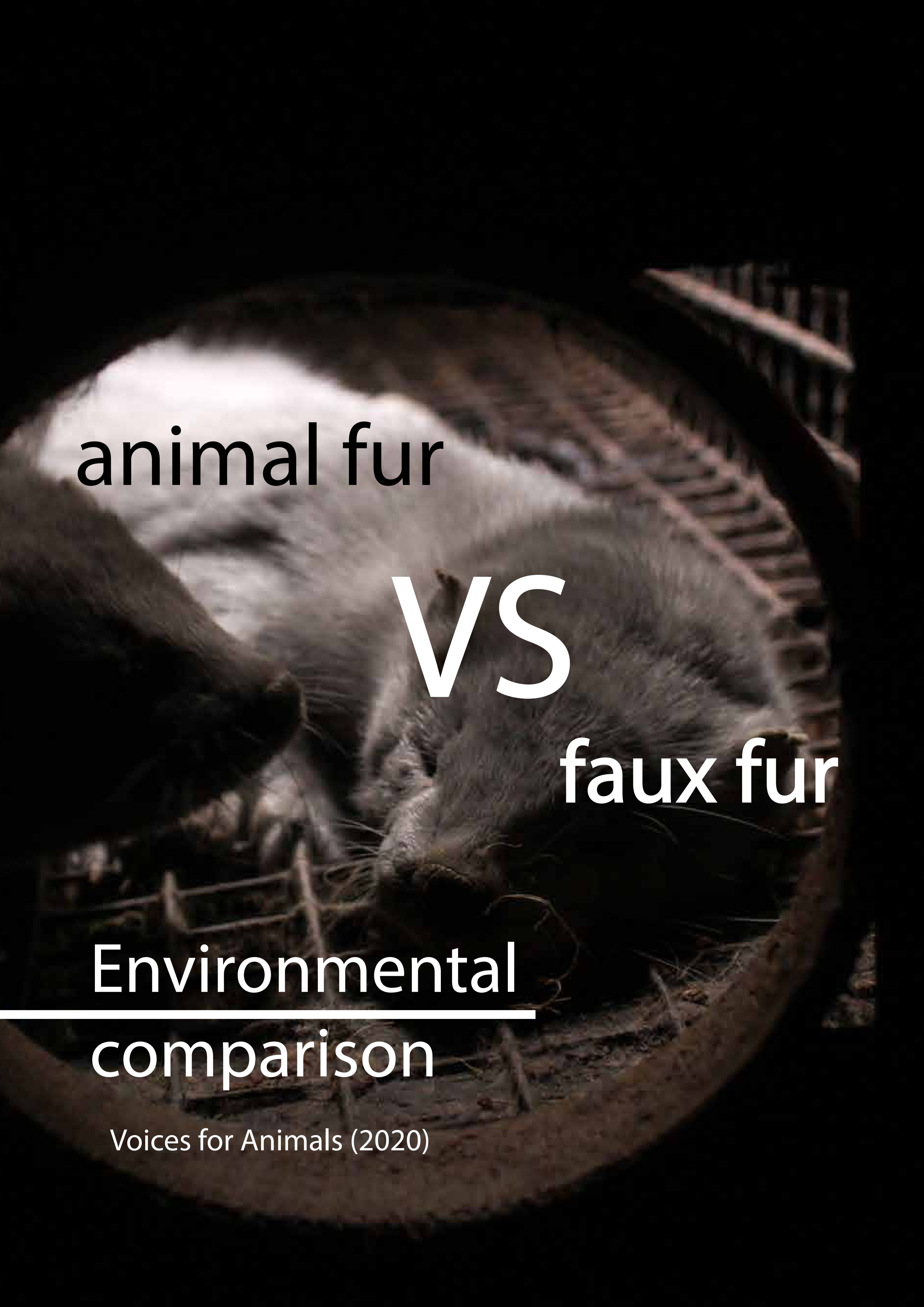


animal fur VS faux fur

Environmental comparison

Voices for Animals (2020)

Table of Contents

Analysis of LCA researches

performed by CE Delft organization in 2011 and 2013

General characteristics of the studies and inventory data

CE Delft is an independent research and consultancy organization from Netherlands, which performed two comparative LCA studies of animal vs faux fur in 2011 and 2013. These studies were commissioned by European animal protection organizations Bont voor Dieren, GAIA (Global Action in the Interest of Animals) and Italian Lega Antivivisezione (LAV) (CE Delft 2011, p. 5). In the CE Delft 2011 study mink coat was compared with three types of faux fur coat which differed in backing material (cotton, polyester, wool). In the CE Delft 2013 study, not only coats but also trim made from animal vs faux fur was compared.

It should be noted that the CE Delft 2011 did not assess use and disposal of products and was actually a "cradle to gate" study, whereas CE Delft 2013 study assessed the environmental impact on all stages of production, use and disposal, thus using the full "cradle to grave" approach. In the CE Delft 2013 study, early aspects of the live cycle (from feed production to mink to fur treatment) were taken from CE Delft 2011 study. Total life cycle of animal fur products was as follows (CE Delft 2013, Table 1, p. 18).

Table 1 System boundaries for the natural mink fur coat

Life cycle aspect	Explanation
Feed production for minks	These life cycle aspects are inventoried in CE Delft, 2011a. For detailed description of these steps and allocation rules see the report 'The environmental impact of mink fur production' (CE Delft, 2011a)
Animal raising (in the Netherlands)	
Pelt preparation	
Disposal of carcass	
Transportation to Norway for auctioning	
Transportation to Greece	
Fur treatment	
Manufacturing of viscose lining	
Coat construction	
Transport to the Netherlands	
Use of the natural fur coat: maintenance (optional)	Various maintenance scenarios: cleaning and cold storage
Waste treatment after final discarding of the coat: incineration	Including energy and heat generation

It can be seen that this model examined the process of raising animals in the Netherlands, followed by pelt transport to Norway for fur auctions, then to Greece for the manufacture of products (coat and trim), and finally back to the Netherlands for sale, use and disposal.

Total life cycle of faux fur products was as follows (CE Delft 2013, Table 2, p. 19).

Table 2 System boundaries for the faux fur coat

Life cycle aspect	Explanation
Production of acrylic fibres	All the production steps, including the manufacturing of the faux fur coat, are assumed to take place in China
Production of fibres for backing	Three backing types are assessed: cotton, polyester (PET) and wool
Production of backing out of various fibre materials	
Production processes for making faux fur out of the acrylic fibres and backing	Various production processes are included
Manufacturing of viscose lining	
Coat construction	
Transport from China to the Netherlands	
Use of the coat: maintenance (optional)	Optional: washing of the coat
Waste treatment after final discarding of the coat: incineration	Including energy and heat generation

Not included are the auctioning of the fur coat and additional materials on the coat such as zippers and buttons.

It can be seen that China was considered as a manufacturing country, with the subsequent transportation of products to the Netherlands for sale, use and disposal.

For modelling the life cycle of fur products, CE Delft makes use of the software programme SimaPro. The quantitative data for inclusion in the model were taken from Ecoinvent database and other sources (CE Delft 2013, p. 19).

This study includes two environmental impact assessments:

1. ReCiPe midpoint assessment, which calculates 18 environmental effects (see CE Delft 2013, pp. 43-44)

2. ReCiPe single score assessment, which expresses the environmental effects in terms of damage and weighs the damage categories into one environmental score.

Both documents (2011 and 2013) are characterized by an extensive and very detailed description of the research methodology (pp. 21-44 CE Delft 2011, pp. 17-26 CE Delft 2013). Therefore, only some key points will be discussed in this document.

MINK FEED

Mink feeding is a major factor in the environmental impact of animal fur production, so we will address it in detail. Mink feed consists of fish and poultry wastes, wheat flour, minerals and vitamins. These components are used to form large slabs which are stored in freezers and transported in insulated trucks. In the CE Delft 2011 study the feed composition typical for Netherlands was used, consisting of 28% fish offal, 64% chicken offal and 8% wheat (CE Delft 2011, p. 33). In other European countries, the basic feed composition (fish offal, chicken offal, wheat) is similar to feed used in the Netherlands, although the proportion of components may be different (CE Delft 2011, p. 52). Since the feed composition could vary, the CE Delft 2013 study also included the alternative feed composition of 92% fish offal and 8% wheat (CE Delft 2013, p. 20, Table 3).

It is obvious that the production of all three feed components (fish offal, chicken offal, wheat flour) have a certain negative environmental impact. However, since fish offal and chicken offal are the by-products of fish meat and chicken meat production, allocation factors (AF) were determined for them, which indicated what part of environmental impact of fish and chicken production was to be attributed to the offal (CE Delft 2011, p. 34). For chicken offal, AFs are from 5.3% to 5.9%, and the lower value (5.3%) was chosen which reflects the lower bound of the negative environmental impact of chicken offal use on fur production (CE Delft 2011, p. 35). For fish offal AFs could differ greatly from 0.83% for plaice to 14% for salmon, and again the lower value (0.83%) was chosen reflecting the lower bound of the negative environmental impact of fish offal use on fur production (CE Delft 2011, p. 35). Therefore, the alternative feed composition (92% fish offal and 8% wheat) is the least harmful for the environment. It should be noted that this alternative variant is rather unrealistic (CE Delft 2013, p. 37) for two reasons. First reason is that mink feed normally includes not only fish offal but also chicken offal, although in different proportions, and second reason is that AF for fish offal could be substantially higher that 0.83% used in the model. Therefore, this variant of feed composition reflects the hypothetical lower bound of negative environmental impact of mink feed production.

Mink feed is stored frozen in cold-storage rooms, which require a substantial amount of electricity to function. Also, their area cannot be used to the full 100%. 50% usage of cold room area was taken as a basic scenario, and 25% usage – as an alternative scenario (CE Delft 2011, p. 36).

THE NUMBER OF MINKS FOR THE PRODUCTION OF 1 KG OF FUR AND THE AMOUNT OF FEED FOR THE PRODUCTION OF 1KG OF FUR

Obviously, the more feed is required for 1 mink throughout life and the more minks are required to produce 1 kg of fur, the higher is the environmental impact of 1 kg of mink fur. The information from US importer and distributor Chichester, Inc. was used to determine the average sizes for female (0.1084 m2) and male (0.155 m2) pelts (CE Delft 2011, p. 32, Table 5).

Table 3 Mink feed: base scenario and alternative (least impact) scenario

	Fish offal	Chicken offal	Meal (wheat)
Base scenario (according to LEI, 2007)	28%	64%	8%
Sensitivity assessment: least impact scenario	92%	0%	8%

The mink fur density was determined using two pelt samples provided by Bont voor Dieren and was found to be 670 g/m2 (CE Delft 2011, p. 32). With the usable area and fur density, it was calculated that 13.8 female or 9.6 male pelts were required to produce 1 kg of fur, with average value 11.4 animals per 1 kg of fur (CE Delft 2011, p. 32, Table 6).

Total amount of feed consumed by a mink during its lifetime is about 40 kg (CE Delft 2011, p. 33), and the average litter size for mink (in the Netherlands) is 5.5 (CE Delft 2011, p. 32). Taking into account the feed of the mother animal as well, which increased the required feed amount on 1/5.5, the total amount of feed is closer to 50 kg than 40 kg. A similar value (49.4 kg) was calculated by dividing the total amount of offal consumed by Dutch mink farms (180-200 thousands of tons annually) to the total number of mink of Dutch farms (4550 thousands, including 700 thousands mother animals which are not killed for pelts at the end of the year) (CE Delft 2011, p. 33, Table 8). Multiplying 49.4 kg (food consumed by 1 mink) by 11.4 (number of mink skins for production of 1 kg of fur), the researchers found that 563 kg of feed was consumed to produce 1 kg of mink fur (CE Delft 2011, pp. 33-34, Fig. 8). It should be noted that it is a very high value. For example, production of 1 kg of pork requires 3-4 kg of feed, and 2 kg of feed is required to produce 1 kg of chicken (CE Delft 2011, стр. 50). Therefore, although the mink feed to a large extent consists of offal that has a low environmental impact (per kg offal), it is the mink feeding that makes the largest contribution to the final environmental impact of the production of animal fur. This is due to the large amount of feed required to produce 1 kg of fur which should be not only processed but also cold-stored until use.

THE ECOLOGICAL IMPACT OF MINK MANURE

The researchers assumed that all manure is collected in gutters and removed or collected on belts and transported for storage in a manure pit (CE Delft 2011, p. 28), without any leakage to the soil. Therefore, only emissions to air were considered when calculating the ecological impact. They included methane, ammonia, N2O and particulate matter (CE Delft, pp. 36-37, Tables 14 and 15). It seems that the model did not consider the positive effects of manure use as a fertilizer (CE Delft 2011, p.36).

The usage of mink manure as a fertilizer would decrease the need for production of mineral fertilizers and would therefore decrease the total negative environmental impact of mink fur production. The biogas production from manure will also reduce the negative impact of animal fur production, but it was not taken into account in this model due to the lack of quantitative data (CE Delft 2011, p. 36). However, in actual practice fur farms are significant sources of not only air pollution but also of groundwater and water basin pollution. For example, in a study at the Finnish fur farm (Salminen et al., 2014), a manifold excess of the content of a number of ions (nitrate, nitrite, chloride, etc.) was found in groundwater under the fur farm compared to unpolluted areas. Significant amounts of phosphorus pollution were found in the lakes of Carlton river basin (Nova Scotia, Canada), where 40 mink farms with a total of 1.4 million minks were situated, and the manure from the farms was impossible to use as a fertilizer due to little agricultural activity in the province (The impacts of the mink industry on freshwater lakes in Nova Scotia: An overview of concerns, 2011). The discharge of excrement from mink farms into water bodies in the Washington state (USA) led to the river contamination by coliform bacteria (WA mink farm fined for manure discharge. April 2, 2013, Bellingham, WA). Thus, water pollution by manure from animal farms is a common event in various countries. A significant proportion of fur farms is located in relatively northern regions, for example, in Scandinavia or in northern China, and therefore the real ability of agriculture to use the manure from fur farms can be significantly lower than the maximum ability. Also, when the manure is spread on farmland as fertilizer, there will be emissions to soil, water and air, which will negatively impact the environment. However, these emissions are not included in the model (CE Delft 2011, p. 36). Therefore, the ecological impact of manure is the "dark horse" of the study, since there are several unaccounted factors which would decrease the total negative impact (production of fertilizers and biogas from manure), as well as several unaccounted factors which would increase the impact.

FUR PROCESSING

Fur processing includes use of many chemicals, some of which could have a profound negative impact on the environment (CE Delft 2011, p. 41, Table 23)

Table 23 Modelled substances used in the fur-dressing phase, according to BASF, 2010

Fur-dressing phase	Mean amount (g/kg)	Name	Description	Selected substance, Ecoinvent
Soaking	10	Bascal	Aliphatic dicarboxylic acids, for acidic post-soaking	Polycarboxylates
Wetting	35	Eusapon S	Ethoxylated synthetic alcohol for wetting, dissolving and emulsifying grease	Ethoxylated alcohols, petrochemical
Bating	15	Basozym 1000	Organic enzymes in acid environment	Not in Ecoinvent, omitted
Tanning	100	Basyntan	Aluminium and chrome complex	50% Sodium dichromate
				50% Aluminium sulphate
Fatliquoring	7	Lipoderm	Various anionic agents, based on: ester sulphite, lecithin, or biobased	Dimethyl sulphate
Washing	10	Soda		Soda, powder
Picking	10	Formic acid		Formic acid

Unfortunately, the significant part of information regarding the chemicals used in fur processing was unavailable to researchers. Therefore, only two classes of chemicals were considered in the study (CE Delft 2011, p. 40). The first group included the reagents used both for fur and for leather processing, which are present in the Ecoinvent database. The second group included the reagents which were found in the final fur products in the study by Krautter (2010), such as formaldehyde. It is important to clarify two things. First, the impact of several compounds which are used in fur production but were not found in the final fur products by Krautter (2010), was not assessed. One example of such compounds is chromium (VI), which was not found in finished fur products (CE Delft 2011, p. 40), but which could be expected to exert significant negative environmental impact due to the its high toxicity and non-degradable nature. Second, since the levels of chemicals reported by Krautter (2010) pertain to the end product, it is likely that far larger amounts are used during the fur-dressing phase. In all likelihood, then, modelled consumption of chemicals and other substances represents a lower-bound estimate, and the actual negative impact of fur processing on the environment could reasonably be expected to be much larger compared to the model estimation.

STORAGE AND MAINTENANCE OF ANIMAL FUR AND FAUX FUR PRODUCTS

For both types of products, the ecological impact of one professional cleaning per year was included in the model (CE Delft 2013, pp. 23, 25). It is recommended to store coats from animal fur in a cold storage facility, which increases their longevity, but also have a clear environmental impact due to electricity consumption by cold storage facilities. However, the researchers were unable to find information regarding the proportion of cold-stored fur products, and therefore cold storage was excluded from the basic model of life cycle of animal fur products and was examined separately.

DISPOSAL OF ANIMAL FUR AND FAUX FUR PRODUCTS

For both types of fur, incineration in a municipal solid waste incineration facility was taken as the disposal method. Incineration causes emissions, but generates electricity and heat as well. The generated electricity and heat avoid the need of conventional electricity and heat generation, thus decreasing the negative impact of the disposal process (CE Delft 2013, p. 25, Table 7).

Having thus described the main characteristics of the modeling process and the most important input data, we can proceed directly to the results of modeling. Since CE Delft 2013 study is more comprehensive than CE Delft 2011 study ("cradle to grave" vs "cradle to gate"), then the main conclusions will be made on the basis of CE Delft 2013 study. It is important to note the following. The researchers were unable to find hard data about the lifespan of products made from mink fur and faux fur (CE Delft 2013, p. 27). However, this is a very important issue, since it is clear that the longer is the lifespan of the product, the lower will be its environmental impact. For example, if two products have an equal harmful effect on the environment during the production, utilization and disposal, but the first product has a 2-fold higher lifespan than the second, then the environmental impact of the first product will be 2-fold lower than that of the second product. Due to the lack of information, the researchers assumed similar lifespan of mink fur vs faux fur coats and trims, and then compared how longer should be the lifespan of mink fur products to have the environmental impact equal to faux fur product environmental impact.

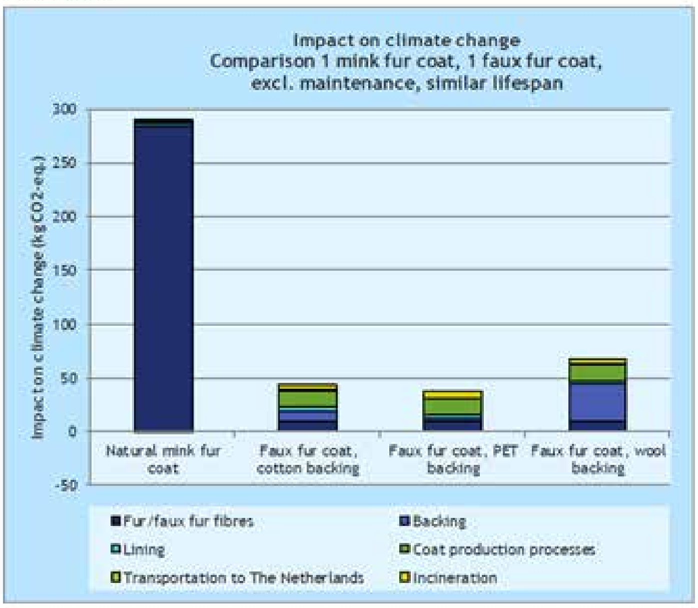
IMPACT OF ANIMAL AND FAUX FUR GARMENTS ON THE CLIMATIC CHANGES

Figure 3 in CE Delft 2013 document (p. 28) describes the impact on climate change (kg CO2-eq) of mink fur coat (left column) with three faux fur coats with different backing material (cotton, polyester, or PET, and wool).

It is clear that the mink feed and mink keeping are the two main contributing factors to the impact of mink coat on climate change. Incineration leads to a very small benefit (due to generation of electricity and heat). Importantly, cold storage and associated impact is not included in the assessment ("excl. maintenance")

The CO2 scores for one faux fur coat are a factor 4 to 7.5 lower than the scores for one natural mink fur coat. The production of the acrylic fibres has a small contribution. The backing material makes the difference: a wool backing has the highest contribution of all three backings and of all life cycle phases of the faux fur. The incineration of the synthetic materials leads to a CO2 emission, instead of a CO2 benefit. **In summary, the lifespan of mink coat should be 4.5-7 times higher than the lifespan of faux fur coat to have an equal environmental impact.**

Figure 3 Impact on climate change: comparison one fur coat, one faux fur coat; excl. maintenance, similar lifespan



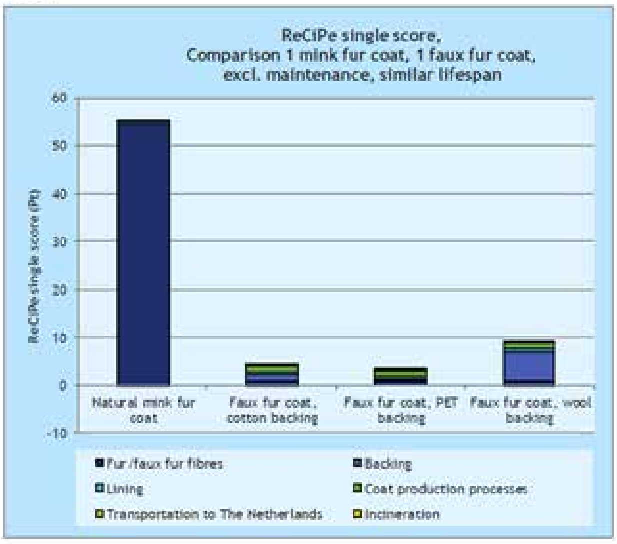
TOTAL ENVIRONMENTAL IMPACT OF ANIMAL AND FAUX FUR GARMENTS

Table 8 (CE Delft 2013, p. 31) shows the results for all 17 remaining environmental effects that were calculated with the ReCiPe midpoint method, such as ozone depletion, human toxicity, fossil depletion etc.. Table 8 clearly demonstrates that, assuming the similar lifespan of mink vs faux fur coat, the environmental effect of mink coat exceeds that of faux fur coat from several-fold to several thousand-fold, dependent on the backing material (see two right columns of Table 8).

Table 8 Environmental results for one coat, similar lifespan and excluding maintenance. All environmental effects (midpoints)

Environmental effect category (midpoint)	Unit	Natural mink fur coat	Faux fur coat, cotton backing	Faux fur coat, PET backing	Faux fur coat, wool backing	Difference factor (minimum)	Difference factor (maximum)
Climate change	kg CO_2 eq.	289	43	38	68	4	7
Ozone depletion	kg CFC-11 eq.	1.8E-05	1.2E-06	1.0E-06	1.4E-06	13	17
Terrestrial acidification	kg SO_2 eq.	14	0.3	0.2	1.1	13	72
Freshwater eutrophication	kg P eq.	0.1	0.004	0.001	0.011	4	44
Marine eutrophication	kg N eq.	1.4	0.02	0.01	0.2	7	186
Human toxicity	kg 1,4-DB eq.	35	5.9	4.3	5.5	6	8
Photochemical oxidant formation	kg NMVOC	0.8	0.15	0.12	0.16	5	7
Particulate matter formation	kg PM_{10} eq.	2.1	0.08	0.06	0.18	12	34
Terrestrial ecotoxicity	kg 1,4-DB eq.	4.0	0.05	0.00	0.03	83	1537
Freshwater ecotoxicity	kg 1,4-DB eq.	2.1	0.3	0.2	0.8	3	10
Marine ecotoxicity	kg 1,4-DB eq.	0.7	0.2	0.2	0.2	3	4
Ionising radiation	kg U_{235} eq.	20	0.6	-0.1	0.3	35	316
Agricultural land occupation	m^2a	586	16	9.1	105	6	64
Urban land occupation	m^2a	22	0.4	0.3	0.9	23	76
Natural land transformation	m^2	0.03	0.004	0.003	0.004	8	11
Metal depletion	kg Fe eq.	7	0.6	0.4	0.8	10	17
Fossil depletion	kg oil eq.	35	9.3	8.4	8.7	4	4

Figure 4 in CE Delft 2013 document (p. 29) describes the total score of environmental impact of mink fur coat (left column) with three faux fur coats with different backing material (cotton, polyester, or PET, and wool). Here, cold storage of mink coats is also not included ("excl. maintenance"), and similar lifespan is taken for all 4 coats.



It can be seen that the difference in total negative environmental impact between mink and faux fur coats is even higher than the difference in the impact on climate change . **Dependent on backing material, the environmental impact of faux fur coat is lower from approx. 6-fold (wool backing) to approx. 14-fold (polyester backing), than impact of mink fur coat. Therefore, the lifespan of mink coat should be 6 times higher than the lifespan of faux fur coat with wool backing and 14-fold higher than the lifespan of faux fur coat with polyester backing to have the equal overall environmental impact.**

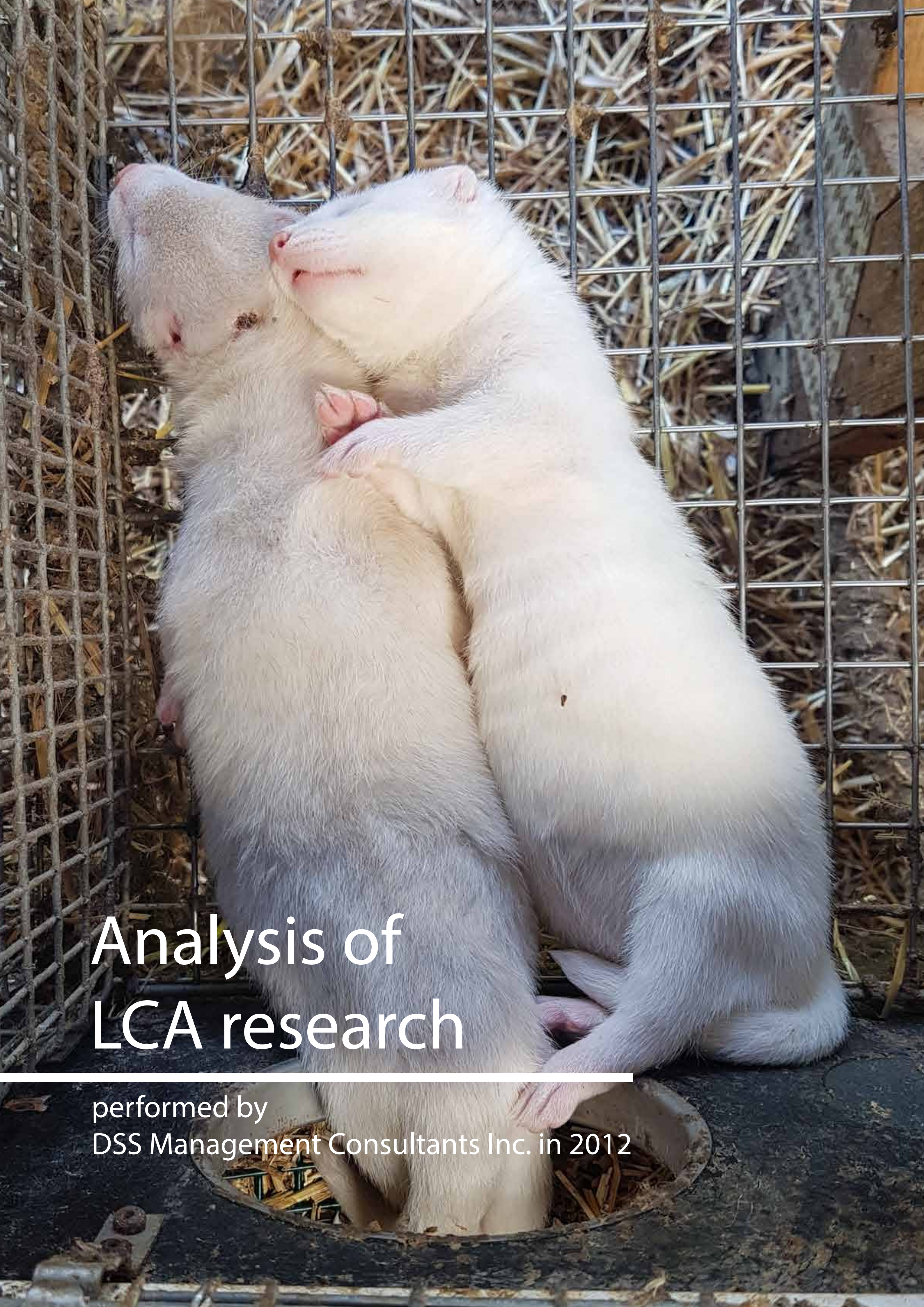
ANALYSIS OF SOME FACTORS WHICH COULD INFLUENCE THE RESULTS OF MODELING

It is important to note that although wheat constituted only a small part of the total mink feed (8%, see CE Delft 2011, pp. 33-34), its contribution to the total negative environmental impact of mink feed is high (CE Delft 2011, p. 49, Figure 11). For example, wheat accounts for approx. 25% impact of mink feed on ozone depletion, approx. 50% of impact on water depletion and more than 80% of impact on marine eutrophication. This is due to the fact that in contrast to fish and chicken offal (with allocation factors taken as 0.83% and 5.3%, respectively, see Section 1.1.1 above), wheat grain is the main product and not the by-product, and therefore much of the ecological impact of the production of required amount of wheat grain is allocated to mink fur production.

It should also be noted that the model assumed the high efficiency of cold-storage room area use (50%) during the feed storage (CE Delft 2011, p. 36), whereas the decrease of cold-storage room use to 25% would increase the negative environmental impact by approx. 25% (CE Delft 2011, p. 45, Figure 9). This is due to the fact that a very large amount of feed is required to obtain fur (563 kg per 1 kg of mink fur, see Section 1.1.2 above), and therefore this amount requires vast cold-storage area and substantial electricity consumption.

It should also be noted that the feed composition significantly influenced the total environmental impact of mink fur production. The use of diet without chicken offal and consisting of fish offal (92%) and wheat (8%) would decrease the environmental impact of a natural mink fur production by about one third (CE Delft 2013, pp. 37-38, Figures 11 and 12). However, as was noted earlier, this scenario is quite unrealistic, since chicken offal is also included in the feed and allocation factor for fish offal could be substantially higher than 0.83%. For example, the use of a higher allocation factor for fish offal (14%, as for salmon offal, CE Delft 2011, p. 35, Table 11) will drastically increase the feed ecological impact. Finally, even after the decrease by one third the environmental impact of mink fur was several-fold higher than that for faux fur (CE Delft 2013, p. 37, Figures 11 and 12).

The modeling also demonstrated that the cold storage of mink coats also increased their environmental impact substantially (CE Delft 2013, p. 32, Figure 5), but the basic scenario excluded the cold maintenance of mink fur coats.



Analysis of LCA research

performed by
DSS Management Consultants Inc. in 2012

General characteristics of the study and inventory data used

In 2012, the Canadian company DSS Management Consultants Inc. performed the LCA of mink vs faux (polyacrylic) fur commissioned by International Fur Trade Federation (IFTF), using the "cradle to grave" approach. For the modeling, the software SimaPro and Ecoinvent database were used (DSS 2012, p. 1), similar to CE Delft 2011 and CE Delft 2013 studies. Therefore, this study is based on the same principle as the CE Delft study 2013, which makes it possible to directly compare them.

It is very important to note that, in contrast to comprehensive description of methodology and input data in CE Delft 2011 and CE Delft 2013 studies, in the public summary of DSS 2012 study the methodology is described shortly, covering 3 pages of the document (DSS 2012, pp. 3-5). In contrast to CE Delft studies, the reported description of DSS methodology completely lacked any numerical values, which are necessary to assess the inputs of the model. The only exception is the lifespan of mink and faux fur coats. For faux fur coat, the mean lifespan was assumed to be 6 years (DSS 2012, p. 3). However, for mink coat unrealistically long lifespan, namely 30 years (DSS 2012, p. 3), was assumed. There were no any references for the source of such information, and the very statement looks quite speculative: "The useful life of a natural fur coat is assumed to be 30 years", and that's all. According to the study "Longevity, repair and reuse of animal fur" (see List of references), the actual longevity of mink coat is currently less than 10 seasons and exceeds that of faux fur coat no more than 2 times. This fact will be very important for the interpretation of results of DSS study.

It should be noted that CE Delft has requested the full report from IFTF, in order to be able to match assumptions and learn which sources were used. This request remained unanswered by IFTF (CE Delft 2013, p. 17). The only information in the DSS study was that "this LCA has undergone a critical, independent third-party peer review as per the ISO LCA standard" (DSS 2012, p. 3), without further clarification or reference.

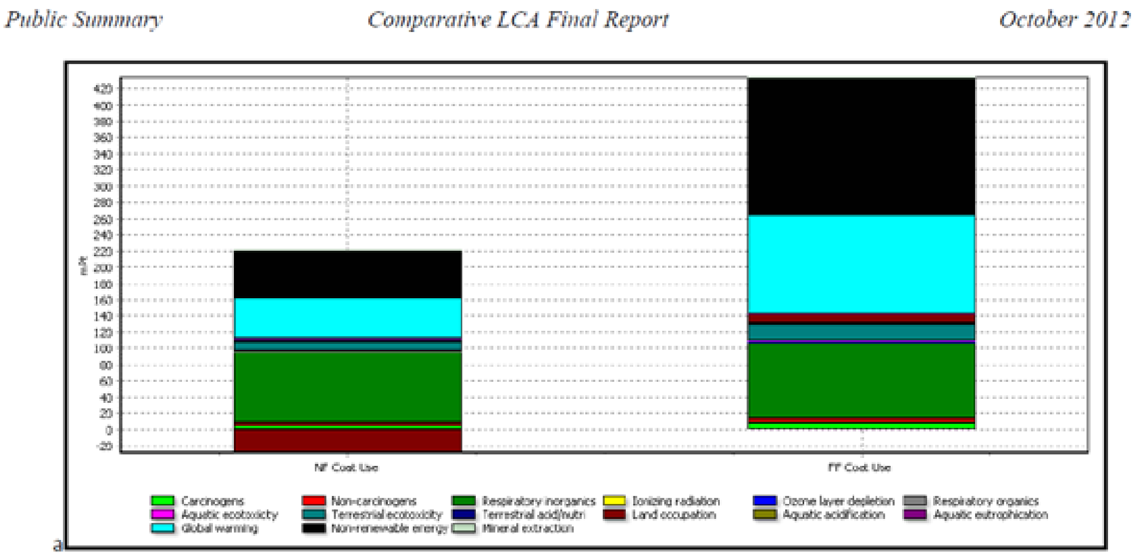
DSS study recognized that fur farms are relatively small compared to faux fur production facilities, and they are widely dispersed with different local conditions and jurisdictions (DSS 2012, p. 3), and therefore the report is largely representative of current good management practice in mink fur production, and higher environmental impact than indicated in this study is possible (DSS 2012, p. 4).

The total impact assessment was performed using the Impact 2002+ method. Four endpoint indicators were calculated: 1. Human health impacts, 2. Ecosystem quality impacts, 3. Climate change impacts, 4. Demand on resources supplies (DSS 2012, p. 5).

Also the researchers assumed that 10% of animal fur is re-used (DSS 2012, p. 13), which reduces the environmental demand by about 5% (DSS 2012, p. 6). Unfortunately, the source of this information is uncertain.

Now the results of the modeling can be evaluated. In the Figure 6 (DSS 2012, p. 9) mink coat (left bar) and faux fur coat (right bar) are compared according to their total environmental impact (similarly to ReCiPe single score in CE Delft studies):

As can be seen, the overall negative impact of faux fur coat is considerably (about two-fold) higher than that of mink coat. However, these results are obtained assuming the 5-fold difference in the lifespan between mink coat (30 years) and faux fur coat (6 years).



If the realistic lifespan (10 years) will be taken for mink coat, then the left bar will increase 3-fold, and the total negative impact of mink coat will become substantially higher than that of faux fur coat. Also, the way in which the data given in the Figure 6 were obtained is obscure, since the DSS report has a very short description of methodology without the numerical inputs. Therefore, the reliability of inputs cannot be verified – in contrast to CE Delft studies, where the methodology is described in details.

In the end of the document, a quite confusing statement is given (DSS Management Consultants Inc. 2012, p. 14):

«From a fur industry perspective, mink feed rations are continually being improved and these improvements will largely yield improvements in the overall environmental performance of natural fur. Much less potential exists to improve the environmental performance of faux fur. The potential for significant efficiency gains in the production of synthetic materials like faux fibre is becoming less and less. For this reason, the life cycle demands of faux fur are less likely to diminish over time compared to those associated with natural fur. By closing the loop in natural fur production, considerable further improvements are possible»

This statement clearly contradicts both the industry development experience and the common sense. The negative ecological impact of animal fur production is formed mainly by animal feeding, as is stated both in CE Delft 2011and 2013 studies (see Section 1.2.1 above) and DSS 2012 study on p. 14. But the facts are that one mink must eat about 40-50 kg of feed during the life, and about 10 minks must be killed to obtain 1 kg of fur, and these facts cannot be changed by the "rations improvement". The improvements of technologies of animal fur production are inevitably and heavily limited by the very fundamental issue, namely the biology of the fur species. Loosely speaking, mink is not "optimized" for the fur production. Nature and millions of years of evolution optimized the mink to move, swim, hunt, give birth and take care of the offspring. Therefore, when the animal is used to produce the very specialized product (such as pelt), very high losses are inevitable. The production of fur using living organisms is fundamentally inefficient due to purely biological reasons, and this fundamental fact cannot be changed by any technology.

On the contrary, the decrease of ecological impact of faux fur production is purely a technological issue, which is not limited by biological constraints and therefore has much higher potential for improvement. As an actual example, the improvement of technology of acrylic fiber production allowed to eliminate the mercury emission to the atmosphere and substantially decrease the negative impact of faux fur production calculated in CE Delft study, based on data from Ecoinvent database dated by 2009, in comparison with Van Dijk (2002) study, where the 1997 year data with less improved technology were used (CE Delft 2011, p. 52). Section 6 of the study "Longevity, repair and reuse of animal fur" (see List of references") provides examples of modern technologies of the production of faux fur using crop waste and recycled plastic, which significantly reduces the negative environmental effects of the production of such products. Therefore, the production of faux fur has much more potential for improvement in different aspects, including the environmental impact, than the production of animal fur, thus strictly opposing the groundless statement outspoken by the DSS 2012 report.

Analysis of the LCA research

performed by
MTT Agrifood Research Finland in 2010-2011

In 2010-2011, MTT Agrifood Research Finland conducted a LCA study of mink and blue fox fur production in Finland. The research was commissioned by the Finnish Fur Breeders' Association (FIFUR) and Saga Furs. Current analysis of the study was carried out using a version translated from Finnish into English, and the pages of the translated document did not always coincide with the pages of the original document, and therefore links will be made to the corresponding sections and not pages will be made (e.g. MTT, Article 1.4; MTT, Article 2.1, etc.)

GENERAL PRINCIPLES

The study analyzed the environmental impact of the following key steps in the fur production: production of feed for fur animals, raising animals on a farm, skinning, processing of skins and sewing of finished fur products (MTT, Article 1.3). The study did not take into account the environmental effects of storage, sale, use and disposal of garments, i.e. the approach was "cradle to gate" approach was used instead of "cradle to grave" approach, which was used in the CE Delft 2013 study (see Part 1) and DSS 2012 study (see Part 2).

Most of the information required for the research was obtained directly from the manufacturers involved in the production process (MTT, Section 1.1). Information on animal feed production was obtained from 7 manufacturers, who in total produced 88% of all the fur animal feed in Finland. Information on actual practices of animal raising were received from 29 fox farms and 14 mink farms. Also, the required information was received from the skinning shop, where most mink skinning is done, from a fur processing plant, fur auction house, and sewing shop. Thus, the study fairly objectively reflects the actual production practices of the fur industry utilized in Finland in 2010-2011 years. In addition, there are strong reasons to believe that these practices reflect a relatively "environmental- friendly" technology for the fur production of fur, because Finland is a highly developed country with modern production methods and strict environmental standards.

The life cycle analysis included an assessment of the environmental impact of production in 3 categories (MTT, Article 1.4):

- emission of greenhouse gases (carbon footprint)

- eutrophication emissions

- acidification emissions

Importantly, the researchers did not combine the calculated environmental effects for these 3 categories into one total indicator characterizing the final effect of fur production on the environment (MTT, Article 1.2), which differed from the approach used in the CE Delft 2011-2013 and DSS 2012 studies.

Also, the effects of the use of various chemicals used in fur processing on the environment were assessed at a qualitative level (MTT, Articles 1.4 and 2.3, Table 6).

MINK AND BLUE FOX FUR PRODUCTION PROCESS

To assess the ecological effect of feed production, data on the composition of feed for blue fox and mink on farms were used (MTT, Article 1.5, Table 2). The main raw materials for fur animal feed are slaughter by-products (48%), feed fish and fish processing by-products (20%), grains (14%), protein feed (6%) and water (10%). As in the CE Delft 2011-2013 studies (see Section 1.1.1. above), allocation factors (AF) were used to calculate the environmental impact of slaughter and fish by-products, according to their cost compared with the cost of total production.

It is very important to note the following detail. The feed for fur animals included herring (and other fish) caught from the Baltic Sea. When caught fish is removed from the sea, the nutrients contained in the fish (primarily nitrogen and phosphorus) are also removed, and thus the eutrophication level of the sea is reduced, thereby having a positive effect on its ecological state. This fact will be of great importance later on (see Section 3.2 below).

In this study, in contrast to the CE Delft 2011-2013 studies, the positive effect of the use of manure as fertilizer was taken into account (MTT, Article 1.2). The use of manure allowed avoiding the need to produce the corresponding amount of nitrogen fertilizers, thus being beneficial to the environment. It was also taken into account that various compounds having a negative effect on the environment are released during the manure treatment (MTT, Article 1.4, Table 1; MTT, Article 1.7). These compounds included the greenhouse gases (carbon dioxide CO2, methane CH4, nitrous oxide N2O), compounds that cause eutrophication (ammonia NH3, nitrogen oxides NOx, soluble nitrogen and phosphorus compounds), and compounds that cause acidification (ammonia NH3 , nitrogen oxides NOx, sulfur dioxide SO2).

The skinning of blue fox was performed mainly on farms (MTT, Article 1.8), whereas skinning of mink was performed on Furfix processing plant using a modern, highly machined production line (MTT, Article 1.9). As a result, three types of production were obtained – carcasses of fur animals, scraped fat that can be mechanically separated from skins, and fur skins (the main product). Animal fat was used directly, whereas animal carcasses were delivered to the Honkajoki Oy destruction plant (MTT, Article 1.9) to be used as raw material for fur animal feed (MTT, Article 1.2). The wood chips used in fox skinning were utilized in the farm's own energy production or delivered for incineration to a heating plant (MTT, Article 1.8). Processing and dyeing of fur skins were performed using the latest technology (MTT, Article 1.11). Thus, the fur production technology considered in the study was highly advanced, with the maximum possible use of waste: manure was used as a fertilizer, carcasses were processed in animal feed, wood chips were used for heat generation, etc.

ALTERNATIVE PRODUCTS

Two alternative scenarios were considered in the MTT study: the production of alternative clothing and alternative uses of slaughter by-products.

When production of alternative clothing was considered, 3 types of winter clothes were taken into account: 1. jacket (65% polyester and 35% cotton), 2. artificial fur coat (65% acrylic, 7% modacrylic and 28% cotton), 3. artificial fur coat (100% acrylic) (MTT, Abstract; MTT, Article 1.15). Thus, in MTT study, the comparison was expanded relative to the CE Delft 2011-2013 studies (see Part 1) and DSS 2012 study (see Part 2), which both considered only faux fur coats and not the jacket as alternative products.

The second scenario considered the alternative use of animal slaughter by-products instead of using them to produce feed for fur animals. This analysis is unique to MTT research; the CE Delft 2011-2013 and DSS 2012 studies did not consider such an alternative. According to this scenario, slaughter by-products were treated on Honkajoki Oy rendering facility into the meat bone powder and fat (MTT, Article 1.16). The environmental impacts of this scenario in relation to the economic value of the utilization of by-products were compared to the environmental impacts of the production of fox and mink furs in Finland in relation to their economic value (MTT, Article 1.2). Accordingly, the scenario with lower environmental impact per 1 euro of created economic value can be considered better from the environmental point of view. Importantly, the alternative scenario considered only the processing of slaughter by-products and did not considered catching and processing herring from the Baltic Sea (MTT, Section 1.2). Therefore, the nutrients contained in the fish (nitrogen and phosphorus) were not removed from the sea in the alternative scenario. Therefore, for an alternative scenario, the authors of the study excluded the possibility to decrease eutrophication of the Baltic Sea due to the removal of nutrients from it.

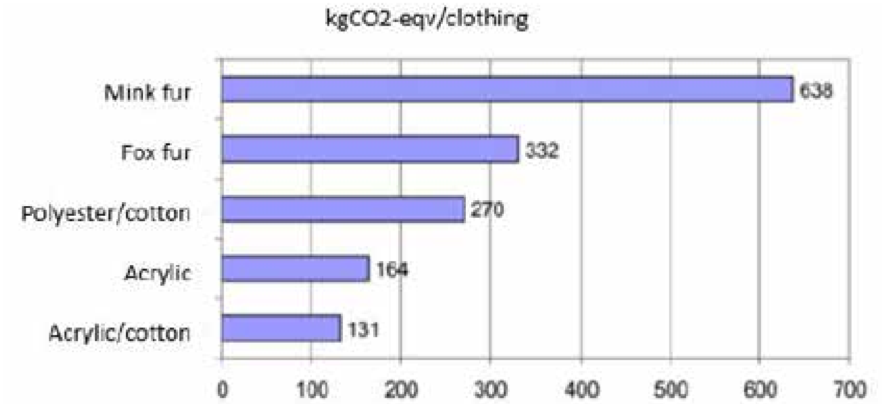
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF PRODUCING ALTERNATIVE CLOTHING AND FUR CLOTHING

Comparison was performed on 3 categories: emission of greenhouse gases (carbon footprint), eutrophic emissions and acidifying emissions.

Emission of greenhouse gases

On Fig. 12 in Article 2.4.2, the total level of greenhouse gas emissions (in kg CO2-eq) is given per one garment; from top to bottom: mink fur coat, fox fur coat, jacket (polyester/cotton), faux fur coat (acrylic), faux fur coat (acrylic/cotton):

It can be seen that the production of a mink coat led to the emission of the largest amount of greenhouse gases among all 5 items (638 kg CO 2-eq), in the second place was the coat from blue fox fur (332 kg CO2-eq), and the levels of emissions from production of all 3 alternative products were substantially lower than for fur garments products (from 131 to 270 kg CO2-eq). The critical point is that the authors of the MTT study arbitrarily assumed that the lifetime of fur garments is 10 times higher than the lifetime of alternative products, for example, 20 years versus 2 years (MTT, Article 2.4.2). Therefore, even when a 10-fold greater lifetime of fur garments compared with alternative clothing was assumed, the production of the former was more harmful when looking at climate effects.



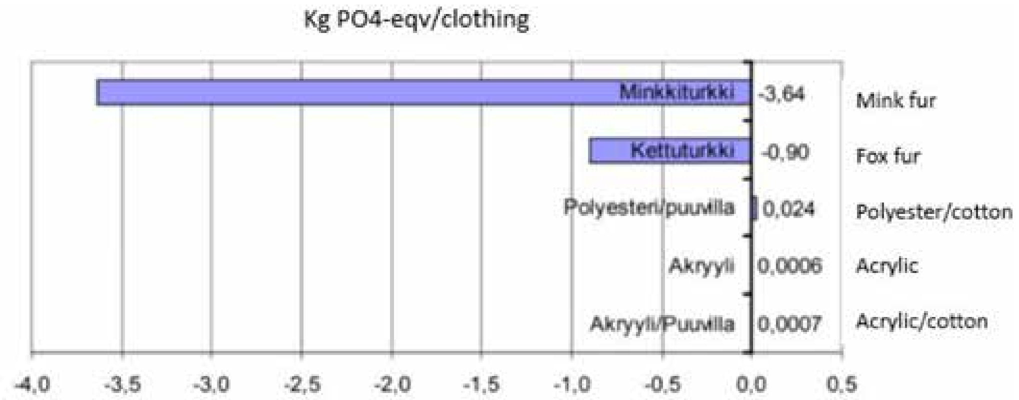
It should be noted that this 10-fold difference in lifespan was accepted by the authors without any references to enforce this statement. However, as was stated earlier (see Section 2.1), the actual longevity of mink coat is currently less than 10 seasons and exceeds that of faux fur coat no more than 2 times. For the coat made of blue fox fur the expected lifespan would be even less (about 7 seasons), since its durability is lower than that of mink fur (see Section 2.2 in "Longevity, repair and reuse of animal fur" for more information). Based on this information, let's assume that the actual lifetime of animal fur garments exceeds the lifetime of alternative garments 2-fold instead of 10-fold. In this case, the emissions of greenhouse gases due to production of fur garments will increase 5-fold, reaching 3190 kg CO2-eq for a mink coat and 1660 kg CO2-eq for a blue fox coat, which are many times greater than the carbon footprint of alternative garments (131- 270 kg CO2-eq).

The largest single factor contributing to carbon footprint of animal fur was the emission of nitrous oxide (N2O) from manure treatment, which alone accounted for 47% of the total carbon footprint of mink fur (MTT, Article 2.1) and for 37% of the total carbon footprint of blue fox fur (MTT, Article 2.2). Such a large impact of nitrous oxide emissions due to the fact that the greenhouse effect of 1 kg of N2O corresponds to the greenhouse effect of 298 kg of carbon dioxide CO2 (MTT, Article 1.4, Table 1).

One factor not considered by the MTT study which could reduce carbon footprint of fur and increase that of alternative garments is the disposal of garments after the end of their life cycle. Incineration of animal fur in a solid waste incineration facility leads to a small benefit when looking at climate effects, since small amounts of heat and electricity are generated (CE Delft 2013, p. 28, see Section 1.2.1). On the contrary, incineration of faux fur increases its carbon footprint, since the negative impact due to emitted CO2 is higher than the positive impact due to heat and electricity generation (CE Delft 2013, p. 28, see Section 1.2.1). However, quantitatively the negative effect of faux fur incineration is rather low, and the positive effect of animal fur incineration is even lower (CE Delft 2013, p. 28, Fig. 3). Therefore, the inclusion of disposal of fur and alternative garments in the calculation would not substantially change the results of MTT investigation. In the MTT study, the environmental impact of storage, transport and disposal of fur and alternative products was "assumed to be relatively the same for both product groups" (MTT, Article 1.3), which argues against the major role of disposal in the total carbon footprint of these products.

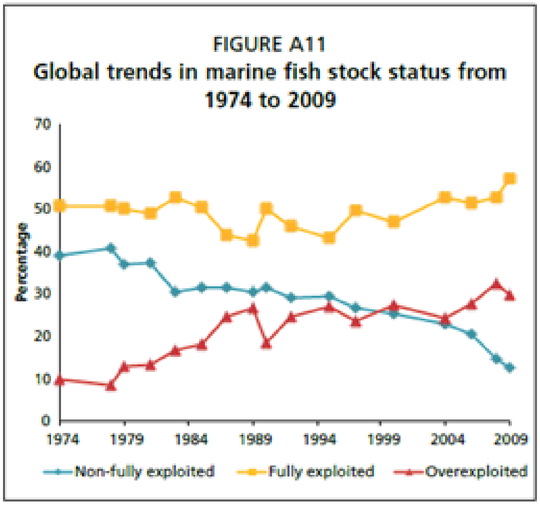
Eutrophication emissions

On Fig. 13 in Article 2.4.2, the total level of eutrophic emissions (in kg PO4-eq) is given per one garment:



The diagram shows that the **production of alternative clothing has virtually no effect on the eutrophication of the environment. The production of fur garments reduces the level of eutrophication of water bodies, thus having a significant positive environmental effect.** As was noted earlier (see Section 3.1.2), the fishing for herring and other fish used to feed fur animals removes significant amounts of nutrients from the waters of Baltic Sea, while production of alternative clothing does not provide a similar benefit. Caught fish used to feed fur animals removes from four (for blue fox fur) to five (for mink fur) times the amount of nutrients from the water bodies relative to emissions of these nutrients during the remainder stages of fur production (MTT, Articles 2.1 and 2.2), and therefore net decrease of eutrophication occurs. It should be noted that the different usage life of the fur and alternative products was not taken into account when eutrophic emissions were calculated, contrast to calculation of climate impact (see above). Accordingly, if we assume that fur garments have 2 times longer lifespan than alternative garments, then the positive effect of fur production on the eutrophication of water bodies will decrease by 2 times.

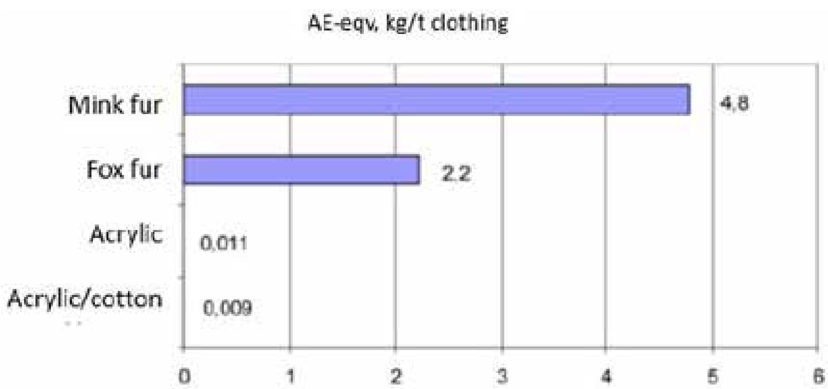
However, there is a main problem with this "positive" environmental effect of fur production. Intense fishing can indeed counteract eutrophication, but sustainable and rich catches can only derive from large and well-managed fish population (Hjerne and Hansson, 2002), when there is no threat of fish population depletion. As indicated in MTT study (Article 2.4.1), the negative values for eutrophication emissions are due to the use of normally underutilized fish caught in Baltic Sea. However, the 57.4% of world's fish stocks were fully exploited and 29.9% of stocks were overexploited in 2009, according to FAO "Review of the state of world marine fishery resources" (2011). Moreover, the percent of overexploited fish stocks was increasing over the years (see Fig. A11 from FAO, 2011):



According to FAO 2011 study (p. 41), there are several herring stocks in the Baltic that are fully exploited or whose status is unknown owing to a lack of data. The largest stock, central Baltic herring, is overexploited. Western and eastern Baltic cod appear currently fully exploited, and sprat is fully exploited. In summary, most fish stocks in the world are already fully exploited or overexploited, and the demand for fish is growing every year due to the growth of the human population. Thus, although it is potentially possible to reduce the eutrophication of water bodies by fishing and feeding caught fist to fur animals, but the negative effects of this practice are probably much more important than the positive effects.

Acidifying emissions

On Fig. 14 in Article 2.4.2, the total level of acidifying emissions (in kg AE-eq) is given per one ton of garments:



It is not clear from the text of the MTT study whether the difference in the lifespan of animal fur and of alternative materials was taken into account when acidifying emissions were calculated. In any case, it is obvious that the **acidifying emissions due to fur production exceed the emissions due to production of alternative clothing by hundreds of times.**

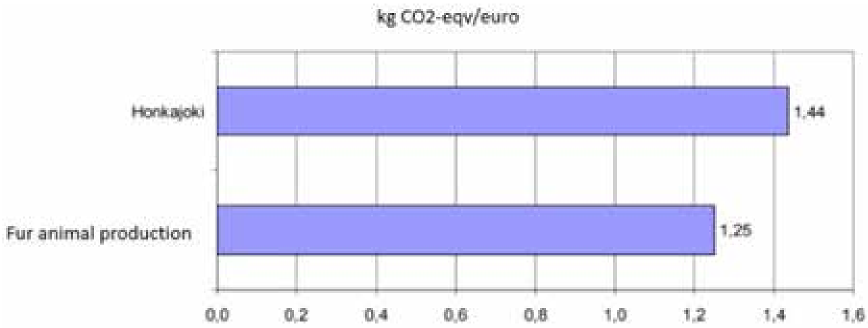
The largest single factor contributing to acidifying emissions of animal fur production was the emission of ammonia (NH_3) from animal manure and urine, which alone accounted for about 90% of the total amount of acidifying emissions of mink and fox fur production (MTT, Articles 2.1 and 2.2).

COMPARISON OF THE ENVIRONMENT IMPACT OF ALTERNATIVE USE OF ANIMAL SLAUGHTER BY-PRODUCTS AND OF THEIR USE TO PRODUCE FEED FOR FUR ANIMALS

Comparison was performed on 3 categories: emission of greenhouse gases (carbon footprint), eutrophic emissions and acidifying emissions. It should be recalled that the environmental impacts of these two scenarios per 1 euro of created economic value were compared – the lower the negative impact, the less harmful the scenario is for the environment (see Section 3.1.3).

Emission of greenhouse gases

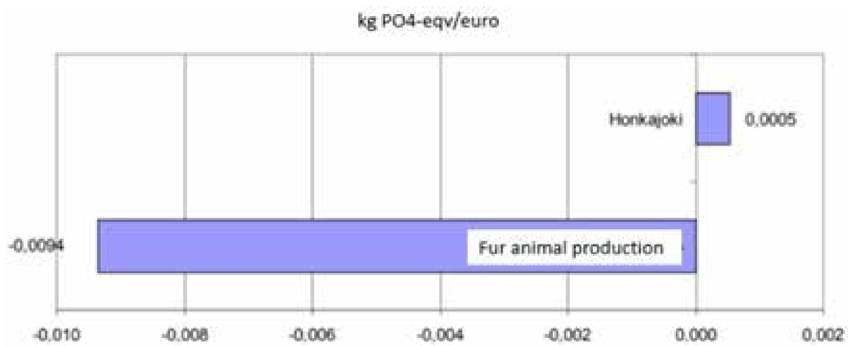
When comparing the effects of two scenarios on climate change, fur production has slightly lower greenhouse gas emissions (1.25 kg of CO2-eq per 1 euro, lower column on Fig. 15, MTT, Section 2.4.3) than production of meat bone powder and fat on Honkajoki Oy rendering facility (1.44 kg of CO2-eq per 1 euro, upper column on Fig. 15, MTT, Section 2.4.3):



Therefore, the environmental loads of these 2 scenarios are quite close to each other, with fur production having slightly lower impact. It should be noted that the fur prices were quite high in the studied period (2009-2011). Given the substantial decrease of fur prices since the beginning of 2010s, nowadays the alternative usage of slaughter by-products is probably substantially better than their utilization for fur production in terms of greenhouse gas emissions per 1 euro of the cost of finished products.

Eutrophication emissions

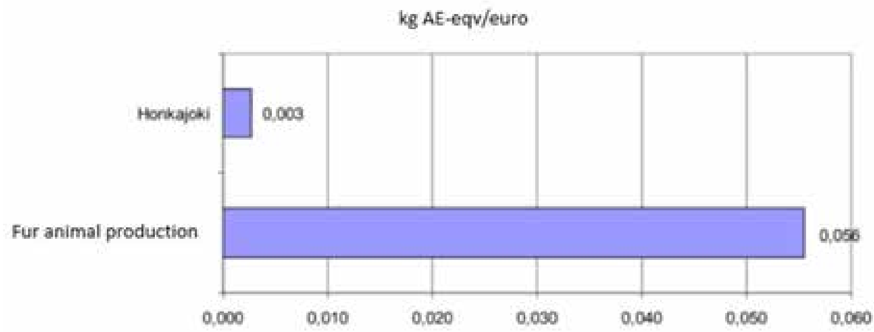
The comparison of two scenarios on their impact on eutrophic emissions, given on Fig. 16 of Section 2.4.3, seems quite controversial:



It can be seen that the fur production has a significant positive environmental effect on eutrophication (i.e., decreases its level, see lower column on Fig. 16), while the production of meat bone powder and fat leads to a small negative effect (increased eutrophication, see upper column on Fig. 16). This positive impact of fur production is due to the removal of nutrients from the Baltic Sea with the caught fish used for feed production (see Sections 3.1.2 and 3.2.1 above). However, as we noted earlier (Section 3.1.3 above), the possibility of processing of caught fish on the Honkajoki Oy rendering facility was not considered in the MTT study. **Thus, the comparison between fur and alternative products does not seem entirely correct, since the main factor influencing the level of eutrophication, namely fish catch from the Baltic Sea, was not taken into account in the alternative scenario.** It can be proposed that if an alternative use of caught fish were considered (for example, for fishmeal and fish oil production) and not only the use of slaughter by-products, then the positive effect of alternative scenario on the eutrophication would be comparable to the positive effect of feed production, since in both cases, nutrients are removed from the sea.

Acidifying emissions

When comparing the effects of two scenarios on acidifying emissions, fur production has much higher level of emissions (0.056 kg of AE-eq per 1 euro, lower column on Fig. 17, MTT, Section 2.4.3) than production of meat bone powder and fat (0.003 kg of CO2-eq per 1 euro, upper column on Fig. 17, MTT, Section 2.4.3):



The acidifying emissions are much higher in fur production than in the Honkajoki rendering plant due to high ammonia emissions from the treatment of manure from fur animals.

SUMMARY

The MTT study fairly objectively reflects the actual production practices of the fur industry utilized in Finland in 2010-2011 years, since most of the information required for the research was obtained directly from the manufacturers involved in the production process (MTT, Section 1.1). The fur production technology considered in the study was highly advanced, with the maximum possible use of waste: manure was used as a fertilizer, carcasses were processed in animal feed, wood chips were used for heat generation, etc.

Despite this, the calculated greenhouse gas emissions from the production of fur garments was much higher than for alternative products (jacket and faux fur coats), even taking into account the unrealistically high lifespan of for garments (10 times higher than for alternative products). Acidifying emissions due to fur production exceed the emissions due to production of alternative clothing by hundreds of times. Fur production reduced the water eutrophication due to the catch of fish used for the production of feed. However, the bulk of the fish stocks on Earth are now either fully exploited or overexploited, and therefore feeding fish to fur animals can hardly be considered a sustainable and beneficial practice for the environment. Thus, the production of alternative clothing had a significantly lower negative environmental impact compared with fur in two out of three environmental indicators.

When comparing the greenhouse gases emissions due to using slaughter by-products to produce feed for fur animals or meat bone powder and fat, the environmental loads of these 2 scenarios were found to be quite close to each other. Fur production had slightly lower impact due to high fur prices in the studied period (2009-2011). Acidifying emissions were much higher for feed production than for alternative usage. Fur production reduced substantially the level of eutrophication of water bodies (see above). However, the researchers did not consider the possibility of alternative processing of caught fish (for example, into fish meal), therefore, a correct comparison of these two processing methods in terms of eutrophication is apparently impossible.

Summary results of 4 researches

In the current investigation, 4 studies of the life cycle of products from animal fur were analyzed in comparison with products from alternative materials. Two of them (CE Delft 2011 and CE Delft 2013) were commissioned by animal welfare organizations, two more (DSS 2012 and MTT 2011) were commissioned by organizations representing the fur industry. Among all studies, DSS 2012 appeats to be the least credible because the methodology of this study is described very briefly and the minimum amount of numerical data is given. CE Delft 2011, CE Delft 2013 and MTT 2011 studies are described much more thoroughly, which makes it possible to evaluate the input parameters and significantly increase the credibility of these studies. However, despite significant differences in the input data for analysis, research methodology and results obtained, a number of general conclusions can be formulated from the 4 studies reviewed.

1. In all studies, the negative effect from the fur production was much higher than the negative effect from the alternative products. The longer lifespan of animal fur products was unable to compensate for this difference. In the DSS 2012 study, the calculated negative environmental effect from the production of a mink fur coat was lower than for a polyacrylic coat (DSS 2012, p. 9, Fig. 6) due to unrealistically long average service life of a mink coat, namely 30 years versus 6 years for faux fur coat (DSS 2012, p. 3). Using a more realistic ratio of service lives – 10 years for a mink coat versus 5-6 years for a faux fur coat – this study would give the opposite result, namely, a significantly greater negative environmental effect from the production of animal fur compared to artificial fur production. In the CE Delft 2013 study, the negative effect of mink coat production was higher compared to production of faux fur coat, even when a 5 times longer lifespan of mink coat was considered (CE Delft 2013, p. 35, Fig. 8). In the MTT 2011 study, the production of animal fur had a greater negative environmental impact compared with alternative materials (cotton, polyester, polyacryl) in two out of three indicators, namely the emission of greenhouse gases (MTT, Article 2.4.2, Fig. 12) and acidification of the environment (MTT, Article 2.4.2, Fig. 14), even when a 10 times longer lifespan of fur was considered.

2. The mere facts that natural raw materials (slaughter by-products, fish, grain, woodchips, etc.) are used in fur production, and the resulting waste is of a biological nature (manure, animal carcasses, etc.), do not mean a low negative environmental impact of fur production. On the contrary, the feed production and animal farming are the two stages responsible for the vast majority of environmental impact of fur production (CE Delft 2013, p. 29, Fig. 4; MTT, Articles 2.1 and 2.2.). According to the MTT study, nitrous oxide (N_2O) emissions from manure alone accounted for 47% (for mink fur) or 37% (for fox fur) of the total greenhouse gas emissions from fur production, while ammonia (NH_3) emissions from manure accounted for about 90% of the total acidification effect of fur production (MTT, Articles 2.1 and 2.2.). The use of fish for the production of feed for fur animals can reduce the level of eutrophication of the waters basins from which the fish was caught (MTT, Articles 2.4.2 and 2.4.3), but this is possible only in water basins with large and well-managed fish populations. Thus, the negative effect of fur production is largely due to the most "natural" stages of production.

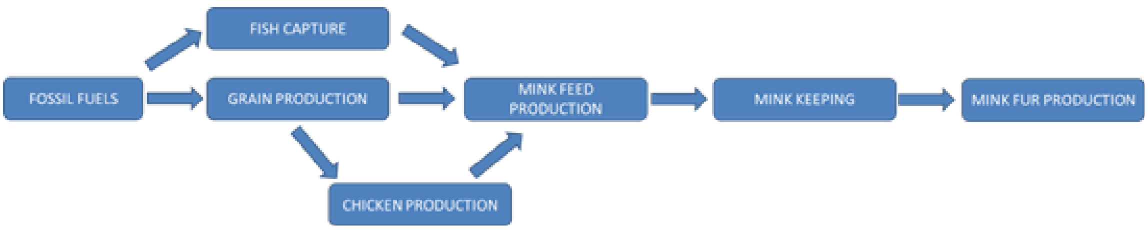
3. Because the main negative effects of fur production are not associated with fur skin processing and the harmful chemical compounds used in it, the introduction of "greener" technologies of fur processing (e.g., chrome-less or formaldehyde-less) will not lead to a significant reduction in the overall negative environmental effect of fur production.

4. Using the wastes of fur production to generate by-products is presented by the fur industry as an example of a "closed loop" production and a way to significantly reduce the negative impact of fur production on the environment (DSS 2012, p. 14). However, the MTT study, where such an advanced technology was considered (manure was used as fertilizer, carcasses for processing, wood chips for heat generation, etc.), clearly demonstrated that the negative effect of fur production remains very high, even if such advanced "zero waste" technology is used. Moreover, higher greenhouse gases emissions from fur production compared with alternative clothing production were found in MTT study, which took into account the use of manure as fertilizer, compared with CE Delft 2011 and CE Delft 2013 studies, where this positive effect of manure was not taken into account. Thus, even the maximum use of by-products from fur production does not fundamentally change the overall picture of very large environmental damage per unit of fur produced – much higher than for winter clothing made from alternative materials.

5. Slaughter by-products can be used in a various ways other the production of feed for fur animals, and the ecological effect of their processing per 1 euro is comparable to the ecological effect of feeding them to fur animals, even during periods of high fur prices (MTT , Article 2.4.3).

The animal fur producers like to oppose the "natural" animal fur to "petroleum-based" faux fur made from acrylic fibers. However, nowadays the use of hydrocarbon fuels in fact lies at the bottom of the vast majority of productions, both industrial and agricultural. Hydrocarbons are required to fuel tractors, trucks and fishing trawlers, to produce fertilizers and pesticides. To produce 1 calorie of feed, from 10 to more than 300 (!!!) calories of fossil fuels are required (Joel C. Magnuson, 2013, p. 166). Without the consumption of large amounts of hydrocarbons there will be no chicken and fish offal and wheat grain to produce feed for fur animals, no electricity to freeze the food, no trucks to transport the food and the manure, etc.. Therefore, both animal and faux furs are actually petroleum-based. But the clear difference is that faux fur is produced in relatively low numbers of highly specialized and highly optimized steps, which have great potential for technological improvement:

whereas for animal fur production, fuel is transformed to fur in large number of much less specialized and much less optimized steps with low potential for improvement due to biological restrictions:



At each stage, the resource and energy losses occur and wastes are generated, and the less specialized this stage is, the greater will be the resource loss and waste production. Animal fur production includes at least one very ineffective stage – the transformation of hundreds kg of feed to 1 kg of fur. Even the fact that the feed is mainly composed of offal with relatively little negative ecological impact compared with the major products of fish and chicken production, does not change the overall state of things. The following example is also patent. In 2012, a campaign by the European Fur Breeders' Association (EFBA), which claimed that it is 'eco-friendly to wear fur' was banned by the Advertising Standards Authority. The small print stated that fur is 'naturally long lasting', can be 'recycled easily and biodegrades' and is 'one of the most ecologically balanced systems in agriculture'. ASA has said that the campaign and the supporting documents provided for the investigation did not show that the fur trade was 'eco-friendly', would cause no environmental damage and that 'taking in the full life cycle of the product from manufacture to disposal, we concluded the ad was likely to mislead' (see "Cruel or eco-friendly: is fur the ultimate sustainable material?" Ruth Stokes | 10th April 2012). Animal fur is neither "animal-friendly" nor "environmental-friendly", in contrast to warranties of animal fur producers. Refusal to use it is a matter of not only a humane attitude towards animals, but also a responsible attitude to the environment.

Analysis of the critical response

of representatives of the animal fur industry (www.truthaboutfur.com) to the CE Delft studies

It is obvious that CE Delft researches have attracted the attention of the animal fur industry. As an example, the site TruthAboutFur (www.truthaboutfur.com), which is one of the most important fur-promoting sites, has published a critical article concerning the CE Delft studies. This critical article will be followed up thereunder – the citation from the article will be given in italics, followed by their evaluation and criticism.

– *CE Delft sets out to compare 1 kilogram (kg) of mink fur with 1 kilogram of fake fur and other textiles. To this end, they propose that 11.4 mink pelts are needed to produce 1 kg of fur, and that each animal consumes close to 50 kg of feed (including a share for the mother). From these assumptions, CE Delft concludes that 563 kilograms of feed are required to produce one kilogram of fur (49.4 kg of feed x 11.4 pelts/kg of fur.), and this is the figure on which they base all their subsequent calculations of environmental impacts. [p.6]*

– *Our own survey of North American and European farmers – including statistics published by the Danish Faculty of Agricultural Science, Aarhus University (2010) — suggests that it actually requires from 38-45 kg – or an average of about 41.5 kg of feed to produce a mink pelt*

Answer: As was noted earlier, the value 49.4 kg in CE Delft 2011 was obtained by two independent ways - both by calculation from theoretical considerations and by dividing the total offal consumption by mink farms to total number of minks in Netherlands (CE Delft 2011, p. 33). It should be noted that without the consideration of feed for mother animals, feed amount for 1 mink was calculated to be 41.8 kg (CE Delft 2011, p. 33, Table 8), which is very close to 41.5 kg given in TruthAboutFur article. It is likely that this value (41.5 kg) simply does not include the need to feed not only animals that are pelted for fur production but also feed mother animals, and therefore could underestimate the amount of mink feed required.

CE Delft's figure for how many pelts are required to supply a kilogram of fur is also higher than what we found — perhaps because their calculation was apparently based on two sample pelts provided by the Dutch activist group Bont voor Dieren, which may not represent a true average size. Using the same methodology as CE Delft but with a large data set provided by European fur auctions, we find that 1 kg of fur represents about 7.75 pelts – not 11.4, as CE Delft proposes

Answer: This statement is either a misinterpretation or a disinformation. In the CE Delft 2011 study (p. 32) it is clearly stated that two pelts provided by Bont voor Dieren was used to calculate fur density only and not the «true average size». Average size was considered based on data of American fur importer and distributor Chichester, Inc. (CE Delft 2011, p. 32, Table 5). By multiplying the average size on the average density, the final value of 11.4 mink per 1 kg of fur was obtained (CE Delft 2011, p. 32). Therefore, there is no reason to believe that the TruthAboutFur value of 7.75 pelts/1 kg fur, which was obtained from the " large data set provided by European fur auctions" without any references to the source of this data set, is more relevant than value of 11.4 pelts/1 kg fur calculated in CE Delft 211 study.

If an average of 41.5 kg of feed is required to produce one mink pelt, multiplying this by 7.75 pelts indicates that 322 kg of feed would be required to produce 1 kg of fur – i.e., a little more than half (57%) the amount of feed used by CE Delft in their calculations.

Answer: As was thoroughly surveyed above, there is no reason to believe that TruthAboutFur data (41.8 kg feed per 1 pelt and 7.75 pelts per 1 kg of fur, giving 322 kg in total) are more credible than CE Delft data (49.4 kg feed per 1 pelt and 11.4 pelts per 1 kg of fur, giving 563 kg in total). However, as will be seen later, even the decrease of total feed amount to 322 kg per 1 kg of fur will not fundamentally change the results of comparison between animal and faux fur.

– *CE Delft also assumes that mink food is comprised of 70% chicken waste and 30% fish offal. But feed composition varies according to local availability. Thus, in Denmark (which produces three times more mink than Holland, where CE Delft is based) feed is more commonly composed of 80% fish offal and 20% chicken waste. But the environmental cost of fish offal is much lower than that of chicken wastes. In fact, in a 2013 follow-up study, CE Delft acknowledged that a mink diet based on fish rather than chicken would lower environmental impacts by 30%.*

Answer: As was mentioned earlier, two feeding scenarios were considered in CE Delft 2013 study, with the first scenario based on real feed composition in Netherlands (28% fish offal, 64% chicken offal, 8% wheat), and the second alternative "low-impact" scenario without use of chicken offal at all (92% fish offal and 8% wheat) (CE Delft 2013, p. 20, Table 3).

The quite unrealistic alternative scenario would decrease the environmental impact of mink fur production by one third, but it would still be several-fold higher than the impact of faux fur production (CE Delft 2013, p. 37, Figures 11 and 12). Moreover, the allocation factor for fish offal could vary substantially (from 0.83% for plaice offal to 14% for salmon offal), and therefore the real ecological impact of fish-based diet could be expected to increase substantially in comparison with CE Delft calculations which used the lowest allocation factor for fish offal (0.83%, CE Delft 2011, p. 35).

In addition, average feed composition in Finland, which is one of the main European fur-producing countries along with Denmark, consists of by-products of slaughtering of pig, cattle and hen (48%), Baltic Herring and side-products of fish slaughtering (20%), barley (14%), protein supplement (6%) and water (10%) (MTT, Article 1.5). Therefore, feed based mainly on "high-impact" chicken, pig and cattle offal could actually be more typical (at least for European countries) than the fish-based feed used in Denmark.

– *Most important of all: other uses would have to be found for this meat and fish waste — or it would go into landfills or be incinerated — if mink weren't eating it. It could therefore be argued that an environmental CREDIT should be applied to mink food production, since the environmental costs of disposing of these meat and fish wastes are avoided.*

Answer: Obviously, fish and chicken offal will neither be buried nor incinerated. These by-products are used for production of various products, such as industrial oil or protein meal, which is used to feed poultry, pigs, and other farmed fish. For example, about 56% of fish meal is used to feed farmed fish, about 20% was used in pig feed, about 12% in poultry feed, and about 12% in other uses, which included fertilizer. Therefore, fur farming is neither the only nor the major consumer of fish and chicken offal. In Article 2.4.3 of the MTT study, an alternative scenario of processing slaughter into meat bone powder and fat instead of using them for feed production was considered in detail.

According to the p.13 of study "Fur farming in Latvian national economy" ("Zvēraudzēšana Latvijas tautsaimniecībā", 2020), the by-products of food production are traditionally used to produce the feed of other animals, not only fur animals. According to "Norsk Hundefor", which is the Norwegian manufacturer and exporter of dog feed, fur farming is the main competitor in the demand for side products of animal origin. Another Norwegian manufacturer of animal feed "Norsk Protein" declares that there are no animal by-products which this company is unable to process and use. In addition, the use of animal by-products in the production of biogas, rather than in fur farming, is a way to reduce the use of fossil fuels and greenhouse gas emissions. Biogas production is a widespread use of food waste, for example in Sweden and Norway, with great developmental potential. Therefore, the statement of TruthAboutFur that fish and chicken offal would be buried or incinerated if not consumed by fur animals and therefore environmental credit should be given to animal fur production, is unreasonable and incorrect.

Moreover, TruthAboutFur preferred not to mention the third component of mink feed, namely wheat flour. Although it constitutes a small part of total feed amount in CE Delft studies (8%), its proportion of total feed environmental impact is considerable (CE Delft 2011, p. 49, Figure 11), since wheat grain is the main product of agriculture and not the by-product like the chicken and fish offal. According to Articles 2.1 and 2.2 of the MTT study, the barley grain production accounted for 44% of the total greenhouse gas emissions from the production of mink fur and 42% from fox fur.

Here again, CE Delft ignored the subsequent use of this manure and the environmental CREDITS that could be associated with reducing the need for artificial fertilizers, when mink manure and other wastes (soiled straw bedding) are properly managed and applied to local agricultural lands. Mink carcasses and wastes are now also used to produce biofuels, thereby reducing the need for fossil fuels.

Answer: As was mentioned earlier, due to the lack of required information the ecological impact of mink manure was "dark horse" for the CE Delft investigators, since the studies did not accounted for both substantial positive effects of manure usage (production of fertilizers and biogas from manure) and substantial negative effects of manure on the ground waters and water bodies (CE Delft 2011, p. 36). However, the use of manure as fertilizer was taken into account in the MTT study, and the conclusions of the MTT and CE Delft studies turned out to be fundamentally similar, since the negative effect on climate change was much higher for the animal fur compared to artificial materials even at 5- or 10-fold higher lifespan of fur garments (see Part 4).

CE Delft did not do a complete, "cradle-to-grave" Life Cycle Assessment in its 2011 study. Instead, it did a partial ("cradle-to-gate") analysis which included the environmental costs of raising the mink on the farm, pelting, transportation, auction sale, and processing (dressing) – but stopped at the point when the fur would be made into a garment.

Answer: This restriction was characteristic only to CE Delft 2011, whereas the CE Delft 2013 study used the complete "cradle to grave" analysis technique, considering all aspects of life cycle up to disposal.

CE Delft therefore completely ignored one of the most important environmental attributes of fur apparel, i.e., that it is much longer-lasting than most other clothing materials. Clearly, it matters whether the environmental costs of production are amortized over 5-10 years (fake fur coats) or 40, 50 or more years (real fur coats)

Answer: The mentioned lifespan of animal fur products (40-50 years and higher) is clearly overestimated. Of course, there are examples when the animal fur coats retained their properties for 20 and more years – especially when they are mainly stored in the wardrobe or cold storage instead of active use. On the other hand, there are also examples of irreversible deterioration during the first year of exploitation. Clearly, it is the mean and not maximum lifespan that we are interested in when calculating the ecological impact of the product. The actual lifespan of mink fur garments is 10 years or less, and lifespan of arctic fox fur garments is about 7 years or less (see Section 2 in "Longevity, repair and reuse of animal fur"). Once again – it is the mean and not maximal lifespan value that matters in LCA analysis. Moreover, both animal fur and faux fur are increasingly used for trim production (Guseva, 2016). When used as trim, both animal and faux fur will have equal lifespan, which depends on the lifetime of the product as a whole. Animal fur could be re-used, but the percent of re-used animal fur is low and is estimated to be about 10%, which would reduce the environmental impact of animal fur production by about 5% (DSS 2012, pp. 6 and 13).

If we will take the realistic mean lifespan of mink coat (10 years) and will compare it to the lower (!) bound of lifespan of faux fur coat, as TruthAboutFur stated (5 years), then the 2-fold lifespan difference between mink and faux fur coat will be obtained. As stated earlier (see CE Delft 2013, p. 29, Figure 4), the total negative environmental impact of faux fur coat is approx. 6-14 fold lower than that of mink fur coat, depending on the backing material. By dividing this difference in two (10 years vs 5 years), we will obtain a 3-7-fold lower environmental impact of faux fur even in the case of two-fold lifespan difference. As mentioned earlier, TruthAboutFur stated that mink feed amount could be just 57% of that used in CE Delft studies (322 kg vs 563 kg). Let's agree with them and diminish the total environmental impact of mink coat by 100% - 57% = 43%; then the mink fur coat still have 1.71-3.99-fold higher environmental impact than faux fur coats.). Let's make another assumption in favor of mink fur and use the "low-impact" mink diet consisting of only fish offal (92%) and wheat (8%), which is quite unrealistic in practice (CE Delft 2013, p. 37). This would decrease the environmental impact of a natural mink fur production by about one third (CE Delft 2013, pp. 37-38, Figures 11 and 12). As a result, we obtain that mink coat still have 1.14 to 2.66 higher negative environmental impact, when a 2-fold lifespan difference is considered and all available assumptions in favor of animal fur are made. Any comments are needless.

– *CE Delft also claims that the longevity of real fur coats may be off-set by the environmental costs of cold storage during the off-season. They suggest that 30 years of seasonal cold storage would have more impact on climate change, for example, than the entire process of raising the mink, processing the pelts and producing the coat! (Figure 7, p. 34.) The energy costs of fur storage as estimated by CE Delft, however, are considerably higher than figures collected from real fur storage facilities. More to the point, most fur coats are simply not kept in special cold-storage vaults, especially now that many homes are air-conditioned through the summer months. Furthermore, off-season storage of furs has always been less common in Europe than in North America, and is almost non-existent in Russia and the booming new markets of Asia*

Answer: As was many times mentioned earlier, the cold storage of animal fur products was an additional option and was not considered in the basal scenario of mink coat life cycle assessment. Figures 3 and 4 in CE Delft 2013 (pp. 28-29) are obtained without cold storage ("excl. maintenance"). Therefore, the above-mentioned 6-14-fold difference between mink and faux fur was calculated without the consideration of cold storage at all. If the cold storage would be included in the basic CE Delft calculation, the difference would be even higher (see CE Delft 2013, p. 32, Figure 5).

– *More fundamentally: we could question CE Delft's core contention that real and fake fur coats can be compared at all. The fact that people are prepared to pay considerably more money for real fur coats than for fakes would seem to confirm that they have different qualities and "value".*

Answer: Some people could also pay a considerable price for "conflict diamonds", elephant ivory or illegal drugs, but this fact does not neither mean that these products have high value for society nor that they are environmentally-friendly. CE Delft studies investigated the environmental impact of mink vs faux fur, so the essence of TruthAboutFur complaint is groundless.

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