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Grüttner, Henrik; Dall, Ole; Thomsen, Henning; Wenzel, Henrik

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Society environmental economic benefits of swan-labelled workwear service

Henrik Grüttner[1], Henrik Wenzel[1] Ole L. Dall[1], Henning Thomsen[2],

[1] University of Southern Denmark, Odense

[2] Rambøll Management, Århus

* hegru@kbm.sdu.dk

Abstract: This paper presents an environmental and socio-economic comparison of textile supply of workwear with and without the Nordic Swan labelling scheme. The study is part of a project for development of a methodology for the environmental and socio-economic comparison for product groups. The study was funded and published by the Danish Environmental Protection Agency 2009-2011. The assessment illustrates the problems to find reliable documentation for the environmental performance of eco-labelled versus conventional products. The assessment mainly focuses on the use-phase since this has been proven to be the most important part of the lifecycle. For the use-phase a significant difference in environmental performance can be demonstrated between the European average figures and the figures for the Danish company providing the eco-labelled service. By application of the developed methodology this difference is transferred into economic impacts demonstrating a substantial saving for the society when purchasing the eco-labelled service.

1 Introduction

Eco-labelling is generally claimed to a sign to the consumer of environmentally optimized products or services, but this is rarely documented due to the lack of comparative studies analysing the environmental performance of a eco-labelled product against a reference group. The reference group cover products or services that either do not comply with the eco-labelling criteria or where the supplier have not found sufficient reasons in the market to take the burden of proof and the costs related to the labelling. Hence there might be significant variations in environmental performance within the reference group – and in fact also within the group of eco-labelled products or services.

An example of a study covering both eco-labelled services and not-eco-labelled services was conducted by The European Textile Services Associations in 2007 (named ‘the ETSA survey’ below). This study provides average data for a number of resources consumed for providing workwear textile service [1]. The Danish company supplying the eco-labelled service has provided the equivalent data set for the eco-labelled laundries for the present study. This gives an opportunity to compare the eco-labelled plants with a representative reference group for Europe. The two sets of data is the core input to the assessment below.

The Nordic eco-labelling organisations performs similar surveys for the different products or services covered by their scheme but unfortunately these results are only presented as relative figures in order to assure confidentiality for the data-suppliers and hence cannot be used for real assessments of environmental benefits of eco-labelled products [2].

For both public and private companies it is relevant to consider socio-economic costs related to the environmental performance of the products or services in their procurement activities. A recent Danish study compares the socio-economic environmental burden of functionally equivalent product pairs: a product (or service) complying with eco-labelling criteria towards a conventional product (or service) within the same product/service group [3]. The comparison comprises product pairs within the categories of TV-sets, washing machines, workwear supplied as textile services, bookshelves and copy paper. The study included development of a methodology for the environmental and socio-economic comparison as well as the application of the methodology on the selected product groups. The study was funded and published by the Danish Environmental Protection Agency 2009-2011.

In this assessment the supply of the workwear service required a special methodology due to the fact that the functional unit assessed in this case was defined as a function and included several elements. This paper presents the detailed methodology and results for the assessment of the workwear case in the above mentioned Danish study.

1.1 The objectives of the study

The overall aim of this study was to contribute to the development of a methodology for an assessment of the environmental benefits and economic value of buying a green product or service instead of a conventional one and to perform such an assessment on selected products/service groups.

Specifically the objective for the present study is to perform the actual analysis and assessment of environmental benefits and socio-economic costs related to environment of eco-labelled workwear service versus the conventional service.

2 Methodology

The assessment involved in several steps:

- Definition of the functional unit to be assessed
- Assessment of available data versus data-needs
- Calculation of resource consumptions
- Estimation of emissions using the EcoInvent database
- Estimation of economic impacts

2.1 Defining the functional unit for the study

The functional unit chosen for this assessment is to provide one worker with workwear for one year.

The corresponding consumptions of textile items and washes are shown in table 1. The numbers are based on information gathered from Berendsen Textile Service in 2002 [4].

Table 1: Typical consumption of articles and number of laundering operations to provide one worker with workwear for one year. NB: The table covers two different options – see text below table.

Material:	P/C	P/C	Cotton	Cotton	Cotton
Items:	Trousers	Jacket	Trousers	Jacket	T-shirts
Quality (g/m^2)	245	245	300	300	180
Weight per article (g)	560	580	650	680	120
Number of launderings per year	37	24	37	24	111
Lifetime (number of launderings)	27	36	23	30	25
Consumption per year	1.37	0.67	1.61	0.80	4.44
Total volume for laundering (kg)	20.72	13.92	24.05	16.32	13.32

The functional unit will comprise laundering services for either trouser and jacket in Polyester/Cotton (P/C) or 100% Cotton plus the T-shirts. The weight of the purchased textiles hence is around 1.2 kg for the polyester cotton option and around 1.6 kg for the cotton option. With the P/C-option the total weight washed is 48 kg and with the 100% Cotton option the total is 54 kg. For the following calculations 50 kg washing per functional unit is used.

2.2 Assessment of data-needs versus available data

Ideally the assessment was meant to cover the entire supply in a lifecycle perspective:

1. Production of the clothes – typically in China or another Fareast country
2. Transport to Europe / Denmark
3. Pre-wash and adjustment of the clothes for the actual user
4. Transport to the client
5. Use of the clothes by the user at the client facility
6. Collection of the dirty textiles – simultaneous with distribution of clean clothes (together called ‘distribution’)
7. Wash, drying and packaging in the industrial laundry – including use and discharge of detergents
8. Point 4 to 7 is then repeated a number of time dependent on the lifetime of the individual pieces of clothes.
9. Discarding of the worn-out clothes either for incineration or cutting up for wipers

The Swan-labelling of textile service includes criteria for the production of the clothes, distribution to/from the clients and the laundering activities – including a number of requirements for the detergents used [5].

With regards to the textiles it is required in the present version of the criteria that a certain share of the textiles are labelled with either the Swan-label, the EU-flower label or are certified according to Eco-Tex 100.

It is expected that these certifications will mean that the production of the textiles used in the Swan-labelled laundries has less environmental impact than conventionally produced textiles. Unfortunately documentation of impact of the different certifications seems not to exist.
Further it was not possible to get information of the actual share of the textiles meeting the different certifications in the Swan-labelled laundries.
Hence quantifying the environmental benefits related to the purchase of certified textiles had to be left out. In the overall perspective the impact of selecting the eco-labelled textiles is expected to have a limited importance.

With respect to the laundering activities the Swan-label has a number of requirements regarding the consumption of resources and requirements regarding the environmental impacts of the detergents used. The requirements regarding the resource consumption is dealt with below. With respect to the environmental impacts of the detergents again, unfortunately, there is a lack of information since a survey of the typical composition of the detergents used in the conventional laundries does not exist, and these elements are not covered by the ETSA survey [1].

Regarding the distribution the Swan-label give points for the use of trucks meeting the Euronorm IV or V, as well as the use of Swan-labelled fuel, but again there is a lack of data both for the Swan-labelled laundries and the reference group.

2.3 Resulting scope for the assessment

As a consequence to the above described evaluation of the data needs versus the available data it must be concluded that it is only feasible to perform the assessment related to the use of electricity, heat, detergents and water during the use-phase of the textiles. According to the very comprehensive study performed by Søes Hansen and Krarup Holst (2002) [4] – and other studies – this seems to be the most important part of the lifecycle.

3 Results

3.1 Resource consumptions

Table 2 list the available data regarding resource consumption for the two groups of industrial laundries. Such data is typically reported per kg washed textile in the textile service business.

Table 2: Resource consumptions for dedicated workwear laundries.

	Units	ETSA survey for workwear 2007	BTS Swan-labelled workwear laundries 2007	Difference
Water	l/kg	17	15	12%
Electricity	kWh/kg	0.43	0.3	30%
Oil/gas for heating	kWh/kg	1.8	1.37	24%
Sum: Heating and electricity[1]	kWh/kg	2.88	2.12	26%
Fuel for distribution	kWh/kg	1.02	0.475	53%
Detergents	g/kg	38	28	26%
Number of data sets		37	5	

[1] See text for explanation.

In should be noted that the sample of laundries included in the ETSA survey [1] typically represent all the dedicated laundries within the different European textile service groups participating in the survey and in that way is expected to represent the variations across Europe pretty well.

Further it should be noted that the sample of BTS Swan labelled laundries is included in the ETSA survey.

Comparison with the Swan labelling criteria
The Swan labelling criteria for resource consumption operates with a maximum of either 17 or 20 l water per kg and either 2.7 or 3.15 for the sum on heating and electricity, with electricity being converted into primary energy using a factor of 2.5. The lover values represent 'lightly soiled workwear' while the higher values represent 'heavily soiled workwear'.
These criteria are in fact – more or less – met by both the European average and the Eco-labelled laundries, but here it has to be noticed that the criteria operates with giving points for the size of the 'distance' to the absolute maximum and a certain number of points has to be obtained to get the licence. This is why the practical performance of the eco-labelled laundries shows better performance than required by the criteria.

Energy for distribution
In the following calculations the energy for distribution is assumed equal and hence in not included. The reason for that is the fact that it cannot be clearly documented that the lower consumption found in the eco-labelled laundries is due to a better driving efficiency. Hence the explanation might as well be the shorter distances for the distribution.

Applying those data on the defined functional units – table 1 – gives the results found in table 3 by simple multiplication.

The slightly strange notation for oil and gas represent the fact that it is assumed that 50% of the laundries included in the ETSA survey use light fuel oil while the eco-labelled laundries all use natural gas. This distinction is important for the economic assessment feasible – see below.

Table 3: Resource consumptions for the functional unit – providing one worker with workwear clothing for one year.

	Units	ETSA survey for workwear 2007	BTS Swan-labelled workwear laundries 2007	Difference
Water	l	850	750	100
Electricity	kWh	22	15	7
Light fuel oil	kWh	45	0	45
Natural gas	kWh	45	69	- 24
Fuel for distribution	kWh	51	24	27
Detergents	kg	1.9	1.4	0.5

3.2 Environmental impacts

In order to estimate the environmental impacts of the identified resource consumptions has been transferred into a selection of impact categories by application of data from the EcoInvent database [6].

Detergents
For the detergents the same 'default-list' of detergent products has been applied for all the laundries based on information supplied by Berendsen Textil Service and the Safety Data Sheets for the relevant products. Hence the impacts of the eco-labelling on the selection of the product and the optimisation of products done by the detergent supplier are not considered.

According to the Danish Eco-labelling Organisation meeting the requirement for the detergents is typically one of the most demanding areas for the applicants, but it has not been feasible to quantify the improvements achieved and again including these effects had to be given up.

Wastewater
The assessment includes impacts of the detergents and the soiling in the wastewater system. The energy consumption for degradation of the detergents has been calculated using an estimated value of 2.0 kg COD per kg active substance (totally 3.1 kg for the reference group and 2.3 for the eco-labelled laundries) and the 1.0 kg COD from the soiling for the entire functional unit. Further an estimated average of 0.8 kWh per kg COD has been applied.

In total
The calculated totals are listed in table 4 for the selected impact categories.

Table 4: Total estimated energy related impact potentials for the supply of workwear for one worker for one year from the average European laundries and the Swan-labelled laundries.

Impact category	Units	ETSA survey for workwear 2007	BTS Swan-labelled workwear laundries 2007	Difference
NMVOC	kg	0.018	0.010	0.007
Carbon dioxide, fossil	kg	37.4	25.0	12.4
Sulphur dioxide	kg	0.062	0.033	0.028
Nitrogen oxides	kg	0.036	0.021	0.015
Particulates, <2.5 um	kg	0.0053	0.0034	0.0018
Mercury	g	0.00101	0.00063	0.00038

Basically the differences in impact potential showed in table 4 represents the differences in energy consumptions in the two systems.

3.3 Socio-economic impacts

With the methodology developed in the above mentioned project [3], it is feasible to determine the economic benefit of the conventional versus the environmentally optimised solution.

Table 5: Total economic costs related to environment and net benefit for the environmentally optimised solution calculated in DKK for the functional unit – providing a worker with workwear for one year.

	Conventional supply Average		Eco-labelled Average		Difference	
Impact	Society	Private	Society	Private	Society	Private
Electricity	9.60	31.20	6.60	21.30	3.00	9.94
Gas oil	17.80	57.60	-	-	17.80	57.55
Natural gas	12.20	37.20	18.80	57,00	-6.50	-19.83
Detergent	68.50	68.40	50.40	50.40	18.00	18.02
Water	39.90	39.90	35.20	35.20	4.70	4.69
Carbon dioxide, fossil	5.10	-	3.40	-	1.70	-
Sulphur dioxide	5.30	-	2.80	-	2.50	-
Nitrogen oxides	2.00	-	1.20	-	0.80	-
Particulates, <2.5 um	0.50	-	0.35	-	0.15	-
NMVOC	0.05	-	0.03	-	0.02	-
Mercury	0.07	-	0.04	-	0.02	-
Use phase totally	161.00	234.00	119.00	164.00	42.00	70.40

As illustrated in table 5 the economic consequences can be expressed either as directly private economy – the direct costs of the resources etc. – or as the society costs of delivering the resources etc. and dealing with the impacts of the emissions. It may be noted that the societal costs related to the impacts are relatively small compared with the costs of the resources.

For the energy sources the private economy is higher due to the different duties and taxes, for the water and detergents it is the same costs and for the emissions the burden lays solely on the society costs.

Measured both on the society and private economy the selection of the eco-labelled product gives a reduced cost. Part of these savings on the other hand goes to maintaining the eco-labelling system – both for the company having the licence and for the society.

4 Discussion

This study clearly illustrates the troubles to find reliable data regarding the impacts of the eco-labels.

Part of this problem relates to the lack of relevant studies and part relates to the lack of openness regarding the findings of the surveys conducted by the eco-labelling organisations. Naturally the confidentiality of information from data-providers has to be respected, but with a proper design the surveys might be designed for a providing data for studies like the one presented above – or perhaps including these elements. Anyhow the eco-labelling organisations are strongly encouraged to seek to find ways to document more openly their findings.

5 Conclusions

Despite the above discussed troubles to get reliable data for impacts of the eco-labels the study clearly document a significant environmental and economic effect of the eco-labelled workwear during the use-phase of the textiles.

6 References

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