The figures available include carpets and thus clearly overestimate the quantity of carpet tiles manufactured.

The EU professional market for carpet tiles is estimated at some 25-40 million m^2 per year. According to a major producer, the typical weight of carpet tiles is around 4 kg/m^2, meaning that this equals some 0.1-0.16 million tonnes per year. Compared to the figures presented in table 2.5.1, this means that import of carpet tiles into the EU is minimal.

2.5.3 Plasticisers in use

Based on the survey in this study, most carpet tiles marketed in the EU is made with other backing materials than PVC. Of five contacted European producers of carpet tiles, three used other backing materials than PVC (bitumen, textiles), and two had production of carpet tiles with PVC backing. The contacted producers believed that the total market share for PVC-backed carpet tiles to be low. Based on their information the market share is estimated here to be around 10-15% of the total carpet tile market.

Information from producers of carpet tiles with PVC backing indicate that today, only DINP is used as plasticiser in the PVC backing of carpet tiles in the EU. PVC share of product weight around 70-90%, and plasticiser concentrations in PVC of around 13-23% are reported.

The European industry association on these products is the European Resilient Flooring Manufacturers Institute, ERFMI, has been contacted for this study. ERFMI informed that they were not in a position to provide data requested in the questionnaire (Annex 2), and forwarded the questionnaire to their members (with no resulting response) [ERFMI, 2010b].

2.5.4 Alternatives available

Alternative backing materials covers bitumen and textiles. DINP is used in PVC backing. DOTP, DIHP and DINCH are mentioned by producers as alternatives to DEHP, and isodecyl benzoate is mentioned as an alternative to BBP.

Adipates, phosphates and trimellitates are also mentioned as potential alternatives, yet one producer states that some of these may not be suitable technically.

2.5.5 Trends and perspectives

Substitution seems to be completed already. A producer reported that BBP was substituted (or abandoned) in the late 1980's and DEHP was substituted around 2000.

The case for imports is unknown except that alternative plasticisers are now also used for example in China for various other product types.

2.5.6 Costs of substitution

According to one producer, abandoning phthalates altogether could mean that some product types would perhaps not be produced anymore because of higher non-phthalate plasticiser prices.

One producer states that re-formulation of polymer blend is done every 5 years or so (atypical, may refer to overall polymer composition and not regular minor adjustments). Dies and similar are reported replaced every 10 years or so, while larger physical changes are reported to take place every 10-20 years.

No other information was available regarding costs of substitution.

2.5.7 Companies contacted regarding this product group

InterfaceFlor, USA

Ege Carpets, Denmark

Burmatex, United Kingdom

Desso, The Netherlands

Westbond (Forbo), United Kingdom

2.6 Water beds and air mattresses

2.6.1 Definition of the product group

The product group covers water beds and air mattresses produced of PVC film or coated fabrics.

From these materials, phthalates may be released by evaporation to indoor air. Phthalates present on the surface of water beds and air mattresses may be a source for intake for small children touching the vinyl with fingers, etc.

2.6.2 Import to and production of products in EU

Import of air matresses to EU27 is registered in Eurostat's database on external trade (CN8) /Eurostat 2010a/, while production in EU27 is registered in Eurostat's PRODCOM - database /Eurostat 2010b/.

Extra-EU Import and EU production registered by Eurostat for the year 2008 are shown in table 2.6.1.

Table 2.6.1
Import to and manufacturing of water beds and air mattresses in EU27- 2008 figures

Import to EU 27			
Position *1	Tons	Value (1000 Euro)	Comments
63064000	10,516	27,156	Pneumatic mattresses of textile material
Import - total	10,516		
Manufacturing in EU27			
13922270	1,167	6,526	Pneumatic mattresses and other camping goods (excl. tents, sleeping bags etc.)
Manufacturing- total	1,167		

Notes:
* For import, the position number stated is referring to Eurostat's database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostat's PRODCOM - database.

As stated in table 2.6.1 no figures on import and manufacturing of water beds in EU27 are available. The figures available cover air mattresses only. Furthermore, figures on manufacturing also include other camping items and cannot be compared directly with import figures.

From the figures stated in table 2.6.1 it may, however, be noted that the import of air mattresses seems to be large compared to the quantity manufactured in EU27.

2.6.3 Plasticiser in use

Water beds

Water bed mattresses are made of flexible PVC with different barriers of PVC or other materials inside the mattress. In addition, the water beds generally contain a PVC safety liner which can contain the total water amount in case of leaks. Of the contacted major European producers of water beds, 2 out of 4 producers use only Mesamoll II (ASE, alkyl sulfonic acid ester of phenol). One producer has two product ranges, one with Mesamoll II and one with unspecified phthalates. One producer used unspecified non-phthalate plasticiser(s). One producer estimates that some 40-50% of the world market for water beds is produced with Mesamoll II today, while another producer estimates that only 10-20% of the marketed water beds in the EU do not contain phthalates.

Water beds are produced both as high-end products where health issues are a priority, and as low-end, less expensive products for which the main focus is low price. A higher prevalence of phthalate use in the low-end products has been reported by some producers.

The PVC film used in the water beds is produced partly in Europe, partly in China, according to information from producers and Fachverband Wasserbett [2010]. The mattresses are manufactured from the film primarily in the EU, but some finished mattresses may be imported.

According to a major EU producer, the annual sale of water beds in Germany and Austria was estimated at 49 million Euros for 2007. According to Fachverbund Wasserbed [2010], sales per capita on the German market may be in the higher than in the EU in general. With sales prices in the range of some 1000-2000 Euros, this corresponds to a sale of around 25,000-50,000 water beds per year. Extrapolated to the whole EU population, this indicates a

sale of perhaps 100.000 - 200,000 water beds annually. This figure has been evaluated as a "reasonable estimate" by one of the major producers. Plasticiser concentrations in PVC in water beds are assumed to similar to the film used in air mattresses, namely 20-30%. With a flexible PVC amount of around 25-30 kg per water bed according to a major producer, this corresponds to some 3,000-6,000 tonnes PVC and 600-1,800 tonnes plasticiser.

Air mattresses

PVC air mattresses now dominate the market according to a producer, while traditional rubber/cotton air mattresses are also available, but may be loosing market. Of the 3 major producers of airbeds contacted (all with actual production outside the EU), and one company uses DINP in their air mattresses, while another uses so-called "non-3P" film, meaning PVC film without DEHP, DBP and BBP, but with unspecified plasticisers. The third company did not wish to provide information on their plasticiser use due to the competition in a price-sensitive market. According to one producer, large parts of the world production of air mattresses today use "non-3P" PVC film.

Only one producer has reported plasticiser concentrations in air mattresses, namely 20-30% DINP.

Assuming that this plasticiser concentration is general, that the EU manufacturing of " pneumatic mattresses and other camping goods (excl. tents, sleeping bags etc.)" is dominated by air mattresses, and that the export is marginal, the total marketed amount of some 11,700 tonnes of air mattresses in the EU corresponds to around 2,000-3,500 tonnes plasticiser annually. It cannot be ruled out that part of this may be DEHP, but available data do not allow a quantification of this possible use. If DBP and BBP are present in these products at all (not verified), it may likely be in small amounts only.

With potential relevance to both product groups, it may be worth mentioning that for EU manufacturing, the EuPC [2010] has reported that the use of DEHP may be more widespread than average in some flexible PVC film products; see the section on tablecloth, etc. This information supports an assumption of that DEHP could still be used in these product groups, but as stated above, quantification is not possible.

2.6.4 Alternatives available

ASE seems to be a major alternative for PVC film in water beds. For air mattresses DINP is mentioned by one major producer. Other producers have not specified which plasticisers they use, except that one specifies "non-3P" usage.

For air mattresses - as stated above - the traditional rubber/cotton solution may be regarded as an alternative material.

2.6.5 Trends and perspectives

Water beds

According to Fachverband Wasserbett [2010], there may currently be a shift towards a higher sale of the low-end water beds with possible higher prevalence of phthalate plasticiser due to the general financial crisis. One producer estimates that some 40-50% of the world market for water beds is produced with Mesamoll II, and expects, that this share will increase.

Air mattresses

The use of air mattresses may be increasing based on observations in shops over the last years in Denmark. PVC king-size air mattresses are increasingly marketed as guest beds for home use, along with the traditional camping use. One producer informs that "non-6P" PVC film is now also available for air mattress production . This PVC film is without DEHP, DBP, BBP, DiNP, DiDP, DNOP.

2.6.6 Costs of substitution

According to one producer, "non-3P" PVC film for air mattresses were 2 years ago some 5-10% more expensive than PVC film with these phthalates, while there is no difference now as large parts of the production today use "non-3P" film.

A major producer of water beds state that the additional price for non-phthalate plasticiser use in water beds is marginal.

2.6.7 Companies contacted regarding this product group

Akva Waterbeds, Denmark

Blu times/Goldeck Textil Gmbh, Germany

Abbco Waterbeds, Germany

T.T.I., Belgium

Harboe Trading, Denmark (Campingaz/Coleman, France/USA)

Oase Outdoors Aps (Outwell), Denmark

Intex , USA

2.7 Wallpaper/tapestry made of or coated with PVC

2.7.1 Definition of the product group

The product group covers wall papers or wall coverings made of or coated with plasticised PVC. PVC wallpaper is also called vinyl wall covering, but should not be confused with the thicker wall covering products used for bathroom walls etc. (vinyl flooring style coverings), see section 2.1.

Phthalates may be released by evaporation and dust formation to indoor air and environment or by washing of the wallpaper. Phthalates present on the surface of wallpaper may be a source for intake for small children touching the PVC with fingers etc. Phthalates present on the surface of wallpaper may be removed by washing and thereby be disposed of with residues from eth washing process e.g. washing water directed to sewer systems.

2.7.2 Import to and production of products in EU

Import of wallpaper made of or coated with PVC to EU27 is registered by Eurostats database on external trade (CN8) [Eurostat, 2010a], while production in EU27 is registered in Eurostats PRODCOM - database [Eurostat 2010b].

Extra-EU Import and EU production registered by Eurostat for the year 2008 are shown in table 2.7.1

Table 2.7.1
Import to and manufacturing of wallpaper/cover made or coated with PVC in EU27-2008 figures

Import to EU 27			
Position *[1]	Tonnes	Value (1000 Euro)	Comments
48142000	4,201	18,343	Wallpaper made of paper coated or covered with a decorative etc. layer of plastics
48149010	600	3,163	Wallpaper made of paper decorated etc. and covered with a layer of plastics
Import - total	4,801		
Manufacturing in EU27			
17241100	293,379	970,796	Wallpaper and similar.
Manufacturing- total	293,379		

Notes:
* For import, the position number stated is referring to Eurostat's database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostat's PRODCOM - database.

From the figures stated in table 2.7.1 it may be noted that the import is small compared to the quantity manufactured in EU27, as the import of wallpaper which may contain PVC counts for less than 2% of the total quantity of wallpaper manufactured in the EU (including other types of wallpaper).

Major producers have confirmed that most wallpaper marketed in the EU is PVC wallpaper produced in the EU. Import from the USA may occur, but is not widespread due to other design preferences.

2.7.3 Plasticisers in use

According to major European producers DINP is today the main plasticiser used in wallpaper/wall covering manufacturing. The use of DOTP has however also been reported, as well as DOA and TXIB for special purposes (secondary plasticisers). All producers contacted reported that they do not use DEHP, BBP, DBP or DiBP in wallpaper.

The usage of PVC wallpaper is widespread in Europe due to its surface which is very resistant to washing, and which can be produced with more detailed surface structures than possible with paper (so-called art embossing). A major producer estimates that PVC wallpaper constitutes 90-95% of the EU market for wallpaper, and that paper wallpaper thus constitutes a relatively minor share.

According to another European producer of wallpaper, PVC wallpaper is not much used in Scandinavia. Other types of washable wall paper are common here. Examples are paper wallpapers coated with water soluble lacquers, which are also washable but cannot be scrubbed as heavily as PVC wallpapers.

According to major producers of PVC wallpaper, typical plasticiser concentrations are 25-30%. Based on the statistics presented in table 2.7.1 the amount of plasticisers used for production in EU may thus be roughly

estimated to approx. 60,000 - 90,000 tonnes, which should be regarded as mainly DINP with lesser quantities of DOTH, DOA, TXIB and probably also DEHP and BBP as stated below.

A total DEHP consumption of 10,100 tonnes per year in the EU was estimated for "wall covering" for 2007, based on updated DEHP production statistics in combination with partly older consumption distribution estimates, and import/export statistics. Most of this was used in European production. The term "wall covering" may be used for both PVC wall paper and flooring style "bathroom" vinyl, and thus these product types may both contribute to this consumption estimate [ECHA, 2009a]. Based on similar considerations, the total consumption of EU-produced BBP for "packaging films, calendared flooring, wall covering" was estimated at 560 tonnes per year for 2007. Here, import/export were not included in the estimation process, but it is known from producers interviewed in the present study, that import of wall paper/wall covering is minor compared to EU production. The similar ECHA report on DBP [ECHA, 2009c] does not mention wall paper/wall covering as one of the product types, where DBP may be used.

2.7.4 Alternatives available

Producers report that DINP, DINCH, DOA and DOTP are all used by the wall coverings industry, and that there are no wall paper qualities which cannot be produced without DEHP, BBP, DBP and DIBP.

2.7.5 Trends and perspectives

Substitution away from DEHP, BBP, DBP and DIBP seems to have started several years ago. No other information was given by producers as regards trends and perspectives.

The case for imports is unknown except that alternative plasticisers are now also used for example in China for various other product types.

2.7.6 Costs of substitution

A producer reports that replacing DEHP with DINP/DOTP resulted in about 5% higher total plasticiser prices. This is consistent with general knowledge about the prices for these plasticisers [Maag et al, 2009].

The flexible polymer formula is re-formulated frequently (perhaps monthly, or so) to take advantage of price differences for the used raw materials. Larger physical changes are reported to be made seldom. One producer reported changes every 5 years or so on average.

As calculated for vinyl flooring, the substitution of DEHP for DINP could result in a product price increase of a few percent. The price of DOTP is similar to that of DINP, i.e. about 10% higher than DEHP, when the plasticizing effect is taken into account. DINCH prices are reported to be about 30% higher than DEHP [TURI, 2006] - reference is made to table 1.1.

2.7.7 Companies contacted regarding this product group

Graham & Brown, United Kingdom

Fiona, Denmark

Juvita Home Decoration, Denmark

A.S. Creation Tapeten, Germany

Tapetenfabrik Gebr. Rasch, Germany

Renolit Cramlington, United Kingdom

2.8 Footwear

2.8.1 Definition of the product group

The product group covers sandals and slippers/flip flops made partly or completely of PVC. The group also covers thermo boots for children.

To the extent the product materials contain phthalates, the products in question may present a source for direct skin contact, and thereby uptake of phthalates in the human body via the skin, as well as evaporation to the indoor climate with resulting exposure. Exposure to indoor air are in particularly relevant for thermo boots during the winter season e.g. in kindergartens and similar places.

2.8.2 Import to and production of products in EU

Import of the relevant footwear to EU27 is registered by Eurostats database on external trade (CN8) [Eurostat 2010a], while production in EU27 is registered in Eurostats PRODCOM - database [Eurostat 2010b].

For year 2008 the import and production which has been registered is stated in table 2.8.1.

Table 2.8.1
Import to and manufacturing of sandals, slippers in EU27- 2008 figures. Statistics on thermo boots are not available for EU*3.

Import to EU 27			
Position *1	Tonnes	Value (1000 Euro)	Comments
64019900	3,779	14,560	Waterproof footwear, ankle free, soles and uppers of rubber or plastic
64022000	25,321	114,243	Footwear with straps or thongs, soles and uppers of rubber or plastic
64029931	17,098	130,714	Footwear with a vamp made of straps or the like, uppers of plastic, max. sole and heel height > 3 cm
64029939	69,136	322,026	Footwear with a vamp made of straps or the like, uppers of plastic, max. sole and heel height ≤ 3 cm
Import - total	115,334		
Manufacturing in EU27			
15201100		144,851	Waterproof footwear, ankle free, soles and uppers of rubber or plastic
15201210		679,593	Sandals with soles and uppers of rubber or plastic (incl. thong type sandals, flip flops)
15201231		137,061	Town footwear with rubber or plastic uppers
Manufacturing- total	92,146*2		

Notes:
* 1 For import the position number stated is referring to Eurostats database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostats PRODCOM - database.
* 2 Estimate based on value of manufacturing and value/tonnage of import.
* 3 Separate statistics on thermo boots are not available as thermo boots statistically are registered together with rubber boots, and to the best of knowledge are of minor importance compared to rubber boots. For these reasons, no statistics on thermo boots are presented, neither on EU manufacturing nor on import to EU.

From the figures stated in figure 2.8.1 it may be noted that both import and EU27 manufacturing of sandals and slippers are significant. However, as the quantity manufactured is estimated based on the manufacturing value combined with the value/weight relationship for import data, the estimated quantity manufactured could be biased.

Shoes in general

The statistical data available on production in EU are assessed as rather uncertain, as no direct information on the volume manufactured are available. It has, furthermore, based on the information available from Danish and international trade organisations and Danish manufacturers and importers to the Danish market not been possible to obtain a picture of EU production that can be regarded as consistent and reliable. For these reasons the choice has been made to focus the discussion in the following on goods imported to EU. Here, the imported amount of sandals, slippers etc. is stated to be about 115,000 tonnes.

No exact knowledge of the share of shoes containing PVC and the precise average content of PVC in shoes are available. An indication of the share of shoes containing PVC may be obtained from a Swedish study, in which tests of 27 different plastic sandals and slippers purchased in 7 countries (Sweden, Philippines, South Africa, Indonesia, India, Uganda and Tanzania) world wide, was made [Naturskyddsföreningen, 2009]. The testing revealed that 18 of the 27 tested shoes corresponding to approx. 67% contained PVC. Of

the18 pair of shoes containing PVC, 17 pair contained classified phthalates (DEHP and/or DBP).

Considering only shoes purchased in the EU 4 pairs of sandals etc. were sold in Sweden. 2 pairs contained PVC and both of these contained DEHP and DBP [Naturskyddsföreningen, 2009].

The Swedish investigation revealed no data on the share of PVC compared to other materials. Personal experience based on visits to supermarkets and shoe shops in Denmark and measurement of density of selected shoe parts seems to indicate that as an average for flip flops, girl sandals, ladies shoes and lady slippers approx. 50% of the shoes consist of PVC. The content of PVC is estimated to vary from approx. 30% PVC for flip flops to approx. 60% for lady shoes, all figures based on weight.

Considering an import of 115000 tonnes of shoes of which 50-67% contains PVC, and that half of the weight of each such shoe is PVC, leads to a estimate of a yearly import of PVC to EU with sandals, slippers etc. of approx. 29.-38.000 tonnes.

Thermo boots
There is no known production of thermo boots in Denmark or the EU.

Based on information from Danish importers of thermo boots, it is estimated that the import to Denmark is approx. 330,000-470,000 pair of boots per year. Thermo boots weigh between 600 g (size 24) and 1,000 g (size 32) including lining. Based on this information it is estimated, that the average weight of thermo boots is 800 g excluding lining (and thus the weight of the PVC including phthalates). This results in an import to Denmark of PVC with thermo boots at approx. 260 - 380 tonnes per year.

Information from Dominant suppliers to the Danish market indicates that thermo boots of PVC as well shoes containing parts of PVC are mainly imported to EU from Asian countries. It is not possible, however, based on the data available to estimate the import of thermo boots to EU.

The Danish shoe association and the international organisations CEC and FAIR have been contacted, but have not been able to supply further information for this study.

2.8.3 Plasticizers in use

The types of used plasticizers vary considerably depending on the type of shoe. Thus, the following section is split into two: first sandals and flip-flops are describes. Next, the used plasticizers for thermo boots are described.

Sandals, flip-flops etc.
The investigation by Naturskyddsföreningen i Sverige revealed that the PVC in the tested footwear contains up to 23.2% DEHP, up to 9.6% DBP, no BBP, up to 19.4% DNOP, up to 3.2% DINP and up to 4.7% DIDP. [Naturskyddsföreningen, 2009]. The total content of phthalates varied between 7 and 36.2%.

The investigation furthermore showed that regarding the phthalate content of PVC in shoes there seems to be no difference on in which country the shoes were manufactured [Naturskyddsföreningen, 2009].

Thermo boots
According to information from producers, the choice of phthalate varies for thermo boots; one producer uses DINP and DIDP. Another producer uses mainly DEHP together with small amounts of DBP and DIDP.

Information about the other EU countries is obtained from Intertek, which is a world wide group of testing facilities (www.intertek.com). Intertek test numerous products from various countries. According to an interview with the laboratory manager for toys and hardlines, thermo boots sold in Europe are made of PVC. The most used plasticiser is DEHP and the concentration is in the range of 20-35%. Several other "replacers" are also used together with DEHP (see text under the section 2.8.4) [Intertek, 2010].

2.8.4 Alternatives available

Alternatives available include other materials as well as other plasticisers.

The main vendors and importers of sandals, slippers and thermo boots to Denmark indicate that PVC is not considered a very attractive material in shoes, mainly because PVC gives shoes a cheap appearance making the consumers deselect shoes with PVC. Furthermore, the trend is that consumers deselect PVC products. Therefore, the purchasing agents for the large super market chains in Denmark try to avoid products containing PVC, when alternatives are available at the right price.

The general experience among purchasing agents is that alternatives to phthalates and PVC are available for all types of products. The main alternative material utilised is polyurethane (PU). Considering alternative plasticisers apart from those listed in section 2.8.3 above, tests of thermo boots indicate that a small fraction of the tested thermo boots contain DINCH, "Citroflex" (ATBC) or "Eastman 168 – 1-4 - disubstituted" (DOTP) [Intertek, 2010].

2.8.5 Trends and perspectives

The opinion to trends in the market concerning the use of phthalates differs depending on the actual market segment in question.

The super markets sell shoes primarily produced outside Europe. The purchasers are aware of the problem with PVC and phthalates. The responses differ between actors and include the position of actively trying to phase out PVC in products no matter the regulation. An example is the use of PVC in running shoes which was widely used previously but is very limited nowadays. However, the opposite position of not introducing alternatives before regulation bans certain phthalates (and/or PVC) exists as well. In this case the argument presented is that there is no market for products sold at a price 25% higher than the price of competitors. Thus no general trend seems to dominate this segment of the market.

The shoes stores are served by a number of producers. The phthalates are used in slippers, sandals, soles, thermo boots and colouring for shoes. There is a general trend in the larger companies towards no use of phthalates and PVC. Nevertheless, the use of phthalates in colouring for shoes will only be phased out due to regulation (information on the types of phthalates used for this purpose is not available). The same tendency applies to thermo boots where large quantities of phthalates are used. One large shoe chain indicates, however, that no changes will be made if no regulation is introduced.

Sale of shoes, in particular flip flops and the like, does also take place in a number of the small seasonal shops aimed at mainly persons on holiday or leisure activities. The number of shoes made of PVC sold by such shops may be considerable, but no efforts have been invested in detailed investigations of the market segment, as the segment is not well-organised making it difficult to obtain answers being reasonable representative of the segment.

2.8.6 Costs of substitution

The costs of substitution depends on the alternative selected and the amount of phthalates in the footwear to be substituted.

As regards substituting DEHP with other plasticisers, no estimate of actual or assumed price raise are available. The Danish shoe associations and the international organisations CEC and FAIR have been contacted, but have not been able to supply further information for this study.

Assuming that DEHP in PVC can be substituted by DINP, the price raise related to the content of PVC may be roughly estimated to 1-3% (reference is made to the estimate presented for flooring of vinyl in section 2.1.6). The resulting price raise for the product, considering that only part of the footwear is made of PVC will be below 3% and often in the range of 1-2%.

It is estimated by a Danish super market chain that substituting thermo boots made in PVC with thermo boots made in PU shoes will raise the selling price for a pair of boots by approx. 25%.

According to [PIEWEB, 2010] raw materials for manufacturing of PU (polyols and isocyanates) are supplied at a price level of 1500 - 2300 EUR/t, which can be compared to the price for PVC resin and DEHP which is respectively 870-1,050 EUR/t [ICIS pricing, 2010] and 800-1,000 EUR/t [Miljøstyrelsen, 2010]. Raw materials for manufacturing of PU are thus almost twice as expensive as raw materials for manufacturing of PVC. That the price raise for thermo boots in PU may be limited to just 25% may be explained by the share of price related to manufacturing, transport and handling in general.

2.8.7 Companies contacted regarding this product group

Angulus, Denmark

Bilka, Denmark

Føtex, Denmark

Skoringen, Denmark

Shoe-D-Vision, Denmark

Vagabond, Sweden

Intertek, United Kingdom

Ecco, Denmark

Coop, Denmark.

2.9 Bathing equipment (swim-coats/wings/belts and pools)

2.9.1 Definition of the product group

The product group covers all kinds of bathing equipment made of plasticised PVC film or coated fabrics inclusive of pools (inflatable and non-inflatable), swim-coats/wings/belts except items classified as toys.

To the extent this material contains phthalates and the products are stored indoors, phthalates may be released by evaporation to indoor air. Phthalates present on the surface of PVC material may be a source for intake for small children touching the vinyl with fingers etc., and generally via skin absorption. Phthalates may furthermore be released to water in pools allowing intake of phthalates by intake of water from the pools.

2.9.2 Import to and production of products in EU

Import of bathing equipment etc. to EU27 is registered by Eurostats database on external trade (CN8) [Eurostat 2010a], while production in EU27 is registered in Eurostats PRODCOM - database [Eurostat 2010b].

Extra-EU Import and EU production registered by Eurostat for the year 2008 are shown in table 2.9.1

Table 2.9.1
Import to and manufacturing of bathing equipment etc. in EU27- 2008 figures

Import to EU 27			
Position *[1]	Tonnes	Value (1000 Euro)	Comments
95066290	203,488	636,935	Articles/equipment for sport and open-air games, swimming and paddling pools
Import - total	203,488		
Manufacturing in EU27			
32301590	423,323*[2]	1,325,036	Articles/equipment for sport and open-air games.
Manufacturing- total	423,323		

Notes:
* 1 For import the position number stated is referring to Eurostats database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostats PRODCOM - database.
* 2 Estimate based on value of manufacturing and value/tonnage of import.

From the figures stated in figure 2.9.1 it may be noted that both import and EU27 manufacturing are significant. Import can be calculated to count for approx. 50% of the quantity manufactured. However, the figures quoted will include several other items than just bathing equipment. Focusing on bathing equipment, other information available - se below - seems to indicate that import is very important and the EU market is dominated by products manufactured in Asia.

Also, as the quantity manufactured is estimated based on the manufacturing value combined with the value/weight relationship for import data, the estimated quantity manufactured could be biased.

In the report [Miljøstyrelsen, 2003], it is roughly estimated by the Association of Danish Plastic Manufacturers that about 30% of the products in this category are made of PVC only. Assuming this estimate still to be reliable at

least for the import of bathing equipment etc. to EU, as it is known that a significant import is taking place of bathing equipment including plastic swimming pools and pool covers and the like manufactured in Asia, it can be assessed based on the statistics stated in table 2.9.1 that the import will include approx. 60,000 tonnes of PVC.

The knowledge available does not allow for any estimate of the content of PVC in articles manufactured within the EU. The considerations presented in the following are therefore focused on the import only.

It is known, that a dominant manufacturer of bathing equipment is the American company Intex, who are producing outside EU. Based on site inspections (large supermarket chains, toy stores etc.) in Denmark as well as on information from dominant vendor and importers in Denmark it is clear, that Intex is the dominating supplier of inflatable bathing equipment in Denmark by far. There are small suppliers, e.g. Italien companies, but their market share in Denmark must be considered small (probably less than 10%) compared to Intex. The production volume of inflatable bathing equipment in EU is not known, and seemingly no industrial industry organisation exists able to provide figures on this subject.

Information from dominant suppliers to the Danish market states that only the large inflatable swimming pools and pool covers contain phthalates. They also inform that approx. 1.5 swimming pools are sold for every sold pool cover. From this information it is estimated that about 10% of the bathing equipment in this category is pool covers.

Regarding other types of bathing equipment, dominant suppliers to the Danish market informs that the products supplied can be assumed to fulfil Danish and EU legislation on this issue, meaning that no phthalates will be present in any product aimed at children in the age of 0 -3 years, while DEHP, BBP and DBP will not be present in any product aimed at children up to the age of 15 years, and DINP, DIDP and DNOP will also not be present if the products can be anticipated to enter the mouth. No information on this issue has been available for other European countries.

2.9.3 Plasticizers in use

Intex are using DEHP and DINP. Typically, the pools contain 20-30% DINP and pool covers contain 25-30 % DEHP. [Intex, 2010]

Intertek who also perform tests on bathing equipment informs that DEHP is the preferred plasticiser with concentrations in the interval 20-40%. Alternatively 20-30% DiNP is used [Intertek, 2010].

For inflatable swimming pools etc. sold in Denmark and the other Nordic countries, a dominant supplier also assumes DEHP to be widely used.

Based on information from Intex and the quantitative estimates presented above it can be roughly calculated that the import of PVC to EU with these products results in an import of approx. 1,800-2,700 tonnes of DINP and 1,500-1,800 tonnes of DEHP (order of magnitude).

2.9.4 Alternatives available

According to Intex, the non-orthophthalate alternatives could be DINCH and DOTP among others. No supplementary information to this statement is available.

2.9.5 Trends and perspectives

Intex informs that they will "***continue using the phthalates that we use currently in our products if no restrictions***". Considering Intex to be a dominant manufacturer of bathing equipment supplied to the EU, this statement is of significant importance regarding the trend and perspectives in the EU.

However, while the statement from Intex probably is representative for the general trend on the market, other positions may exist as well.

A dominant supplier to the Danish market thus informs that they will keep on working to remove phthalates from the products. In their opinion, the Danish regulation from 2009 has resulted in the positive effect regarding the use of phthalates in toys for children in the way that more producers have got focus on producing phthalate-free products. Furthermore, the consumers have also become more aware of the use of phthalates in PVC.

2.9.6 Costs of substitution

Intex estimates a price difference of approx. 10-20% between products plasticised with DEHP and other plasticisers [Intex 2010].

A dominant supplier to the Danish market indicates a price difference at about 5-20%.

2.9.7 Companies contacted regarding this product group

TOP TOY A/S, Denmark

Bilka, Denmark

Føtex, Denmark

Intex, USA

K.E. Mathiasen, Denmark

Intertek, United Kingdom

Hasbro Nordic, Denmark

Mattel, USA

2.10 Balls of PVC for playing and physical exercises

2.10.1 Definition of the product group

The product group covers balls made entirely of PVC, PVC- film and coated fabrics for playing and physical exercises.

To the extent this material contain phthalates, phthalates may be released by evaporation to indoor air. Phthalates present on the surface of balls may be a source for intake for small children touching the vinyl with fingers etc., as well as generally via skin absorption.

2.10.2 Import to and production of products in EU

Import of balls to EU27 is registered by Eurostats database on external trade (CN8) [Eurostat 2010a], while production in EU27 is registered in Eurostats PRODCOM - database [Eurostat 2010b].

Extra-EU Import and EU production registered by Eurostat for the year 2008 are shown in table 2.10.1.

Table 2.10.1
Import to and manufacturing of balls in EU27- 2008 figures

Import to EU 27			
Position *[1]	Tonnes	Value (1000 Euro)	Comments
95066290	37,221	195,983	Inflatable balls (not leather)
95066990	10,204	48,788	Balls (not inflatable, golf, tennis, table-tennis, cricket etc.)
Import - total	47,425		
Manufacturing in EU27			
32301580	13,245*[2]	69,738	Balls (not golf, table-tennis, medicine balls or punch balls)
Manufacturing- total	13,245		

Notes:
* 1 For import the position number stated is referring to Eurostats database on external trade (CN8), while for manufacturing in EU 27 the position number is referring to Eurostats PRODCOM - database.
* 2 Estimate based on value of manufacturing and value/tonnage of import.

From the figures stated in table 2.10.1 it may be noted that the import is significant compared to the quantity manufactured in EU27, as the import counts for almost 4 times the quantity manufactured. The difference may actually be higher, as the definition of balls used in the PRODCOM-statistics for manufacturing in EU is broader and thereby covers more items than the definitions used in the import statistics.

It should also be noted that most balls for soccer today is manufactured in polyurethane, and thus is included in the figures for inflatable balls imported to EU stated in table 2.10.1.

In the following sections this product group is divided into 3 segments (large inflated balls for play primarily for children, balls for fitness and soccer balls) as these types of balls differ regarding producers and content of phthalates.

Large inflated plastic balls for play (>13 cm in diameter)
Based on experience from Denmark (retail shops, supermarkets etc.) it seems like the market is dominated by 2 European companies (from Italy and Germany). It has not been possible to identify other manufacturers of large inflatable plastic balls for play. This picture is consistent with the experience of a large Danish toys chain, that the EU market for large plastic balls is

dominated by balls produced in EU. The main reason for this is that the balls are inflated in the production process and the valves used do not allow the balls to be re-inflated - the valves are welded together in the inflation process. Due to the volume of the inflated balls, it is not feasible to transport inflated balls from Asia etc. to EU. If the balls should be re-inflated, other types of valves must be used. As this type of valve is more expensive, this alternative is not realistic. The market for these types of balls in Denmark equals a sale in the range of 120,000-150,000 balls yearly in Denmark. As no knowledge is available regarding the use of such balls in other EU countries it is not possible to estimate the total consumption in EU.

Balls for fitness

Balls for fitness also known as balls for body training are marketed by fitness centres as well as retail shops (sports equipment etc) and on the internet. Fitness balls weigh approx. 1.400 g per ball.

Based on information from suppliers to the Danish market, it is roughly estimated that 25,000 - 35,000 fitness balls are sold in Denmark per year via retail shops. No information is available on the sale via fitness centers and the Internet. As no knowledge is available regarding the use of such balls in other EU countries it is not possible to estimate the total consumption in EU.

Soccer balls

Most soccer balls today are manufactured of polyurethane. Cheap balls as the so called "street soccer balls", however, are often manufactured of PVC. Soccer balls are, however, generally build of several layers of materials. Thus is may be so that even seemingly PU balls contains a layer of PVC.

Based on information from dominant vendors of sports equipment it is estimated, that approx. 100,000 "street soccer balls" are sold in Denmark per year. The weight of these types is estimated to be in the range of 250 g to 450 g per ball.

The total amount of balls containing PVC may based on information from suppliers to be Danish market be estimated to as high as 200,000 - 300,000 balls per year. This estimate is, however, very uncertain. As no knowledge is available regarding the use of such balls in other EU countries it is not possible to estimate the total consumption in EU.

Soccer balls seem typically to be manufactured in Asia (e.g. Pakistan).

2.10.3 Plasticisers in use

Based on information from the manufacturers European production of large plastic balls seems to be made of PVC without phthalates. However, information on the used plasticisers is confidential.

Regarding balls for fitness several manufacturers confirms that the balls are made or contain PVC. The plasticisers used are DINP or acetyl-tri-n-butylcitrat (ATBC). DIDP and DIOP are used together with DINP. One manufacturer informs that DEHP may be observed in small concentrations (< 0.1 %). No other data on concentration of plasticisers used has been available.

One manufacturer, furthermore, informs that some colorants contain phthalates in insignificant levels. The type of phthalate used for this purpose is unknown.

For soccer balls made of PVC, one manufacturer informs that the balls do not contain plasticizers as DINP, DNOP, DIDP, BBP, DBP and DIHP, but traces of DEHP (concentrations negligible) may be registered. Another large producer informs that DEHP and DBP are used in very low concentrations (<1%). In both cases no information on the main plasticisers used has been available.

2.10.4 Alternatives available

The alternatives available cover other materials as well as other plasticisers.

Regarding materials for soccer balls, dominant international manufacturers inform that PVC has been permanently replaced by PU as a matter of company policy.

For fitness balls - as stated above - the material being used is PVC, and DINP and acetyl-tri-n-butylcitrat (ATBC) are used as plasticisers. DIDP and DIOP may be used together with DINP.

Regarding large plastic balls - as stated above - the material used is PVC, while alternative plasticisers (no phthalates) are employed.

The conclusion is that alternatives to phthalates or PVC are available for all types of balls.

2.10.5 Trends and perspectives

The general trend seems to be a movement away from PVC and phthalates and in particular classified phthalates. This trend illustrates a typical strategy of fulfilling existing regulation and trying to be ahead of future regulation and using environmentally friendly alternatives. However, individual companies may have different strategies and some companies may limit their ambition to fulfilling existing regulation only.

Although it is believed that contact has been made to most of the dominant players on the EU market, it cannot be ruled out that the assessment presented above may not be valid for manufacturers not supplying the Danish market or not known to importers of balls to the Danish market.

It may be noted that a dominant importer to the Danish market is presenting the point of view that the main barrier for production of balls without phthalates is the lack of stricter regulation.

2.10.6 Costs of substitution

Concerning large plastics balls for play a dominant manufacturer informs that the price difference of balls with and without phthalates is approx. 15%.

Dominant importers to the Danish market inform that they are not aware of a price increase due to regulation of phthalates in balls. One importer cautiously indicates a price difference of approx. 5-20%.

On balls for fitness no information about the exact price differences are available. One manufacturer informs that the production without phthalates is "a little more expensive" than producing fitness balls with phthalates.

Regarding soccer balls the experiences of individual manufacturers and importers differ. One manufacturer informs that the price difference will only be <1% of the total price of the ball. As this price difference cannot be forwarded to the consumers on a short term, this relatively small price difference will, however, be a significant expense for the company.

A dominant importer to the Danish market have registered a price increase of about 75 % substituting a ball made of PVC with a ball made of PU.

A dominant international manufacturer replacing PVC with PU noted practically no price increase for the consumer due to this change in material. The reason is that it was possible to make the manufacturing process more effective. Thus, other production costs were reduced at the same time as a price increase for substituting PVC with PU. The increased production costs counterbalances the savings.

Another international manufacturer informs that they have had a reduced marked share after their internal ban on PVC in soccer balls. This price difference has now been levelled, so that the company again is competitive to other large brands.

2.10.7 Companies contacted regarding this product group

Mondo, Italy

John, Germany

TOP TOY A/S, Denmark

Bilka, Denmark

Føtex, Denmark

K.E. Mathiasen, Denmark

Mattel, USA

Intersport, Switzerland

Sportmaster, Danmark

Select, Danmark

Unisport, Denmark

Theraband, USA

Casall, Sweden

Nike, USA

Adidas, Germany

2.11 Other products

Among other products partly investigated for this study was nitrocellulose lacquers for coating of wooden furniture and flooring and erasing rubber.

2.11.1 Nitrocellulose lacquers

The knowledge presented here is primarily derived from existing studies.

The ECHA report [ECHA, 2009c] on DBP mentions nitrocellulose lacquers as one of the product types where DBP is used, and estimates an annual consumption of 160 tonnes for this application. The estimate is based on updated (2007) DBP production statistics in combination with partly older consumption distribution estimates and import/export statistics. The same report mentions that DiBP has application properties very similar to the properties of DBP and may therefore be used to substitute for DBP in most, if not all, of its applications.

The total consumption of DEHP for paints and lacquers has been estimated at 900 tonnes per year in 2007, based on similar considerations [ECHA, 2009a].

In the same manner, the total consumption of EU-produced BBP for paints and inks was estimated at 160 tonnes per year for 2007. The main function of BBP in paints and inks is to give flexibility to prevent the paints/inks from chipping and flaking from the surfaces they are applied to (BBP RAR, 2007). [ECHA, 2009b].

For this study, one producer of nitrocellulose lacquers contacted via CEP has replied that they have not used phthalate plasticisers for this purpose since 2003. Today they use DOA instead, at a concentration of 2% in wood finishes.

As regards a related product group, printing inks, ECHA [2009a] states that according to CEPE, DEHP, DBP and BBP are no longer used in printing inks by CEPE/EuPIA (European Printing Ink Association) members following their classification as reprotoxic category 2. CEPE covers approximately 85% of this industry in the EU. EuPIA represents close to 90% of the printing ink manufacturers selling in Europe. The substances may, however, be used by some manufactures e.g. in new EU Member States, and one manufacturer of DEHP reported that 2% of the tonnage from the manufacture is used for inks [ECHA, 2009a].

2.11.2 Erasing rubber

Erasing rubber was originally included in this investigation, but has been left out due to lack of reliable statistical data. The following data regarding registered presence of phthalates in erasing rubbers made of PVC should, however be noted.

A Danish investigation from 2006 [Glensvig & Pors, 2006] has shown the use of phthalates in Erasing rubber made of PVC. The investigation has revealed the content of 320.000 mg/kg of DINP/DIDP in one sample of erasing rubber. The sample, furthermore, revealed traces (<1%) of DEHP and DBP.

By the EU's "Rapid Alert System for Non-Food Products" (RAPEX) examples on erasing rubbers with concentrations of DEHP has also been reported. The following examples may be noted [EU 2006]:

- Erasing rubber shaped as flowers with strong colours, produced i China and sold in Greece in 2005 contained 43,1 % DEHP.

- Pencils with erasing rubber shaped as animals attached, produced i China and sold in Greece in 2006 contained 25,1 % DEHP.

- Round erasing rubbers produced in China and sold in Greece in 2006 contained 31,5 % DEHP.

3 Summary and discussion

3.1 Import to and production of products in EU/plasticisers in use

The information presented in section 2.1 to 2.11 on plasticizers in use and significance of import to EU for the different fields of application is summarised in table 3.1.1. The data presented clearly illustrates that the situation differs between the fields of application covered.

Table 3.1.1
Plasticisers in use/significance of import to products supply on the EU market; summary

Fields of application	Plasticisers in use - EU	Plasticisers in use - import	Significance of import to supply
Flooring of vinyl	DEHP, DBP, BBP, DINP, DIDP, DIHP, DIOP*1	No data	Low
Wires and cables	DEHP, DINP, DIDP, DPHP, TOTM	No data	Low
Bags, brief-/suitcases and similar	no examples of phthalates usage identified *2	no examples of phthalates usage identified *2	Equals EU production
Tablecloth, curtains, shower curtains and similar	DEHP, DBP, BBP, DINP, ATBC, DINCH, DOA, ESBO	No data	Low
Carpet tiles/squares	DINP	No data	Low
Water beds- and air mattresses	DINP, ASE, unspecified phthalates	May not differ from EU production	High
Wallpaper/tapestry	DINP, DOTP, DOA, TXIB and maybe DEHP and BBP	No data	Low
Footwear	DEHP, DBP, DNOP, DINP, DIDP	May not differ from EU production	Equals EU production
Bathing equipment	No data	DEHP, DINP	? *3
Balls for playing and physical exercises	DINP, DIDP, DIOP, ATBC, other non-phthalates? DEHP and DBP in conc. <1%,	May not differ from EU production	High
Others - erasing rubber	DEHP, DINP, DIDP*1	May not differ from EU production	No data
Others - lacquers for wooden furniture and flooring	DEHP, DBP, BBP, DOA*1	No data	No data

*1 Information on use of DEHP and other phthalates stated dates back to 2007 and before. The picture may have changed since then.
* 2 no examples of phthalates usage identified; data may only be representative for Danish companies and suppliers to Danish companies.
*3 Statistical data are not consistent with information from market actors. Information from market actors indicates import from Asia to be very significant for bathing equipment.

To the best of our knowledge classified phthalates is still in use in flooring of vinyl, wires and cables, tablecloth etc. , footwear, pool covers, erasing rubber and lacquers for furniture and flooring.

Some manufacturers, furthermore, report presence of classified phthalates in balls in concentrations below 1%. These observations, however, should probably be regarded as contamination rather than intended use.

For other areas no evidence has been found that classified phthalates are still in use, and for these applications the classified phthalates seem to have been substituted by other phthalates such as DINP and by non-phthalate plasticisers.

In this context, attention must be paid to that the information collected and presented here generally represents either Danish companies or international companies operating in many countries. The information is not necessarily representative for all markets within EU and for all companies operating in EU.

The information that phthalates are not used anymore within the field of bags, brief-/suitcase and similar is e.g. probably highly influenced by the fact, that data collection for these products was undertaken in Denmark and that most information was available on school bags, a product group for which significant concern is invested by manufacturers and suppliers to the Danish market in order to eliminate potential concerns to consumers. Therefore, it may well be so that phthalates and even classified phthalates are still used in similar products marketed in other countries in EU or could be imported also to Denmark by minor importers.

Data on plasticizers used in imports are scarce or lacking for products where manufacturing in EU dominates (e.g. flooring of vinyl), as it has not been possible to identify the companies responsible for the import. For the products where import by EU based brands dominate, however, it must be assumed that the material composition of the imported product is determined by the importing company and thus most likely will not differ significantly from products manufactured in EU.

The data available has not enabled a full quantification of the classified phthalates present in imports and EU manufacture of the products covered.

A major constraint in this context has been that statistical data for several product groups are not sufficiently detailed to provide reliable knowledge on volume produced or imported (particular the case for the PRODCOM database on EU-production). Also, many European trade organisations seem to have relatively little knowledge about the substances used in products within their market segment, and are therefore not able to provide significant information on the use of plasticisers in products produced in, or imported to, EU.

3.2 Alternatives available

For all fields of application considered, alternatives to classified phthalates are available on the market. The alternatives available may include other plasticizers as well as other types of materials. Reference is made to table 3.2.1 in which the information presented in section 2.1 to 2.11 on alternatives available for the different fields of application is summarised.

The dominant alternatives to classified phthalates reported used for the covered product groups are DINP and DIDP, but also other ortho-phthalates as DIHP, DPHP and DIOP. Sometimes several of these are used in

combination. It is, however, relevant to note that for most fields of application non-orthophthalate plasticizers such as the terephthalate DOTP, and other plasticisers types such as DINCH, ASE, ATBC, COMGHA and dibenzoates are actually in use or being considered by manufactures as realistic alternatives to orthophthalates.

Table 3.2.1
Alternatives available, summary

Fields of application	Alternatives available
Flooring of vinyl	DINP, DIDP, DIHP, COMGHA, dibenzoates
Wires and cables	DINP, DIDP, DPHP, TOTM, adiapates Other materials: PE, silicon rubber
Bags, brief-/suitcases and similar	Alternatives are available for materials as well as plasticisers - little information on alternatives actually employed
Tablecloth, curtains, shower curtains and similar	ATBC, DINCH, DOA, ESBO. Other materials: Polyester, EVA, PEVA
Carpet tiles/squares	DINP, DOTP, DIHP, DINCH
Water beds- and air mattresses	DINP, ASE
Wallpaper/tapestry	DINP, DOTP, DOA, DINCH
Footwear	DINCH, ATBC etc.
Bathing equipment	DINCH, DOTP
Balls for playing and physical exercises	DINP, DIDP, DIOP, ATBC, other non-phthalates?
Others - erasing rubber	DINP, DIDP
Others - lacquers for wooden furniture and flooring	DOA

3.3 Trends and perspectives

The overall picture on the trends and perspectives to be observed in case no initiatives aimed at further regulation are brought forward differs between the following company positions/strategies:

- Phthalates (in particular classified phthalates) and PVC are phased out as a matter of company policy.

- No changes in present use of phthalates and PVC without further regulation

For many fields of application voluntary phasing out of classified phthalates and/or phthalates in general has already taken place, or is in the process. In this context, attention must be paid to that the information collected and presented here represents either Danish companies or international companies operating in many countries. In Denmark for many years, there has been a focus on voluntary improvement of products and substitution of materials and substances which may be regarded as problematic. Similarly, also many international companies have a company policy of voluntary substitution of materials and substances that may cause concern on some markets. Thus, the information summarised in table 3.3.1 may likely reflect the policies in companies which in this context may be considered as relatively advanced (frontrunners), and it may not necessarily be representative for all markets within EU and for all companies operating in EU.

Table 3.3.1
Trends and perspectives, summary

Fields of application	Trends and perspectives
Flooring of vinyl	Use of classified phthalates decreasing - alternatives also used outside EU
Wires and cables	Use of DEHP decreasing
Bags, brief-/suitcases and similar	Phthalates and/or PVC seem to be substituted for schoolbags. For other items substitution depends on regulatory demands
Tablecloth, curtains, shower curtains and similar	This application seem to be slightly behind average as regards substitution of DEHP, No future trend has been identified
Carpet tiles/squares	Substitution seems accomplished already
Water beds- and air mattresses	High-end producers have substituted, No definite future general trend has been identified
Wallpaper/tapestry	Substitution seems accomplished already
Footwear	Trend a mix between phasing out PVC and/or phthalates and no changes without regulation
Bathing equipment	No changes unless stricter regulation
Balls for playing and physical exercises	PVC, phthalates, classified phthalates are being phased out
Others	No data

3.4 Costs of substitution

Also on the issue of substitution different experiences are reported - reference is made to table 3.4.1 - but a reasonable clear picture seems, however, to exist.

Substitution of classified phthalates to DINP/DIDP seems generally to be the least expensive option. This is likely because these phthalates can substitute directly for DEHP with no major changes in the production. Based on the costs differences of the plasticizers, the substitution is estimated to imply increased production costs of the product in the range of 1-5%.

Substitution to non-phthalate plasticizers as TBC, DINCH, DOA, ESBO and COMGHA may imply extra costs typically in the range of 5-50 % depending on the product and the alternative chosen.

Substitution to other materials may differ considerably depending on application. For balls substitution to PU, the price of the product was reported to increase by 75 %, while substitution of cable insulation plasticised with DINP to non-PVC material (for example PE) raised the price of cable by 7% - meaning that substitution from PVC with DEHP to non-PVC-material would likely raise price of wire by about 10%.

Attention may be paid to the fact that cost elements like a change of manufacturing process and change of production equipment seems to be of less significance for these products. This is likely because major changes in the production setup are not necessary with many of the alternative plasticiser in question. Some producers have mentioned changes in the overall production principles as positive elements - e.g. balls; substitution of material was compensated by a more effective manufacturing process. This does not necessarily mean that these cost elements are insignificant, but could be taken

as an indication of that costs related to change of manufacturing process and production equipment in this context generally are not to considered an important constraint to substitution.

Table 3.4.1
Costs of substitution, summary

Fields of application	Costs of substitution
Flooring of vinyl	Substitution to DINP increase price of product by 1-3%. Substitution to COMGHA increase prise of product by 25%
cable and wire	Substitution to DIDP increase price of product by 1-5%. Substitution to alternative material: ~ 7% of product price with DINP
Bags, brief-/suitcases and similar	Products without phthalates reported by some traders to be 30% more expensive
Tablecloth, curtains, shower curtains and similar	Products using non-phthalate plasticizers estimated to be 5-50 % more expensive
Carpet tiles/squares	No specific data
Water beds- and air mattresses	Price increase due to use of alternatives seems to be marginal
Wallpaper/tapestry	Alternative plasticisers reported to be 5-30% more expensive. Increased price for total product only a few percent.
Footwear	Substituting PVC with PU reported to increase price of product by 25%, while substituting DEHP by DINP increase price of product by 1-3 %
Bathing equipment	Substituting DEHP with alternative plasticizers increase price of product by 5-20 %
Balls for playing and physical exercises	Substituting phthalates with alternative plasticizers increase price of product by 5-20 %. Substituting PVC with PU may increase price of a ball by 75%.
Others	No data

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Annex 1
Companies and organisations contacted in this survey

Organisations

Danmarks Skoleverandørforening

Danmarks Skohandlerforening

Dansk Mode og Tekstil

Europacable (ECBL)

European apparel and textile confederation (Euratex)

European Council for Plasticisers and Intermediates, (ECPI) - represents the majority of European manufacturers of plasticisers, a part of The European Chemical Industry Council, (CEFIC)

European Council of producers and importers of paints, printing inks and artists' colours (CEPE)

European Plastic Converters, EuPC

European Resilient Flooring Manufacturers Institute, ERFMI

Fachverband Wasserbett, Germany

Footwear Association of Importers and Retail Chains (FAIR)

The European Confederation of the Footwear Industry (CEC)

Companies

Abbco Waterbeds, Australia

Akva Waterbeds, Denmark

Angulus, Denmark

Adidas, Germany

Adreta Plasticos, Portugal

Armstrong, USA

AS-Creation Tapeten, Germany

Beaulieu / Beauflor, Belgium

Bilka, Denmark

Blu times/Goldeck Textil Gmbh, Germany

Burmatex, United Kingdom

Casall, Sweden

Coop, Denmark

Desso, the Netherlands

Draka, the Netherlands

Ecco, Denmark

Ege Carpets, Denmark

Fiona, Denmark

Forbo, Switzerland

Føtex, Denmark

Harboe Trading, Denmark (Campingaz/Coleman, France/USA)

Hasbro Nordic, Denmark

Graham & Brown, United Kingdom

InterfaceFlor, USA

Intersport, Switzerland

Intertek, United Kingdom

Intex, USA

JEVA, Denmark

John, Germany

Juvita Home Decoration, Denmark

JYSK, Denmark

K.E. Mathiasen, Denmark

Mattel, USA

Mondo, Italy

NEYE, Denmark

Nike, USA

NKTCables, Denmark

Oase Outdoors Aps (Outwell), Denmark

Prysmian, Italy

Renolit Cramlington, United Kingdom

Select, Denmark

Shoe-D-Vision, Denmark

Skoringen, Denmark

Sportmaster, Danmark

Tapetenfabrik Gebr. Rasch, Germany

Tarkett, Sweden

Theraband, USA

TOP TOY A/S, Denmark

T.T.I., Belgium

Unisport, Denmark

Vagabond, Sweden

Westbond (Forbo), United Kingdom

Annex 2
Questionnaire for interviews with associations and companies

COWI

Memo

	Danish Environment Protection Agency
Title	Questionnaire for interviews with associations and companies
Date	12 February 2010
To	EHN, LAN
Copy	Frank Jensen, Danish EPA
From	Jakob Maag, COWI

COWI A/S

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This questionnaire was developed as a guide for interviews with stakeholders.

1. Association or company contacted (name, country, city, names of persons interviewed, e-mail and phone no of contact person)

2. Product groups covered (see list at end of document):

For each of these product groups, ask the following questions (as relevant for the particular contact)

Remember to ask for all questions where more data are needed, who else to ask (get names and contact data for relevant associations, companies, etc.):

3. To your knowledge, which types of products (within group) are produced within the EU or imported to the EU containing DEHP, BBP, DBP and/or DiBP?

4. Which share (of weight) of the import into the EU of these product types contains PVC or other materials plasticised with phthalates or other external plasticisers (or if no specific trade statistics are available, then what is your estimate of the extra-EU import of these product types)?
Taking the total import of XXXX tonnesper yearear under the relevant custom number(s) ZZZZZZZ for this product group into consideration:

4.1 And which share of the EU production (or if no specific production statistics are available, then what is your estimate of the EU production of

these product types)?
Taking the production of YYYY tonnesper yearear under the relevant custom number(s) ZZZZZZZ for this product group into consideration:

5. Which share of the same import into the EU of these product types with plasticisers contains DEHP, BBP, DBP and/or DiBP?

5.1 And which share of the EU production?

6. Which share of the same import into the EU of these product types with plasticisers contains other (ortho-)phthalates[1] than DEHP, BBP, DBP and/or DiBP?

6.1 And which share of the EU production?

7. Which share of the same import into the EU of these product types with plasticisers contains other plasticisers than ortho-phthalates?

7.1 And which share of the EU production?

8. Which alternatives to DEHP, BBP, DBP and DiBP are available on the market, and which of these alternatives are today employed by the industry in EU?

9. Which concentrations of plasticisers are typically used in these types of products (for each product type and plasticiser type)?

10. With the current regulation in mind, which trends regarding the use of DEHP, BBP, DBP and DiBP and other plasticisers can be assumed in case no further restrictions are introduced?

11. Are there any product types for which there are no alternatives to the phthalates DEHP, BBP, DBP and DiBP currently available, and if so, which product types?

[1] DEHP, BBP, DBP, DiBP, DiNP, DiDP and most other phthalates traditionally used in Europe are ortho-phthalates. Other chemical isomers (structural forms) of phthalates used as plasticisers exist with different characteristics, for example the tere-phthalates, such as DEHTP (also called DETP or DOTP) and DBTP.

11.1 For each such product type, which are the barriers for substitution (technical, economic, other)?

12. What are the costs of alternatives compared to the phthalates in question?

Cost per weight unit of plasticiser, effective plasticiser cost taking different concentration needed into account (plasticiser efficiency), other continuous expenses, one-time costs. In the short term (2-3 years) and in the long term?

13. For these product types, how often are the following production elements changed/replaced in a general production scheme (years):

13.1 Adjustment of formulation of polymer blend?

13.2 Moulds and similar parts to giving form to the specific, manufactured products?

13.3 Larger physical changes to the production line (location of equipment, new equipment, etc.)

List of products included in study:

- PVC (vinyl) flooring and wall covering.
- PVC on wires and cables.
- Furniture with PVC coated fabric/film/sheet.
- Bags/suitcases with PVC coated fabric/film/sheet
- Tablecloth, curtains, shower curtains and similar items with PVC coated fabrics/film/sheets (excluding industrial uses).
- Carpets, carpet tiles/squares produced with PVC-foam as back cover.
- PVC water- and air mattresses.
- Wallpaper/tapestry made of or coated with PVC.
- PVC footwear.
- Textiles with PVC-print/decoration.
- PVC bathing equipment and pools (swim-coats/wings/belts and pools - inflatable and others).
- Erasing rubber.
- Lacquer for floors, furniture, etc. (nitrocellulose lacquer and other types)
- Balls of PVC for playing and physical exercises.