Costs and Benefits of Green Public Procurement in Europe

Service contract number: DG ENV.G.2/SER/2006/0097r

- Final Report -

Part 1: Comparison of the Life Cycle Costs of Green and Non Green Products

Part 2: Additional Costs for Individual Purchasing Authorities of Buying Green Products (Administrative and Product Costs)

Part 3: The Potential of GPP for the Spreading of New/Recently Developed Environmental Technologies – Case Studies

Freiburg, 26 July 2007

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Overview

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2. Part 2: Additional Costs for Individual Purchasing Authorities of Buying Green Products (Administrative and Product Costs)

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Contents

Abbreviations

ADAC	Allgemeiner Deutscher Automobil-Club
CC	Cylinder Capacity
CHP	Combined Heat and Power generation or the electricity produced with this technology, respectively
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
DTPA	Diethylene Triamine Pentaacetic Acid
ECF	Elemental Chloride Free
EDTA	Ethylene Diamine Tetraacetic Acid
EEV	Enhanced Environmentally-friendly Vehicle
EMS	Environmental Management System
EP	Electro Photography
FSC	Forest Stewardship Council
GO	Guarantee of Origin (either for RES-E or CHP)
GPP	Green Public Procurement
GPU	Graphics Processing Unit
GV	Green Version
HE-CHP	High-Efficient Combined Heat and Power generation, or the electricity produced with this technology, respectively
IJ	Ink Jet
ipm	images per minute
IT	Information Technology
LCC	Life Cycle Costs / Life Cycle Costing
LCCA	Life Cycle Cost Analysis
LCD	Liquid Crystal Display
LDV	Light-Duty Vehicles
LPG	Liquefied Petroleum Gas
MFD	Multifunctional Device
n.a.	not applicable
NO_X	Nitrogen Oxides
NPV	Net Present Value
OM	Operational Mode Approach
PEFC	Pan European Forest Council

PVC	Polyvinyl Chloride
RES-E	Electricity being produced out of Renewable Energy Sources
SCR	Selective Catalytic Reduction
SFD	Single Function Device
TCF	Totally Chloride Free
TCO	Swedish Confederation for Professional Employees
TEC	Typical Electricity Consumption
TED	Tenders Electronic Daily
UDC	Upgradeable Digital Copier
WEEE	Waste Electrical and Electronic Equipment

Notation of numbers

The numbers in this study are written according to DIN 1333 (‘Zahlenangaben’) and DIN 5008 (‘Schreib- und Gestaltregeln für Textverarbeitung’). This means that the comma ‘,’ is the separator between the integer and the decimal part of a number. Numbers with more than three digits are divided by a blank in groups of three digits (in case of monetary values the numbers are divided by a dot in groups of three digits).

Examples:

- The price of electricity is 0,18 € per kWh
- Germany has 82 000 000 inhabitants
- The price of a television set is 1.499 €

Due to calculational reasons, the numbers of some data in this study suggest a higher precision than there is in reality. Please note that in general only two counting digits can be assumed as level of precision.

1 Introduction

Due to the market power of the purchasing activities of public authorities, green public procurement can make an important contribution to reducing environmental impacts and to changing unsustainable production and consumption patterns. Beside the direct positive effects on the environmental impacts, GPP can also stimulate innovation of environmental technologies (demand-pull effect) and serve as an example for private procurement.

However, according to the findings of a previous study which mapped the status of GPP in the (then) 25 Member States, there is still a lot of space for improvement regarding GPP in all Member States (Bouwer et al. 2005 and 2006). Amongst others, the main barrier for GPP is the 'perception that environmentally friendlier products would be more expensive' (Bouwer et al. 2005: 27), which has been the result of earlier studies also (see e.g. Günther 2003).

In order to gain more insight into the real situation regarding the costs and benefits of GPP, the study at hand had been put out by the Commission to Öko-Institut e.V. and ICLEI – Local Governments for Sustainability. The entire study comprises 3 tasks:

Task 1: Comparison of costs / market research: collection of information on the costs of green public purchasing as compared to non green purchasing

Task 2: (Additional) costs for individual purchasing authorities of buying 'green' products (administrative and product costs)

Task 3: Potential of GPP for the spreading of new/recently developed environmental technologies

The report at hand (Part 1) covers Task 1.

2 Goal and scope of the study

The goal of task 1, the study on 'Costs and benefits of Green Public Procurement in Europe', is to compare the economic costs and benefits of GPP versus standard purchasing for national governments and individual purchasing authorities.

In order to achieve this goal, the life cycle costs of green product versions were compared to those of non green product versions for 2 product types in the following 11 product groups:[1]

[1] These 11 product groups were selected for this analysis by the Commission, based on the findings of the study of Bouwer et al. 2006, which identified them as being suitable for *immediate* greening.

1. Construction work
2. Transport: buses and bus services
3. Transport: passenger cars
4. Cleaning products and services
5. Clothing
6. Electricity
7. IT devices: computers and monitors
8. IT devices: printers and copiers
9. Food
10. Paper
11. Furniture

The following figure clarifies the terms ‘product group’, ‘product type’ and ‘versions’.

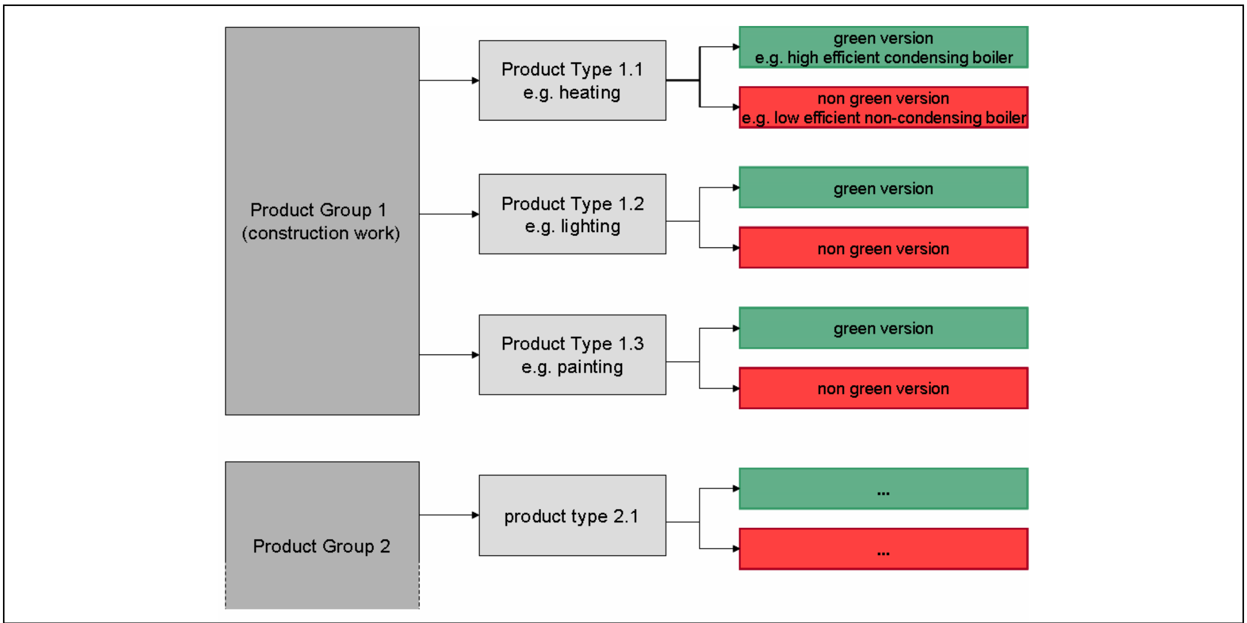

Figure 1 Differentiation between the terms ‘product group’, ‘product type’ and ‘versions’

As differences in costs between the Member States can be expected, a representative sample of Member States was selected, for which the analysis was carried out (see section 4).

The results of this study shall feed into the Impact Assessment, setting out the social, economic and environmental impacts of policy options proposed in a Commission Communication. The main objective of this Communication will be to foster the implementation of national strategies for GPP based on EU-wide target setting and regular monitoring and benchmarking.

Next to actual results of the LCCA for green versus non green product versions in the considered product groups, the applied LCC-methodology is also seen as an important means to foster the implementation of GPP. Therefore, the study at hand also gives a detailed description of the LCC methodology and a short guidance on how to use and transfer the results (to other products or Member States).

After the detailed description of the LCC methodology (see section 3), section 4 elaborates on the selection of the four Member States. The section on the LCCA of the 11 product groups (section 5) is structured consistently. However, due to the differences of the products analysed, it was not possible to give all product groups an identical structure.

The following paragraphs shortly describe the single work steps conducted for the LCCA in each of the 11 product groups, which also give the thread through the sections on each product group.

(1) Selection of three typical product types within each product group, specification of green versus non green version

Most of the 11 product groups cover a broad range of product types with different benefits as well as different environmental performances and costs. Therefore, a representative selection of three product types was made within each product group[2]. The selection focuses on high priority products or services, taking into account environmental impacts, the relevancy for procurement, as well as products being representative for their product category or the analysed country.

For each product type, a green and a non green version was compared. Bouwer et al. (2005) recommend in their conclusions that purchasers in Member States should be stimulated to use the criteria of eco-labels, even if they are not European labels or not from their own country. Also, the European Commission (2004b) states that “contracting entities that wish to define environmental requirements for the technical specifications of a given contract … may use, but are not obliged to use appropriate specifications that are defined in eco-labels, such as the European Eco-label, (multi-)national eco-labels or any other eco-label provided that

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2 An exception is product group 6 (‘Electricity’), where it is not possible to define three different product types. Instead, in this product group three different green versions are compared to one non green version. Additionally, in some product groups it has not been possible to gain prices and costs for three product types. To somehow compensate for that in product group 9 (‘Food’) four product types have been analysed.

the requirements for the label are drawn up and adopted on the basis of scientific information using a procedure in which stakeholders […] can participate, and provided that the label is accessible and available to all interested parties." Criteria to select green versions were therefore mainly derived from existing European or national product labels, but also publicly available from green procurement guidelines or comparative product assessments. An important aspect was to select product versions which are directly comparable regarding the function they provide and the quality of this function (see also section 3.3.2).

The selection of the product types is described in the respective sections on the product groups.

(2) Definition of cost elements and additional parameters for each product group

The nature of life cycle costs depends on the specific product group. Depending on the product group and type, different cost elements were taken into account. As outlined in section 3.3.1, relevant cost elements can be grouped into three main categories: purchase and installation, costs during use phase and costs for disposal.

To calculate the life cycle costs, next to the cost elements additional parameters regarding use patterns or the overall life time of the products had to be defined. Examples are the mileage per year for buses and bus services or passenger cars, time in on-/stand-by-/off-mode and prints per year for IT devices, overall electricity demand, and so on.

The relevant cost elements and additional parameters for each product group and type are described in the respective sections on the product groups.

(3) Market research, calculation and comparison of life cycle costs

For each product type, including green and non green version, data on product specific cost elements and additional parameters was collected in/for each selected Member State. Various data sources were used for the market research, like European or national statistics, European or national industry associations (e.g. for market data, data on use patterns or contacts to manufacturers), individual manufacturers, national procuring authorities or internet research.

With this data the LCC of the three product types in each of the 11 product groups were calculated, comparing the green and non green version for each product type.

3 LCC methodology

3.1 Introduction to LCC

The core methodology that will be applied to calculate the costs and benefits of GPP versus standard purchasing for national governments and individual purchasing authorities is the methodology of life cycle costing (LCC). LCC is generally defined as assessment of all costs which are connected with a certain product, directly covered by one or several actors in the life cycle of this product (Hunkeler et al. 2007). In the study at hand the costs for the procuring authority are assessed. Life cycle costing (in contrast to only focusing on the purchase price) is especially useful if a relevant share of costs incurs during the use or end-of-life phase of the analysed products or services.

Life cycle costing has already been applied in the beginning of the early 20th century for purchasing decisions in the US. Traditionally, LCC is mainly used for larger investment goods or products with a long life span and high initial costs (e.g. public buildings, power plants, military equipment). In recent years, the LCC concept also gained more attention in the discussion on life cycle assessment (LCA) and sustainability management[3] and also in the context of GPP. LCC is seen as one important means to foster GPP, as it is assumed that more environmental friendly products might have a higher purchase price on the one hand, but on the other hand presumably have lower follow-up costs due to lower costs for maintenance, energy and/or water consumption and/or disposal.[4]

Regarding the conduction of a life cycle cost analysis (LCCA) there are several international and national standards and guidelines for special applications (e.g. ISO 15663-2:2001, DIN EN 60300-3-3, DSR 2005). Some aspects are also covered by conventional investment cost calculation methods, which can and should be considered in a LCCA, e.g. regarding dynamic aspects of the LCC. (Walz/Gramlich 2004)

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[3] For example in 2002 a SETAC (Society of Environmental Toxicology and Chemistry) working group on LCC was established (de Haes et al. 2002; Hunkeler and Rebitzer 2003) with the goal of harmonising various LCC approaches and developing a guiding document for LCC. The book is planned to be published within 2007 (Hunkeler et al. 2007).

[4] See for example the respective section on the EU GPP website (http://ec.europa.eu/environment/gpp/gpp_and_life_costing_en.htm)

3.2 Integration of LCC in public procurement

Life cycle costs can play a role in two different stages of the procurement process: (1) when drawing up the technical specifications of the call for tender, and (2) when awarding the contract according to criteria that have been included in the call. In addition, life cycle costs can be included in variants.

Technical specifications describe the subject matter of the contract in a way every bidder can understand the same, so that the procurement officer receives bids which he can compare. Technical specifications define the criteria that every bid has to fulfil. According to art. 23 of the relevant Procurement Directive 2004/18/EC, technical specifications can also contain environmental criteria. It is allowed to include life cycle costing aspects into the specification. The procurement units can e.g. demand that the product has a specific minimum life span, or that the material can be recycled after use.

If the procurement officer is not certain that there are products on the market that meet the requirements in regard to life cycle costs, he or she can also ask bidders to submit ‘green’ variants. All offers then have to fulfil the same basic set of requirements. In addition, the call for tender can ask for green variants that especially take life cycle costs into account.

Life cycle costs are especially interesting when drawing up the award criteria. Under European procurement law it is possible to award the contract either based on the lowest price, or on the tender that is economically most advantageous (art. 53 of the Directive 2004/18/EC). To decide whether a tender is economically advantageous, different criteria (award criteria) can be taken into account. These also include environmental criteria. Generally all criteria

- have to be linked to the subject matter of the contract;
- shall not confer an unrestricted freedom of choice of the contracting authority;
- shall be expressly mentioned in the tender documents; and
- shall not infringe on EU law.

These requirements reflect established case law of the European Court of Justice (ECJ). The first condition is always met in the case of award criteria that relate to life cycle costs: Life cycle costs are defined as the sum of all costs, which are connected with a certain product or service, covered by the procuring authority in the entire life cycle of this product. As such, they have a direct link to the contract to be awarded and will generally not infringe on the basic principles of EC law such as non-discrimination and transparency. The fact that the life cycle costs of the product or service are used as one of the criteria to award the contract has to be mentioned in the tender documents. In addition, the relative weighting that is given to each of the criteria has to be specified in the tender documents according to art. 53 of the Directive 2004/18/EC.

3.3 Guiding principles and general aspects

LCC will be conducted with respect to several guiding principles and general methodological aspects, which are described in the following paragraphs.

3.3.1 Life cycle perspective

LCC considers the entire (physical) life cycle of a product, from production to disposal. Depending on the perspective taken in an LCCA, the costs of the different stages can be calculated more or less detailed. For example, in the study at hand the production costs of the products to be purchased are not calculated in detail, as the relevant cost element for the purchasing authority is the price for the final product. However, the purchasing price (usually) comprises all costs for producing the respective product plus a certain profit margin.

The LCC analysis will be conducted under the perspective of an individual purchasing authority. This means that all costs which are connected to the defined product types and versions, and which have to be borne by the purchasing authority are included in the LCC. In general the following cost elements are included:

- **Purchase and installation:** The cost of purchase is relevant in most cases, except if a leasing system is chosen instead of acquiring property of the product. Additional installation costs might incur in some cases, e.g. in case of heating devices.
- **Costs during the use phase of the products:** In many cases the costs during the use phase are at least as important as the purchase or installation costs. Costs which are relevant during the use phase are for example costs for
  - electricity: e.g. for lighting, heating, IT devices;
  - fuel, gas, etc.: e.g. for buses, passenger cars, heating;
  - consumables: e.g. for printers and copiers (toner or ink, paper…);
  - training: e.g. for bus and car drivers, if relevant;
  - service and maintenance, e.g. possibly applicable to large multifunctional imaging equipment; or
  - other: e.g. taxes, insurance costs, government aid, etc.
- **Disposal costs:** For some of the product groups the costs (or fees) for the disposal of waste from public authorities strongly depend on current regulations. For example, waste electrical and electronic equipment (WEEE) from public authorities can be

disposed free of charge in the EU if this waste is similar in nature and quantity to that of private households[5].

For each product the *relevant* cost elements are considered. 'Relevant' means that the costs for this element either are different for the green and the non green version, or that the costs account for a substantial part of the overall costs connected to the product or service. Taking costs into account, even if there are no differences between the green and non green version, is important for evaluating the relevance of the differences in costs between the two versions: if a substantial part of the costs is excluded from the cost assessment, the differences between the green and non green version seem more relevant than if all costs are included. However, a reasonable choice has to be made when defining the 'relevant' costs, as in some cases it will not be possible (and will not make sense) to include all possible costs.

The decision, which cost elements are considered in the LCCA, is described more detailed in the sections on the regarded product groups and types.

3.3.2 Function based approach and functional unit

An LCCA is always conducted for a certain function which has to be fulfilled by the analysed system. This function is quantified by the functional unit, which provides a reference to which all costs are related. The functional unit has to be equivalent for both versions (green and non green) of the analysed product or service types.

This principle is most important, as otherwise products or services would be compared, which actually are not comparable. For example, it does not make sense to compare a subcompact passenger car, mostly used to transport one person with little equipment over short distances, with a light-duty vehicle of up to 2.8 tonnes (permissible maximum weight) to transport certain goods. Similarly, this approach ensures that not only certain products are compared, but all processes which are necessary to deliver a certain function. For instance, it does not make sense to compare only the prices of two different detergents, but one has to consider all elements necessary to fulfil the function of cleaning a certain item or surface, such as direct labour costs, administrative costs, etc.

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5 Article 3 (k) WEEE Directive defines 'WEEE from private households' as 'WEEE which comes from private households and from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households'.

3.3.3 Iterative approach

Sometimes it is necessary to change decisions or assumptions (regarding system boundaries, included cost elements, etc.) made at first hand with regard to information gained in a later stage of the LCCA. This has been done as far as possible in this LCC-study, however, financial and time restrictions were limiting factors.

3.3.4 Actor specific calculation

LCC have to be calculated on an actor specific basis. To calculate the 'total costs' that incur during a certain product life cycle does not make sense, as, for example, the costs of one actor (e.g. the investment costs for a purchaser) are revenues for another actor (e.g. the supplier or manufacturer of the product). In order to gain relevant information for decision makers, it therefore makes more sense to calculate the LCC from a certain actor's perspective. For each actor, different cost elements are relevant in detail.

As outlined above (section 3.1) the LCCA will be conducted under the perspective of an individual purchasing authority, i.e., all relevant costs which have to be borne by the purchasing authority, are considered.

3.3.5 System boundaries

The system boundaries define for which geographic region the LCCA is conducted or which cost elements[6] are included in the LCC. Similar to the functional unit, the system boundaries also have to be identical for both analysed versions of the regarded product or service types.

Possible cost elements are described in detail in section 3.3.1 on the life cycle perspective. The system boundaries will be defined for each product group or product type in the respective sections.

3.3.6 Transparency and confidentiality

Due to the complexity of life cycle cost calculations and the potential uncertainty of certain cost elements, transparency is essential for the credibility and a proper interpretation of the results. Such transparency also ensures the possibility to transfer the results to other product groups and types or other Member States than those chosen in this study. However, especially regarding costs, confidentiality issues often make it impossible to publish all data in detail, as manufacturers or service providers are often very reluctant to give any concrete figures to the public.

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6 E.g. costs for purchase, installation, transport or disposal; operating costs as for energy, water or consumables, etc.

The present study aims to balance both aspects – on the one hand, to give the most possible transparency regarding calculation methods, and also data used; on the other hand, to consider confidentiality issues important for manufacturers or service providers, by only depicting averaged costs which cannot be traced back to single manufacturers.

3.3.7 Data availability and uncertainty

Cost data is often confidential, and therefore sometimes difficult to collect. Also, data uncertainty can be quite high, resulting from fluctuations between geographical regions (e.g. variation of water prices within Germany); between purchase prices for products of different brands; or from temporal developments (e.g. time-related development of electricity or water costs). It is most important to make those uncertainties clearly transparent and to analyse their relevance with regard to the result of the LCC (e.g. through sensitivity analyses).

3.4 Modelling aspects

3.4.1 External costs

Externalities can be defined as value changes caused by a business transaction, though not included in its price, or as side effects of economic activity (Galtung 1996). When these value changes are expressed in monetary terms, one speaks about external costs. By definition, these costs are no real cash flows for the directly involved actors and are usually borne by society in general (i.e. governments, state, municipality, and so on). For the following reasons, external costs will not be considered in the study study at hand:

- There are a lot of uncertainties regarding the methodologies applied for monetisation.
- The integration of external costs would give quite intransparent results with regard to real cash flows and monetised external effects.
- The environmental impacts of the analysed product groups were already assessed separately in previous studies (e.g. RELIEF or TAKE-5-studies). An integration of external costs would then mean double counting of environmental aspects.

The exclusion of external costs in this study does not mean that it is generally not useful to internalise external costs in the price for products causing social or environmental damage (or added value). In contrary, the internalisation would mean that costs (and benefits) which are currently borne by the society in general have to be borne by the actors who are directly responsible for them.

3.4.2 Currency exchange rates

Cost data of the Member States Sweden, Slovenia and Czech Republic, which are not part of the Eurozone, is presented in Euro, using the following average interbank exchange rates in 2006:[7]

- Sweden (Krona): 1 SEK = 0,10812 EUR
- Slovenia (Tolar): 1 SIT = 0,00418 EUR
- Czech Republik (Koruna): 1 CZK = 0,03532 EUR

3.4.3 Current and future prices for operating media

The current prices and the future development of the prices for operating media, such as electricity, diesel or other fuels, natural gas, ink, etc., are relevant for those products for which these consumables are used during the use phase. In the study at hand this applies to products like heating systems, lighting, passenger cars, buses, printers/copiers and computers. For example, to calculate the costs for electricity that incurs due to the use of a computer during the whole product life, the electricity demand of each period (i.e. 1 year) has to be multiplied with the prices per kWh electricity in each period.

Obviously the estimation of future prices cannot be an accurate forecast, but is an estimation based on past developments and important future influences on price formation. Especially in the energy sector such estimations are connected with a high degree of uncertainty. The following sections describe the current prices and the methodology to estimate the future development for the various operating media.

Starting from a first LCCA based on the described base case assumptions, it is decided whether it makes sense to assume different price developments and to calculate sensitivity analyses with e.g. strongly increasing or strongly decreasing prices for operating media. This decision is mainly based on the share of the operating media at the total LCC, and whether therefore the overall result is sensitive to changes in the underlying assumptions.

[7] See: http://www.oanda.com/convert/fxhistory (last visited 16. April 2007)

3.4.3.1 Electricity

The current electricity prices in the selected member states[8] are as follows:

- Sweden: 0,0707 €/kWh
- Germany: 0,1186 €/kWh
- Spain: 0,0931 €/kWh
- Czech Republic: 0,0882 €/kWh

(Source: Eurostat, industrial customer with 10 GWh/a[9], including all taxes, January 2006)

Concerning the future price development, a conservative approach was adopted, which means that in the base case calculations constant prices were assumed, only corrected by inflation, with the future inflation rate equivalent to the average inflation rate of the past.[10] An analysis of the electricity prices (source: Eurostat) of the selected Member States between 1996 and 2007 (longest available period) resulted in the average annual inflation rates of the electricity prices as outlined in the following table (*base case assumption*).

In order to provide appropriate data for sensitivity calculations, a statistical analysis of the annual inflation rates of the selected MS was carried out for the period between 1996 and 2007 (see annex). This analysis came to the conclusion that the sensitivity calculations should not be based on extremely high/low figures, as they would over-estimate the development. Hence, for the scenario 'strongly increasing prices' the corresponding figures of the upper quartile (75% quartile) were selected, whereas the scenario 'strongly decreasing prices' is referred to the corresponding figures of the lower quartile (25% quartile). The figures gained for the selected MS are shown in the following table as well.

[8] These selected Member States comprise the Czech Republic, Germany, Spain and Sweden. Regarding Finland, information on electricity prices is not indicated, as this Member State is only relevant for the product group 'Food' and 'Textiles', in which no electricity is needed. Furthermore, no data is given here for Slovenia due to the fact that this Member State is only considered within the product group 'Electricity' itself.

[9] This figure is in the order of magnitude of the electricity procurement of the defined reference city.

[10] Obviously also the assumption of future inflation rates bears some degree of uncertainty, as the inflation cannot be accurately predicted either.

Table 1 Future development of electricity prices

	Base case assumption	Strongly increasing prices	Strongly decreasing prices
Sweden	3,9%	7,2%	-11,2%
Germany	0,4%	5,8%	-3,2%
Spain	0,6%	3,5%	-6,2%
Czech Republic[11]	7,7%	15,6%	-0,1%

3.4.3.2 Fuel and natural gas

In the following table the prices for fuel and natural gas for the selected Member States are summarised (including VAT and fuel taxes, Oil Bulletin 2007 and eurostat 2006):[12]

Table 2 Fuel costs for calculations

	Super [€/l]	Diesel [€/l]	Bio-ethanol [€/l]	CNG [€/kg]	Natural Gas [€/kWh]
Sweden	1,30	1,09	0,54	-	0,046
Germany	-	1,14	-	0,84	0,044
Spain	-	0,95	-	-	0,025
Czech Republic	-	0,99	-	-	0,028

The future development of fuel prices is very difficult to foresee. On one side, there is a strong interlinkeage with the price development of crude oil, and on the other side factors like the liberation of the market play an important role in price formation. In a study that was published at the end of 2006 (EU 2006[13]), scenarios on high oil and gas prices were drawn. Already now the fuel price level has exceeded this price level.

Against this background, a conservative scenario was chosen and the fuel costs were increased with the (current) inflation rates of the selected Member States, which are shown in the following table. For possible sensitivity analyses on the future price development of fuel and gas prices, a higher price development was defined, with an inflation rate which is 20% above the average inflation rate of the Member States. The assumed inflation rates are shown in the following table.

11 Due to data gaps, for the Czech Republic the analysis was only carried out between 2000 and 2007.

12 Source: Gaspreise für private Haushalte und industrielle Verbraucher in der EU zum 1. Juli 2006. Statistik kurz gefasst. UMWELT UND ENERGIE 19/2006. Eurostat 2006

13 European Energy and Transport - Scenarios on high oil and gas prices. European Communities, 2006

Table 3 Inflation rates of the selected Member States (Eurostat 2007) for the base case scenario (left column) and for sensitivity calculations with increasing prices (right column).

	Annual inflation March 2007	Sensitivity analysis increased inflation
Sweden	1,6%	1,92%
Germany	2,0%	2,40%
Spain	2,5%	3,00%
Czech Republic	2,1%	2,52%

3.4.3.3 Other operating media

In some product groups operating media like ink cartridges, costs for maintenance (material and personnel) or similar cost elements are relevant. The current prices for these other elements are described in the respective sections of the report.

These prices were increased with the (current) inflation rates of the selected Member States, which are shown in the following table.

Table 4 Inflation rates of the selected Member States (Eurostat 2007)

	Annual inflation March 2007
Sweden	1,6%
Germany	2,0%
Spain	2,5%
Czech Republic	2,1%

3.4.4 Discounting

Present and future costs have to be evaluated differently, as in general people prefer to buy goods and services rather today than later. For example, 1 Euro today (time point t_0) is worth more than 1 Euro in e.g. five years time (t_5), due to the fact, that money which is not spent today can be invested to yield a certain return in the future. Therefore, to pay a bill of 100 Euros in five years time, less than 100 Euros have to be invested today.

Usually all costs connected to a system under consideration are referenced to the present (t_0), i.e. for all costs, the net present value (NPV) is calculated by using a certain discount rate for future costs. The investment costs do not have to be discounted, as they are spent immediately, i.e. in t_0. Obviously, discounting is only relevant for those product groups, where costs incur during the use phase or for the disposal of the regarded product (e.g. construction work, transport (buses, passenger cars), copiers/printers, computers, etc.).

The net present value of x Euro to be spent in y years is the amount of money that has to be invested today to give x Euro after y years.

To calculate the NPV of a certain alternative, the following steps are carried out:

1. All costs are assigned to the time period, in which they occur. The period could be of various lengths, however, usually and in the study at hand, a period length of 1 year is assumed.
2. All expenses that occur within a regarded period are assumed to occur at the end of this period (end-of-period convention). This means that all running costs of the first year are treated as if they occurred at the end of the first year (in time point t_1).
3. An exception of the end-of-period convention is the costs for the initial investment (acquisition/installation costs). They are not assigned to the end of the first period (t_1), but are regarded to occur in the beginning of the first period (t_0).

Example: The regarded investment good is purchased for a price of 900 Euros. It has a life span of 10 years and needs electricity. Maintenance is conducted every two years. For both, electricity and maintenance costs, an inflation rate of 2% is assumed. For end-of-life disposal after 10 years the procurer has to pay 30 Euro. The following table gives the real costs incurring in the time period t_0 to t_{10}.

Table 5 Real costs of an example investment (rounded figures, in Euro)

Period **Cost element**		**t0**	**t1**	**t2**	**t3**	**t4**	**t5**	**t6**	**t7**	**t8**	**t9**	**t10**
Investment		900										
Electricity demand			50	51	52	53	54	55	56	57	59	60
Maintenance				80		83		87		90		
End-of-life disposal												30

4. The costs of each cost element in each period is discounted to give the NPV of the cost element (i.e. at time point t_0) using the following equation:

   NPV = C x discount factor

   C = costs in period n

   Discount factor = $1 / (1+r)^n$ with r = discount rate and
   n = number of period in which the costs occur.
5. The sum of costs per period of each cost element gives the total NPV of this cost element for the whole life span of the product.

6. The sum of all discounted cost elements are the total discounted life cycle costs of the product.

Example: The following table shows the discount factor (calculated with a discount rate of 4,40%), the discounted costs per cost element and period, and the total NPV per cost element and the total life cycle costs.

Table 6 Discounted costs of an example investment (rounded figures)

Period / Cost element	Total NPV	t0	t1	t2	t3	t4	t5	t6	T7	t8	t9	t10
Discount factor		*1,00*	*0,96*	*0,92*	*0,88*	*0,84*	*0,81*	*0,77*	*0,74*	*0,71*	*0,68*	*0,65*
Investment	900	900										
Electricity demand	432		48	47	46	45	44	42	41	40	40	39
Maintenance	274			73		70		67		64		
End-of-life disposal	20											20
TOTAL LCC	**1.626**											

Selection of the discount rate:

The discount rate is usually defined according to the long-term interest rate, which represents best the costs for equity of public authorities.

The following table shows the long-term interest rates of the selected Member States.

Table 7 Long-term interest rates of the selected Member States

	December 2006[14]	**March 2007**[15]	**12-month expectation**[15]
Sweden	3,65%	3,84%	4,40%
Finland	3,82%	*	*
Germany	3,77%	4,00%	4,30%
Spain	3,82%	*	*
Slovenia	3,90%	*	*
Czech Republic	3,68%	4,04%	4,40%

* not available

[14] Source: European Central Bank, Harmonised long-term interest rates for convergence assessment purposes, percentages per annum; period averages; secondary market yields of government bonds with maturities of close to ten years (http://www.ecb.int/stats/money/long/html/index.en.html, last visited at April 20th, 2007)

[15] Source: DekaBank: Volkswirtschaftliche Prognosen. March 26th, 2007. Individual value for March 2007, and 12-month expectation.

As the variation of the interest rates is smaller between the selected Member States than their variation in time, and also for simplification reasons, it seems reasonable to define one common discount rate for all selected Member States.

To take a conservative approach (i.e. in favour of the non green version, which are assumed to have lower investment but higher running costs), and also as the trend seems to be towards higher discount rates in future, this common discount rate is set to be 4,40% for all selected Member States.

3.4.5 Allocation

Allocation means the assignment of costs which are not directly attributable to certain products. A common example is the allocation of general and administrative costs (overhead costs) to a certain product or service unit. In the proposed study it is intended to allocate the cost as most as possible to the causing product or service.

The allocation procedure depends on the product or service under consideration and is described in the respective sections, if relevant.

3.5 Use and transfer of the results

The life cycle cost analyses shown in this report represent exemplary calculations for four selected Member States and some 30 products relevant for public procurers. Obviously there are various differences between the Member States selected for the LCCA in this report, e.g. regarding prices for the purchased products, user's behaviour or prices for operating media, and subsequently the results differ more or less between the selected Member States. Therefore, the LCC for these products in other than the selected Member States will differ from the results of this report as well. Additionally, only a selection of three product types in 11 product groups could be considered – and most of these products are again a well specified example of a certain product category (e.g.: product type 11.2 are 'Envelopes – DIN long format (110x220 mm), self-adhesive without paper stripe, and with window' – of course there is a variety of other kinds of envelopes used in public authorities). Even though the examples were selected with regard to their importance for public procurement, there are still important products which could not be considered in the study at hand.

If public authorities intend to estimate expected costs (related to the environmental criteria of a tender) from any other country than the Member States, or if other products than those at hand shall be procured, the existing information shall allow an estimation in a lot of cases. This is due to the fact that, using the accordant calculation, very similar results can be expected (e.g. because prices between other and the Member States do not differ significantly, or because the product to be procured is very similar to the one at hand and the absolute or at least the relative costs are quite alike). In other cases, though, it could be reasonable to adjust the present calculation to meet own requirements.

In principle, there are three possibilities to adapt or transfer the results of the study at hand to another Member State or another product to be procured as they are variably complex and elaborate. However, doing investigation on the cost data will be necessary in any case.

The *first possibility* to transfer the results is quite simple. It is applicable in all cases if no other costs than the investment costs, mostly represented by the purchase price, have to be considered, and if the results shall be transferred to another than the selected Member State. In such a case, procurers could investigate the market for the products selected in the study at hand and find out the prices for both the green and the non green version, as defined in this study, for their own country. This is the case e.g. for the products in the product groups 'Electricity', 'Food', 'Paper', or 'Furniture'. The information sources given in the sections on these product groups or in the annex can be helpful to identify possible sources of information in the own country.

For product types where also other cost elements have to be included in the calculations, the transfer is a bit more challenging. In principle there are two further possibilities to transfer the results of this study.

The *second possibility* to transfer the results is applicable the calculations conducted for a product selected in this report shall be transferred to another than the selected Member States.

Starting point is the detailed structure of the life cycle costs of the product or service. Ideally, for each cost element own cost data should be available to adapt the results of each cost element:

- The purchase price or installation cost for a certain product is replaced with the purchase price applicable for the specific authority.
- The costs for each operating media are divided by the specific price assumed in this study (per unit operating media, e.g. 'Euros per kWh electricity', neglecting calculatory elements like future price development or discounting). The resulting value is then multiplied with the specific price applicable for the specific authority.
- The costs for (or revenues of) disposal (or resale) are replaced with the respective costs or revenues relevant for the specific authority.

The advantage of this method is that it can be conducted by procurers without having great experience in cost calculating. The disadvantage, however, is that it is rather an estimation than a proper re-calculation, as especially during the adaptation of the costs for operating media some simplifications are inherently applied. However, in a lot of cases this estimation will be sufficient for the purposes it should serve.

The *third possibility* to transfer the results can be applied in all cases, i.e. both for products selected in the study at hand, and where the calculations shall be conducted for other

Member States, as well as for products not selected in this study. In this case, the calculations described and conducted in this study can be adapted with own data and assumptions. This means the identical calculation procedure is conducted, however, certain assumptions or data are replaced. This adaptation of the calculations conducted in the study at hand is more detailed than the other possibilities to transfer the results, and experience in cost calculation is needed.

The following working steps are to be accomplished. At each step the assumptions and data used in this study should be read and evaluated carefully to investigate, whether they have to be changed or should be adapted.

Step 1: Definition of the function and the functional unit (see also section 3.3.2);

Step 2: Selection of the conventional (non green) and the green version to be compared;

Step 3: Identification of all relevant cost elements and of all further parameters necessary for the calculations; Life cycle perspective (section 3.3.1);

Step 4: Market research on costs and prices and specification of all further parameters;

Step 5: Derivation of inflation rates for the future development of the prices for operating media (see also section 3.4.3);

Step 6: Calculation of the costs per cost element and period (e.g. usually period of one year are distinguished), discounting of the costs per period with a defined discount factor (e.g. calculated with the typical interest rate) to give the Net Present Value and addition of all discounted values (see also section 3.4.4).

4 Selection of a sample of representative Member States

The analysis of the LCC of GPP as compared to non green purchasing shall be conducted for a representative sample of Member States. As it was not possible to do the calculations for all 27 current Member States, it was agreed to conduct the LCCA for four Member States in each product group.

As basis for all product groups the Member States Finland or Sweden[16], Germany, Spain and Czech Republic were selected (the reasons for this selection are given in section 4.1 below). If there were product specific reasons, another selection could have been made in the respective product group. This is true for product group 6 ('Electricity'), where Slovenia was

[16] Finland and Sweden are very similar in terms of the selection criteria applied. Therefore there was no clear preference for one or the other. It was agreed in the project team, that either of these two Member States could have been chosen without giving any further rationale. Incidentally for 10 out of 11 product groups Sweden was chosen.

selected instead of Spain (see explanation below). Table 8 gives an overview of the selected Member State by product group.

Table 8 Selected Member States for the LCC-Analysis of GPP vs. non green purchasing

Product group	Member State 1	Member State 2	Member State 3	Member State 4
1. Construction work	Sweden	Germany	Spain	Czech Republic
2. Transport: buses and bus services	Sweden	Germany	Spain	Czech Republic
3. Transport: passenger cars	Sweden	Germany	Spain	Czech Republic
4. Cleaning products and services	Sweden	Germany	Spain	Czech Republic
5. Clothing	Sweden	Germany	Spain	Czech Republic
6. Electricity	Sweden	Germany	Slovenia[17]	Czech Republic
7. IT devices: computers and monitors	Sweden	Germany	Spain	Czech Republic
8. IT devices: printers and copiers	Sweden	Germany	Spain	Czech Republic
9. Food	Finland[18]	Germany	Spain	Czech Republic
10. Paper	Sweden	Germany	Spain	Czech Republic
11. Furniture	Sweden	Germany	Spain	Czech Republic

The advantage of selecting the same Member States for each or most of the product groups is, that the economic costs and benefits of green public purchasing (compared to non green purchasing) of the regarded product groups and types can be directly compared for each selected Member State. This helps to prioritise procurement activities with regard to least costs or most economic benefit.

4.1 Rationale for the selection

The selection of the four Member States Finland or Sweden, Germany, Spain and Czech Republic was based on the comparative price-levels and took into account several additional aspects. These aspects were

- Status of GPP[19]
- Relevance of 'price obstacle'[19]

[17] See reasons outlined in section 4.2

[18] Finland has the highest consumption of coffee per capita: it amounts to 11.8 kg per year with increasing tendency. This is by far the highest per capita coffee consumption worldwide. As coffee has been chosen as product type Finland was selected from the two options Sweden and Finland.

[19] according to Bower et al. 2005

- Regional aspects
- Expected availability of data for the life cycle cost analysis.

Table 9 shows the comparative price levels for EU 25 countries in 2005. The data is expressed in relation to EU 25 = 100. For the selection four categories were built: a very high price level (more than 120) can be found in Denmark, Ireland, Finland and Sweden, followed by eight countries with price levels between 100 and 110. For those countries with price levels lying below the European average, a subdivision into two groups was carried out, i.e. price level between 75 and 99 and price level of 74 and below.

Table 9 Comparative price levels of EU 25 in 2005

	Comparative price levels 2005
Denmark	136
Ireland	123
Finland	122
Sweden	121
France	109
Luxembourg	107
Netherlands	105
United Kingdom	105
Belgium	104
Germany	104
Austria	103
Italy	103
EU 25 countries	***100***
Cyprus	94
Spain	90
Greece	88
Portugal	85
Slovenia	76
Malta	74
Estonia	64
Hungary	64
Poland	60
Czech Republic	58
Slovakia	58
Latvia	57
Lithuania	55

Additional criteria which are covered by the selection:

- Status of GPP: Finland, Sweden and Germany belong to the ‘green-7’, i.e. the seven countries with a higher level of GPP compared to other EU Member States. Spain and the Czech Republic, however, do not have such a high level of GPP (Bouwer et al. 2005).

- Relevance of 'price obstacle':[20] In Finland and Sweden the 'price obstacle' is very far below average: approx. 22% (SV) / 32% (FI) of purchasers indicate that they believe that environmentally friendlier products are more expensive, compared to the average of 44%. In contrast, German purchasers rate the price obstacle very far above average (~ 60% compared to the average of 44%).
- Regional aspects:
  The Czech Republic is a relatively new Member State which joined the European Union in 2004.
  Different regions with different climatic and cultural conditions are covered by Finland/Sweden (northern Europe), Germany and the Czech Republic (central Europe) and Spain (southern Europe)
- Expected availability of data for the life cycle cost analysis.

The following table summarises the criteria for each selected Member State.

Table 10 Selection criteria by Member State

Member State	Comparative price level	Level of GPP	Importance of 'price obstacle'	Region
Finland / Sweden	120 or above	'green-7'-country	below average	Northern Europe
Germany	between 100 and 110	'green-7'-country	above average	Central Europe
Spain	between 75 and 99	'other-18'-country	no information available	Southern Europe
Czech Republic	74 or below	'other-18'-country	no information available	New Member State / Central Europe

4.2 Selection of Member States for product group 6 ('Electricity')

For product group 6 ('Electricity'), the respective price levels for the different Member States differ considerably from the general picture given by the general comparative price levels (CPP). Therefore, the relative price levels of electricity for industrial consumers per purchasing power were assessed. This is an indicator of the financial relevance of the

20 i.e. 'perception that environmentally friendlier products would be more expensive', asked for in a survey conducted in Bouwer et al. (2005)

product field in general for the particular countries.[21] Slovenia was selected as representative Member State replacing Spain. Both countries are in the same category in both classifications (CPP and relative price for electricity) and have a comparable share of RES-E in the national electricity fuel mix. This value is important as baseline for the ecological relevance of particular purchase of green electricity. But Slovenia is an example which is worth being considered in detail, as it has the most liberalised power market of all new EU Member States. Furthermore, the perception of better data availability compared to Spain was essential for this particular choice.

The analysis of the relative prices for electricity (see Figure 2) revealed that all the selected Member States as indicated in Table 8 still could be classified in four different categories covering the total range of both classifications (with Slovenia replacing Spain).

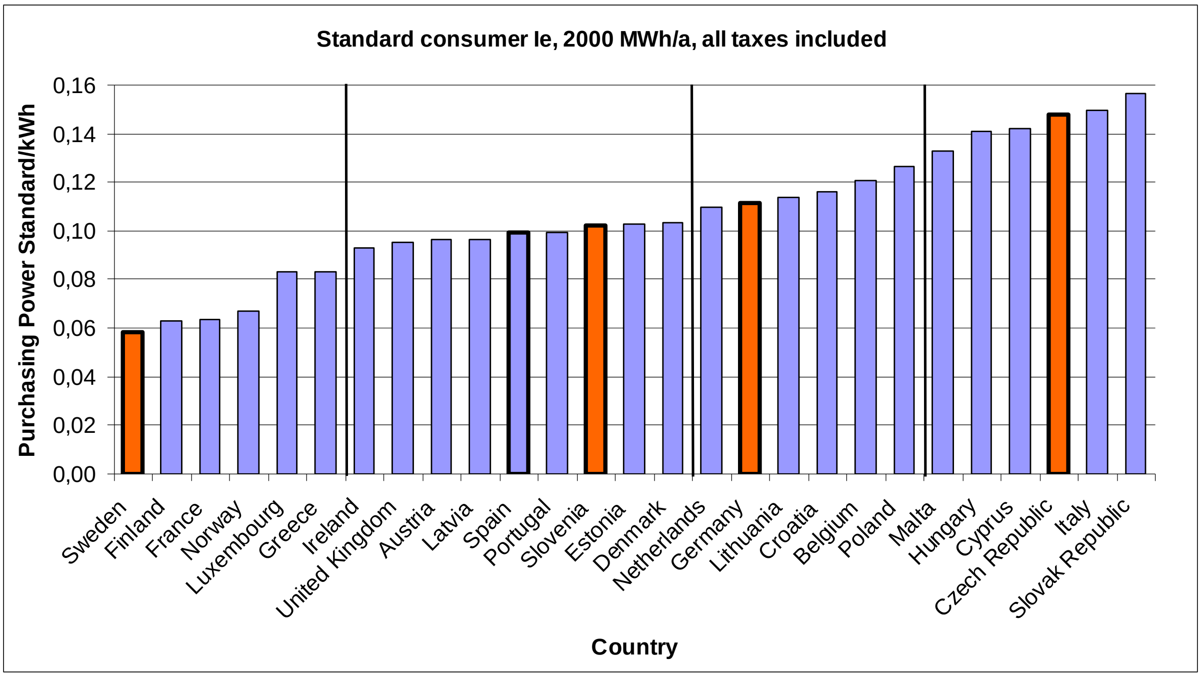

Figure 2 Purchasing Power Standard (PPS) per kWh for industrial standard consumers (Type Ie) with an annual consumption of 2000 MWh for the EU 25 (own figure basing on Eurostat (2006 a)). The four selected representative Member States Sweden, Slovenia, Germany and the Czech Republic are displayed in orange.

[21] Analysis was carried out based on data for 2005 for industrial consumers with an annual consumption of 2000 MWh according to Eurostat (2006). Price levels for industrial consumers can be considered as a proxy for public consumers.

Furthermore, the selected Member States provide for a good selection based on the different shares of RES-E in the particular national electricity fuel mixes of EU Member States. Within the EU 25, these shares vary between 68% for Latvia and 0% for Cyprus and Malta. The selected Member States have shares of RES-E as follows:

- Sweden: 46%
- Slovenia: 28%
- Germany: 10%
- Czech Republic: 3%

The different shares of RES-E for the EU 25 according to EC (2007b) are shown in the following figure.

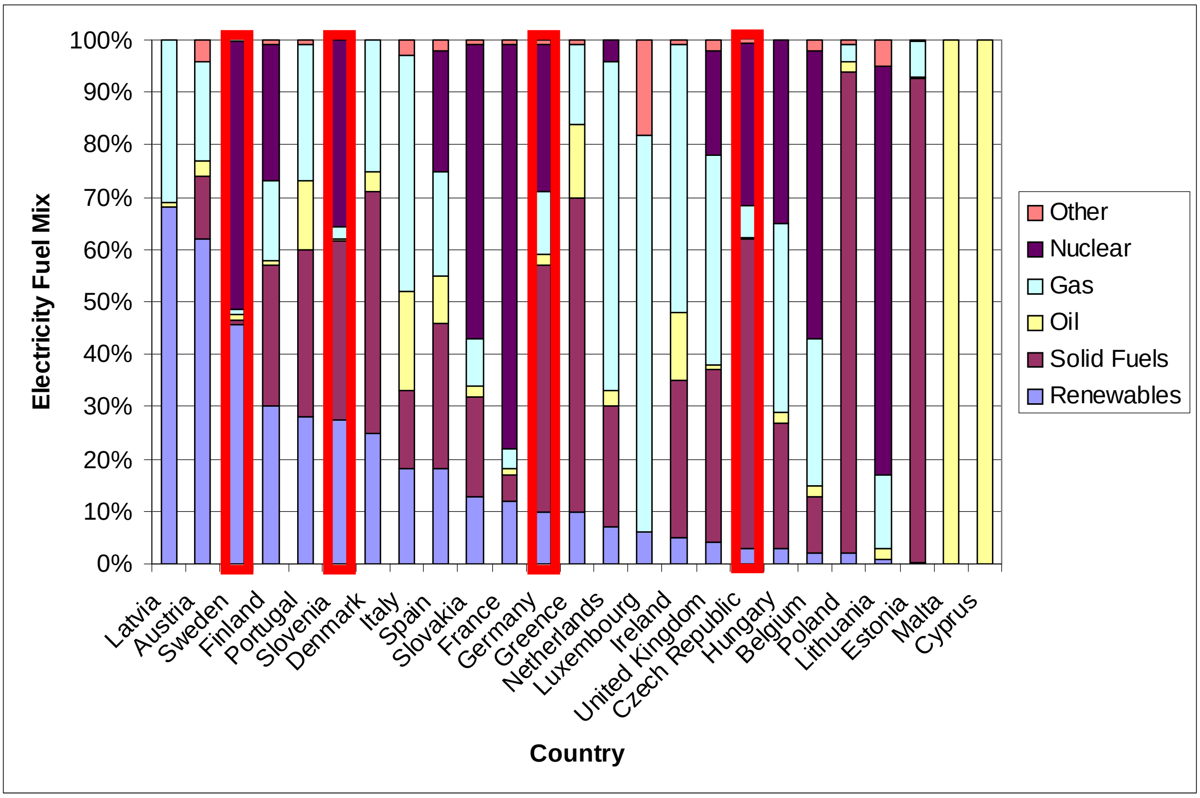

Figure 3 Shares of RES-E and other fuels for electricity generation for the EU 25 Member States (own figure basing on EC (2007)). The four selected Member States Sweden, Slovenia, Germany and the Czech Republic are displayed with a red frame.

5 Life cycle cost analysis by product group

5.1 Product group 1: Construction work

5.1.1 Selection of different product types

From the environmental as well as from the financial point of view, construction work accounts for a large part of the impacts of public procurement.

To select three different product types within the product group ‘Construction work’, the intention was to concentrate on product types that on one hand cause a noteworthy share of environmental impacts; on the other hand offer reasonable environmentally sound alternatives on the market (e.g. gas condensing boilers, luminaries with T5 high efficiency lamps).

Against this background the following three product types were selected:

Product type 1: Boilers for central heating

Within the EuP-study on central heating systems (VHK 2007) an estimate was done on the overall demand of fossil fuel and CO_2-emissions caused by heating. Additionally, an estimate was done on the number of installed central heating boilers in Europe (EU 25). In the non residential sector, around 8 million boilers are installed in EU 25 with an average capacity of 100 kW each (the accuracy of these figures is ±20%). VHK (2007) stated that public administration and education caused around 17,8% of the fossil fuel consumption within the tertiary sector, leading to a rough estimate of about 19 mio. tonnes CO_2 per year.

Product type 2: Office lighting

On a global level, about 19% percent of electricity is used for lighting. In European offices about 109 million luminaries with approx. 312 million fluorescent lamps are installed. Energy demand of lighting is influenced by several factors, only to mention:

- Constructional factors on the side of the building, e.g. use of daylight, size, shape and surface of offices, planning of work units so that groups of lamps might be switched off separately;
- Technical factors on the side of the luminaries (incl. lamps and ballasts), e.g. daylight responsive control systems, presence detection systems, energy efficient and long living lamps and ballasts, adequate luminaries, adjustable luminance of the system (e.g. dimmable lamps);

- Behavioural aspects on the side of the user, e.g. switching off of lamps when illumination is not necessary, regularly cleaning the luminaries.

Product type 3: Paintwork (indoor)

Paintwork is a product group that belongs to all kinds of construction work, and may include a variety of different works in new buildings as well as in the refurbishing of buildings (e.g. indoor and exterior, on mineral base, wood or metal). Public authorities usually own a large quantity of different buildings (public administration, representative buildings, schools, sport facilities, etc.). They are in the responsibility to keep these buildings in a good shape, in order to conserve the value of the building stock and to keep it usable. In average, 1,2% of the value of a building should be invested each year into maintenance in order to prevent obsolescence. Among other measures – like the exchange of heating systems or the insulation of buildings – paintwork is a measure regularly necessary and tendered by public authorities. The LCCA focuses on interior paintwork (on walls with wall paper).

The products are specified in more details in the sections on the three product types (see sections 5.1.3, 5.1.4 and 5.1.5)

5.1.2 Green and non green versions, calculation and cost elements

In contrast to most of the other product groups, the product types selected in the product group 'Construction work' are very different from each other. Therefore the green and non green versions are defined in detail in the sections on each product type (see sections 5.1.3, 5.1.4 and 5.1.5).

The same applies to specific calculation issues and the considered cost elements. These as well are described in detail in the sections on each product type.

5.1.3 Product type 1.1: Boilers for central heating

5.1.3.1 Functional unit and alternatives to be analysed

In this study the heating boiler is assumed to have a service life for the purchasing authority of 15 years producing an annual delivered thermal energy of 68 000 kWh. The amount of delivered energy would enable the heating of one standard office building with 1 000 m² and a heat energy demand of 68 kWh/m²*a for one year (Knissel 1999).

The main environmental impacts from heating systems derive from the CO_2-emissions resulting from the use of fossil fuels. As non green version, a standard boiler for gas fuel is chosen, the green version has to comply with part of the criteria of the German label Blue Angel 'Emissionsarme und energiesparende Gas-Brennwertgeräte RAL-UZ 61' (low emission energy efficient gas condensing boilers) which sets criteria regarding efficiency, emissions and electricity demand in stand-by mode of condensing boilers for gas fuel. The following table lists the criteria in more detail.

Table 11 Green and non green product versions (gas boilers for central heating)

Description	Low temperature boiler for gas fuel	Condensing boiler for gas fuel
	non green version	green version
Compliance with applicable regulations	✓	✓
Maximum power (kW)	70 kW	70 kW
Normal supply level („Normnutzungsgrad“)*	According to existing regulation	104%
Nitrogen oxide emissions (NOx)*	According to existing regulation	60 mg/kWh (34 ppm/kWh)
Carbon monoxide emissions (CO)*	According to existing regulation	50 mg/kWh (46 ppm/kWh)
Electricity demand in stand by mode*	According to existing regulation	15 Watt

* Measurement according to criteria of Blue Angel

5.1.3.2 System boundaries

The relevant cost elements considered are purchase, installation, usage and disposal, which are described further in the following section. The prices cited refer to pricelists that are often subject to discounts. Included are the purchase of the boiler, average maintenance and repair, and demand of fuel and electricity during use phase.

Data quality requirements:

- **Time-related coverage:** Cost data from 2007 is used, as specified in section xyz current gas prices (2006) are increased with the average inflation rate of the regarded Member States.
- **Geographical coverage:** Cost data is used from official price lists of major European manufacturers offering their products in Sweden, Germany, Spain and Czech Republic. Possible discounts given by craftsmen were neglected in order to get comparable results.

5.1.3.3 Calculation and cost elements

The life cycle costs were calculated in accordance with the German VDI-Directive 2067 comprising the total of annual expenses for maintenance and repair, fuels and operation.

Costs investment

Investment costs comprise the costs for the boiler itself (including control), auxiliary parts, chimney refurbishment and installation. It has to be noted that the heating system consists of further elements that were neglected due to complexity (e.g. heat pumps, radiators, heat distribution system, etc.).

Costs usage (electric energy and gas fuel)

The costs for energy are derived from usage, which is depending on the annual capacity utilisation (hours per year) and the supplied thermal energy.

Table 12 Energy demand of green and non green product versions (boilers for central heating)

	Standard boiler for gas fuel	**Condensing boiler for gas fuel**
	non green version	green version
Normal supply level	93%	109%
Delivered thermal energy	68 000 kWh/year	68 000 kWh/year
Demand of gas fuel	84 044 kWh/year	71 707 kWh/year
Demand of electricity	96 kWh/year	64 kWh/year

Costs operation (maintenance and repair)

Costs for regular chimney sweeping are included. This does not apply in Spain and in Sweden.

Table 13 Costs for maintenance and repair (boilers for central heating)

Boiler type	**Maintenance costs**	**Repair costs**
	percentage of purchase costs/year	percentage of purchase costs/year
Gas condensing boiler floor standing	1,0%	1,0
Low temperature gas boiler	1,5%	2,0%

Costs for disposal

Contradictory statements from producers make believe that in some cases take-back of the old boiler is reimbursed for scrap iron (with approx. 100 Euros), whereas it is charged in other cases (with approx. 100 Euros). As no exact numbers could be gathered the disposal costs/revenues were neglected.

5.1.3.4 Results

The following tables show the results on the LCC of gas boilers in the selected Member States. Unfortunately it has not been possible to gather data on purchase prices for Sweden and Spain. Therefore no LCCA could have been conduced.

Table 14 LCC of gas boilers (Germany; incl. VAT)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment costs	4.391	9.268	4.877	111%
Additional material for installation	1.827	1.827	0	0%
Costs usage (electric energy)	41	28	-14	-33%
Costs usage (gas fuel)	13.595	11.600	-1.996	-15%
Costs operation (maintenance and repair)	660	1.037	377	57%
SUM	**20.515**	**23.759**	**3.245**	**16%**

Table 15 LCC of gas boilers (Czech Republic; incl. VAT)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment costs	3.568	7.062	3.494	98%
Additional material for installation	1.827	1.827	0	0%
Costs usage (electric energy)	34	21	-13	-39%
Costs usage (gas fuel)	8.631	7.365	-1.266	-15%
Costs operation (maintenance and repair)	643	832	190	30%
SUM	**14.702**	**17.107**	**2.405**	**16%**

Table 16 Sensitivity analysis for higher gas prices: LCC of gas boilers (Germany; incl. VAT)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment costs	4.391	9.268	4.877	111%
Additional material for installation	1.827	1.827	0	0%
Costs usage (electric energy)	41	28	-14	-33%
Costs usage (gas fuel)	13.674	11.667	-2.007	-15%
Costs operation (maintenance and repair)	660	1.037	377	57%
SUM	**20.593**	**23.826**	**3.233**	**16%**

5.1.3.5 Conclusions

The calculated differences between the green and the non green version are calculated to amount to 16% in Germany and in the Czech Republic even though the annual costs for gas fuel and electric energy are 15% lower compared to the non green version. As a sensitivity analysis for Germany could show, even with gas prices increasing by 20% more than the normal inflation rate the overall results do not change (see Table 9).

In both countries the purchase price of a gas condensing boiler is significantly higher than the purchase price of a standard low temperature gas boiler. The price difference is due to technical features, gas condensing boilers being more elaborate than low temperature gas boilers (e.g. burner technology, heat exchanger, components that collect condensate and the use of materials that – at least partly – has to be condensate stable). As a consequence, the price difference between the green and the non green version will not disappear in future, although some decrease might be expected as the amount of produced gas condensing boilers increases (economy of scale).

The results for Germany shown above point in the same direction as the results of a study on smaller boilers (maximum power 50 kW) in 2005/2006 (EcoTopTen[22]): 'Purchase prices for gas condensing boilers' are about twice the price for low temperature gas boilers.

Distribution channels differ in the four analysed countries. Manufacturers of heating systems use different distribution channels: in Germany as well as in the Czech Republic, heating systems are distributed to craftsmen that sell them in turn to their customers, e.g. to public authorities. Therefore, the prices given by manufacturers in pricelists or in the internet are subject to discount rates ranging until up to 50%. These discounts are only valid for craftsmen that will then install the heating and might hand over some of the discount they got by the manufacturers again to their customers. For a public authority purchasing several heating systems in one year, there might even be space for some more discounts. In Spain as well as in Sweden, manufacturers sell directly to customers like public authorities, sparing the craftsmen – and potential discounts to them – in the middle. Unfortunately, it was not possible to get any prices from manufacturers for products sold in Spain or in Sweden, even though exact the same models are offered in these countries and all major manufacturers were contacted.

[22] For more information see: http://www.ecotopten.de/prod_gasbrennwert_prod.php

5.1.4 Product type 1.2: Office lighting

5.1.4.1 Functional unit and alternatives to be analysed

In this study the LCC of luminaries for office lighting with an assumed service life for the purchasing authority of 25 years are calculated. Within this period several lamps have to be purchased which have an average life span of 20 000 hours, equalling 8 years in this case. (the luminaries are assumed to be switched on 2 500 hours per year).

The main environmental impacts of office lighting result from its electricity demand. Therefore, the main criterion to define the green version is the energy efficiency. The following table shows the applied criteria in detail.

Table 17 Green and non green product versions (office lighting)

Description	**Luminaries with magnetic ballast and T8 lamps (3 bands phosphor)**	**Luminaries with electronic ballast and T5 HE lamps (3 bands phosphor)**
	non green version	green version
Compliance with applicable regulations	✓	✓
Number of lamps in luminairy	4	4
Length of lamps	589,8 mm	589,8 mm
Wattage of lamps (Watt/lamp)	18	14
Life time of lamps (hours)	>20.000	>20.000
Lumen Maintenance	over 90% at 20 000 hours	over 90% at 20 000 hours
Colour rendering index lamps (Ra)	>80	>80
Type of ballast	magnetic	electronic
Luminaire: efficiency of reflection	66,5	71
Energy efficiency class lamp (Label)	A	A
Energy efficiency class ballast (Label)	According to existing regulation (B)	A
Mercury content lamp (mg/lamp)	According to existing regulation	<8 mg/lamp

Comment: As T8 halophosphate lamps have a poor colour rendering (Ra<80), they do not match the EN 12464-1 requirements for office work. For that reason they were not considered in the analysis, although T8 halophosphate lamps are sold in higher numbers compared to T8 Triphosphor lamps (van Tichelen 2006/2007).

5.1.4.2 System boundaries

The relevant cost elements considered are purchase and operation of the luminary-system (incl. luminary, lamps and ballast). The prices refer to data from one major producer. The given prices might be subject to discounts that were neglected here.

Data quality requirements:

- **Time-related coverage:** The investigated product prices are current prices from 2007; electricity prices relate to 2007.
- **Geographical coverage:** The lamp and ballast market is highly concentrated, with a limited amount of players, whereas the luminaries' market is very fragmented. Therefore, for the investigation major producers of lamps and ballasts were contacted (for a list see annex) and additional data was gathered from their internet platforms resp. authorized retailers. The analysis covers the Member States Sweden, Germany, Spain and Czech Republic.

5.1.4.3 Calculation and cost elements

Planning and construction of the building

As described above, the course for lighting is set largely during the planning and construction phase of a building. This process is rather complex and has to consider the whole system with – among others – constructional aspects (e.g. size, position and orientation of windows, shape of office space) and technical aspects (e.g. choice of control technique). As this process is rather individual and complex, such costs were excluded from the investigation.

Purchase and installation

The purchase of the luminary is considered in the LCCA, including lamps and ballast. Costs of labour for the installation of the luminary were not considered.

Substitution of lamps

Lamps need to be replaced several times in the life time of a luminary. Lamp life is 20 000 hours, equalling 8 years in the setting described above, while luminaries are used for typically 25 years.

Energy demand during operation

It is assumed that the luminaries are switched on 2 500 hours per year (in accordance with van Tichelen et al. 2006/2007 for a system without presence detection). The lifetime of the luminary was assumed to be 25 years (as well in accordance with van Tichelen 2006/2007); the non green version having a connected wattage of 102 W, the green version having 63 W. The functionality of both luminary-systems can be described as being equal.

Cleaning of luminaries during maintenance

For luminaries, a regular cleaning and inspection cycle of two years is recommended, but only seldom performed in reality. Therefore, costs for cleaning are neglected within this analysis.

Disposal costs

As the WEEE directive is working in the four countries that are analysed, no disposal costs were taken into account (van Tichelen et al. 2006/2007).

5.1.4.4 Results

The following tables show the results on the LCC of office lighting in the selected Member States (all prices in EUR). Unfortunately, it was not possible to get data for the Czech Republic. Therefore, no LCCA could have been conduced.

Table 18 LCC of office lighting (Sweden)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Purchase price luminary (including the ballast(s) and 4 lamps)	107	147	41	38%
Costs for lamps	30	43	13	41%
Costs for electricity	68	42	-26	-38%
SUM	**205**	**232**	**27**	**13%**

Table 19 LCC of office lighting (Germany)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Purchase price luminary (including the ballast(s) and 4 lamps)	130	231	101	78%
Costs for lamps	28	40	11	41%
Costs for electricity	108	71	-36	-34%
SUM	**265**	**342**	**76**	**29%**

Table 20 LCC of office lighting (Spain)

	LCC		Difference	
	non green version	green version	absolute	relative
Purchase price luminary (including the ballast(s) and 4 lamps)	93	215	122	131%
Costs for lamps	30	54	24	82%
Costs for electricity	81	50	-31	-38%
SUM	**204**	**319**	**115**	**56%**

5.1.4.5 Conclusions

The calculated differences between the green and the non green version concerning the annual costs are calculated to amount to between 13% (Sweden) and 56% (Spain), with the green version being more expensive than the non green version. The high purchase price of the luminary (including the ballasts and four lamps) seems to be decisive for the relative results of the green and the non green version, the lower electricity costs not being able to balance these extra costs.

5.1.5 Product type 1.3: Indoor paints

5.1.5.1 Functional unit and alternatives to be analysed

The LCCA is conducted for 100 m² paintwork on wall paper as functional unit. It is assumed that no preparation work of the underground is necessary and simple covering of the floor is sufficient. As paint, white paint for professional use, wet scrub class 2 (according to EN 13 300) is considered. The work is done by professional painters.[23]

Usually, the quality class of the paint to be used by the contractor is stated in the tender.[24] Sometimes a specific paint is named in the tender that shall be used or alternatively another equivalent product.

The main environmental impacts of indoor paints result from their possible content of solvents, volatile organic carbons (VOCs) and biocide substances, and their application on large surfaces releasing volatile parts of the content on the way. This can cause air pollution or ground level ozone formation (e.g. through VOCs). Additionally, the release of hazardous

[23] In certain cases, e.g. school buildings, it sometimes occurs that non professionals like teachers and pupils, do the paintwork, however, this case was not considered.

[24] According to EN 13 300.

substances due to paintwork worsens indoor air quality. As most people stay indoor at 90% of the daytime, indoor air quality is an important issue. Therefore, it is important to choose low-emission paints. Other environmental impacts are for example use of resources for and waste generation from packaging.

Due to the different market situation in the four countries, the chosen criteria for the green and the non green version differ by country. In general, the focus is on the choice of the paint. The following table gives an overview of the different eco-labels relevant for paintings in the selected Member States.

Table 21 Overview of environmental labels for paints

Country	EU	Sweden	Germany	Spain	Czech Republic
Ecolabel	EU Ecolabel (EU Flower)	Nordic Swan	Blue Angel	Aenor	The Flower - Květina
Product group indoor paints	European Union Eco-label (March 2007): 007 Indoor paints and varnishes	Indoor paints and varnishes, Version 1.1 23 March 2006 – 31 August 2008	Emissionsarme Wandfarben. Low emission wall paint RAL-UZ 102	Paints and varnishes (UNE 48300:1994)	Water-based Coatings - Kategorie výrobků 'Nátěrové hmoty ředitelné vodou' (Směrnice MŽP č. 04-2004)
Number of labelled products (producers)	407 (59)	62* (3)	653 (65)	7(2)	51* (10)

* incl. varnish and wood preservatives

Sweden

For Sweden paints with the EU ecolabel were chosen as green version. The non green version encompasses paints that are not labelled with the EU flower.

Germany

In Germany, paints for professional use usually comply with EN 13 300 'Paints and varnishes. Water-borne coating materials and coating systems for interior walls and ceilings'. This standard defines different quality classes of paints, such as wet scrub resistance class 1 to 5. In Germany, the Blue Angel used to be an important tool to differentiate between paints. In the meantime, the Blue Angel has disappeared widely from professional products and has rather entered the market of products in do-it-yourself-stores. Producers prefer labels like 'Schadstoffgeprüft' or 'Allergikergerecht' that focus (only) on indoor air quality. A second point is that the composition of products has improved considerably so that the emission criteria of the Blue Angel are fulfilled by most of the products on the market. Especially professional products of good quality for indoor use usually do not contain any solvents any more. For that reason, for the German LCCA a comparison was done that deviates from the other countries: The green version was defined as being 'paint on a mineral bases' (silica paint of good quality; for the criteria see the ecolabel *natureplus*) without preservatives and plasticiser, whereas the non green version was defined as 'emulsion paint'.

Spain

For Spain paints with the EU ecolabel were chosen as green version. The non green version encompasses paints that are not labelled with the EU flower.

Czech Republic

The situation in the Czech Republic is different from that in Germany as products with organic solvents are still on the market for use as indoor wall paints. The Czech eco-label for water based coatings mainly focuses on the limitation of the content of organic solvents, heavy metals and formaldehyde. The labelled products encompass a variety of paints, varnishes and lacquers with only one indoor wall paint.

5.1.5.2 System boundaries

The relevant cost elements considered are the costs for the paint and for labour. The prices refer to typical prices for the described paintwork.

Data quality requirements:

- **Time-related coverage:** Cost data (from 2007) is used;
- **Geographical coverage:** For this LCC study cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic).

5.1.5.3 Calculation and cost elements

Paintwork, even when restricted to indoor wall painting, can be very variable, depending on the specific object to be painted. Starting with preparing work like removal of old paint and wall paper, a pre-coat might be necessary as well as the removal and covering of furniture and masking of battens and window frames before starting the paintwork. These details point out that by far most of the cost elements affect costs of labour. The other cost elements affect costs for materials like basically paint, cover material and brushes. As an appraisal, between 6,8 (Germany) and 10 (Czech Republic) working hours for 100 m² of a little complex paintwork on wall paper can be assumed. The amount of working hours might easily double if time consuming preparation of the underground is necessary (e.g. filling of holes).

In the study at hand, the costs based on clearly defined paintwork (clean wall paper underground) and a clearly defined quality class of the paint, ensuring the comparability of the green and the non green version.

The costs for paintwork are usually calculated by the area to be painted and the rates the painter charges the contracting authority per square meter (including all direct and indirect costs for the paintwork):

Costs for paintwork = number of square meters x rate of the painter per square metre

The **number of working hours needed** depends highly on the framework conditions and on the work to be done. The **hourly rate** comprises both all direct and indirect labour costs and the costs for materials, including paint, as well as a surcharge for risk and profits.

To calculate the costs for the green and non green version, all costs are assumed to be identical, except for the used paints. The **market research for prices of paints** builds upon different information sources, e.g. demanding offers or price lists from suppliers and internet research. Only recent prices, not older than one year, have been included. The prices are drawn from suppliers or manufacturers and consider the typical size of the trading unit the suppliers offer.

It has to be mentioned that paintwork is tendered and underlies competition. For that reason there are no fixed prices or pricelists available. Costs undergo changes due to economic cycle. Especially in the area of construction work a macroeconomic bad situation leads to lower wages and therefore lower costs for paintwork.

5.1.5.4 Results

The following tables show the cost differences between the green and the non green version of 100m² paintwork on wall paper or plaster.

Table 22 LCC of paintwork (Sweden)

	LCC structure of		**Difference**	
	non green version	green version	absolute	relative
Labour costs*	1148	1148	0	0%
Costs for paint**	204	233	29	14%
SUM	**1352**	**1380**	29	2%

* incl. materials for coverage and incidentals for two coatings
** paint for two coatings

Table 23 LCC of paintwork (Germany)

	LCC structure of		Difference	
	non green version	green version	absolute	relative
Labour costs*	317	317	0	0%
Costs for paint**	76	49	-27	-36%
SUM	**393**	**365**	**-27**	**-7%**

* incl. materials for coverage and incidentals for one coating
** paint for one coating

Table 24 LCC of paintwork (Spain)

	LCC structure of		Difference	
	non green version	green version	absolute	relative
Labour costs*	335	335	0	0%
Costs for paint**	59	73	14	24%
SUM	**394**	**408**	14	4%

* incl. materials for coverage and incidentals for one coating
** paint for one coating

Table 25 LCC of paintwork (Czech Republic)

	LCC structure of		Difference	
	non green version	green version	absolute	relative
Labour costs*	126	126	0	0%
Costs for paint**	37	84	46	124%
SUM	**163**	**210**	**46**	**28%**

* incl. materials for coverage and incidentals for one coating
** paint for one coating

5.1.5.5 Conclusions

The calculated differences in the LCC between the green and the non green version are different by country: In Sweden and Spain the green version is slightly more expensive by 2 resp. 4 %. In Germany the green version is less costly by 7% and in the Czech Republic the green version is 28 percent more expensive.

In general it can be stated that – even in a little complex situation like above specified – the paint itself has only a minor influence on the overall costs of paintwork. In other more complex situations, with e.g. more preparatory work, the costs for paint are of even less importance for the overall costs. As stated by professional painters, the costs for labour can easely double, when the object gets more complex (e.g. removal of coatings, filling of holes, coverage of furniture, etc.). This might also be the reason for painters to rather use costly high quality paints, instead of using a cheap paint where two sequences of painting are necessary.

5.2 Product group 2: Buses and bus services

5.2.1 Selection of different product types

Buses used for inner-city public transport are the most pertinent to public procurement. The capacity is used as the functional criterion for the selection of the three product types. Therefore the following product types are selected:

Product type 1: Standard public transport heavy duty buses which have the capacity – depending on its manufacture – for up to 80 passengers.

Product type 2: Articulated heavy duty buses (also known as ‘bendy buses’) which have enough space for over 80 passengers.

In Germany, the standard buses of the member companies of the Association of German Transport Undertakings (VDV 2005) make up about 60% and articulated buses approximately 30% of all buses. These two product types thus comprise the greater share of the total buses. In terms of environmental aspects, they differ most notably with regard to fuel consumption.

Product type 3: The minibuses that are frequently used publicly make up the third product type; they are generally registered as passenger cars and contain a maximum of eight seats.

A detailed specification of all product types is given in the respective sections.

5.2.2 Green and non green versions

With regard to new registrations, all buses now have to comply with the EURO 4 emission standard. The green version is chosen in accordance with the criteria of energy demand and emission levels. Various technologies that are more environmentally-friendly as the standard EURO 4 are available in order to reduce fuel consumption to the lowest level possible when a high emission standard is concurrently applied:

One superior standard for buses registered as heavy duty vehicles (standard public transport buses and articulated buses) is the **Enhanced Environmentally-friendly Vehicle (EEV)** standard. That standard is realised by some manufactures by using SCR technology (Selective Catalytic Reduction). This technology reduces NOx emissions to a quantity below the EURO 5 and the EEV level and at the same time decreases fuel consumption by around 6%.

Another possible green version of heavy duty buses is a **hybrid version**[25], which is not available in Europe (but is used, for instance, in New York).

Vehicles driven by **compressed natural gas (CNG) or liquefied petroleum gas (LPG)** have clear advantages over diesel-fuelled buses with regard to the NOx and particulate emissions. The greenhouse gas emissions, however, are only a few percent lower than from diesel vehicles.

In terms of greenhouse gas emissions, **bio-fuels** like bio-ethanol have an advantage of 40 to 60% compared to diesel (related to the total fuel chain, including the cultivation and production of fuels). Bio-ethanol buses require a modified Otto motor; they are so-called flexible fuel vehicles. However, these fuel types are not available in each Member State of the European Union, and the level of support they are conferred by the individual countries differs substantially. Thus, the use of alternative fuels will be taken into account in this project for those Member States in which an alternative fuel and the corresponding vehicle technology is adequate available, which means in generally that the introduction of this alternative fuel is being intensively supported by the government. Depending on the product-specific share of the single cost elements, this subsidy usually affects the total costs in such a way that higher costs for investment or maintenance of the greener product versions are compensated through lower fuel costs. This aspect will be discussed based on the results in section 5.2.7.

Against this background the following green and non green versions are selected:

- A conventional EURO 4 bus is selected as the **non green version** for all three product types. For this purpose, an average mean value of frequently procured buses will be used.
- As in the case of passenger cars, bio-ethanol in Sweden and CNG in Germany are used as **green version** for the heavy duty buses in these two member states. In Spain and the Czech Republic as green version for heavy duty buses EEV buses with the SCR technology are chosen. Since there are no minibuses using alternative fuels, the **green version** for the product type 4.3 is a minibus with enhanced fuel consumption and a particulate filter in all four Member States.

25 Hybrid: power is delivered both via an internal combustion engine or electric motor.

The selection is summarised in the following table:

Table 26 Green and non green versions in product group 2 (buses and bus services)

	SV	DE	ES	CS
Non green version				
Conventional EURO 4 Diesel	X	X	X	X
Green version				
Product type 1 + 2 (heavy duty buses): EEV diesel realised by SCR			X	X
Product type 1 + 2 (heavy duty buses): CNG driven		X		
Product type1 + 2 (heavy duty buses): Bio-ethanol driven	X			
Product type 3 (minibuses): efficient EURO 4 diesel with particulate filter	X	X	X	X

5.2.3 Calculation and cost elements

As is the case with passenger cars, the operating costs play an essential role with regard to buses. The following cost elements need to be taken into account for this product group:

Investment costs

It is difficult to make precise statements on investment costs in the case of transport buses since they greatly depend on the fittings in the standard public transport bus, i.e. the number of seats, the air conditioning system, additional heaters, etc. Moreover, the manufacturers do not make detailed information available on investment costs because of the intense competition. As a result, data from the LastautoOmnibus periodical, which undertakes annual tests, are used for the manufacture costs of the public transport buses. More precise statements can be made on the investment costs of minibuses which are registered as passenger cars. Passenger cars therefore take precedence in this context. In the countries under discussion, a registration tax is not applicable since vehicles intended for public transport are exempt from tax (DIW 2005, BMU 2005, Fleet Europe 2006).

Motor vehicle tax

Annual motor vehicle taxes are not relevant for all three product types. In Germany buses which are deployed for public transport purposes for more than 50% of the time are also exempt from the motor vehicle tax (BMU 2005). Since public procurement vehicles are exempt from tax in Spain, no additional vehicle-related taxes apply in Spain (Fleet Europe 2006). Information on registration tax exemptions in the Czech Republic and Sweden could not be obtained. However, public traffic vehicles are exempt from road tax in the Czech Republic (Fleet Europe 2006). For Sweden, motor vehicle tax is taken into account as follows:

Table 27 Taxes for vehicles in the public transport sector in Sweden

Product type	Specification	Axles	Tax in SEK/year	Tax in EUR/year	Registration category
2.1 Standard public transport buses	ethanol	2	984,00	106,39	Tunga bussar inte dieseldrivna
	diesel	2	18.932,00	2.046,93	Tunga bussar dieseldrivna med tvähjulaxlar, miljö
2.2 Articulated public transport buses	ethanol	3	984,00	106,39	Tunga bussar inte dieseldrivna
	diesel	3	21.937,00	2.371,83	Tunga bussar dieseldrivna med tre hjulaxlar, miljö
2.3 Minibuses	diesel conventional	2	3.089,00	333,98	Lätta bussar dieseldrivna
	diesel particulate filter	2	3.089,00	333,98	Lätta bussar dieseldrivna

Fuel costs

The fuel costs are calculated from the consumption values and the price per litre fuel. Like the investment costs, also the consumption depends on the fittings and above all the purpose and nature of the use of heavy duty buses, such as the frequency of bus stops and inner-city and out-of-city traffic respectively. Thus, an average mean value is again applied according to data from LastautoOmnibus. Additionally, the value is compared with other publications and manufacturer data (LAO 2006, LAO 2007, BMU 2005, Evobus 2007). Minibuses are included in the ADAC database. The fuel consumption of buses powered in other ways is derived on the basis of relative additional or lower consumption respectively. For the product types 1 and 2 an annual road performance of 60 000 km and a service life of 10 years and for product type 3 an annual road performance of 25 000 km and a service life of 5 years is assumed for the purposes of calculating the total fuel consumption (LAO 2007).

For busses with SCR-technology ‘AdBlue’[26] is needed for the NOx-reduction. This liquid is available at several pump stations. The costs for AdBlue vary from country to country and have to be added to the LCC-analysis. The costs for AdBlue amount to 0,62 €/l including taxes at refuelling stations in Spain and 0,74 €/l including taxes in the Czech Republic (integer-research 2007).

For fuel prices see section 3.4.3.2.

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[26] AdBlue®, a clear liquid containing a 32.5% solution of urea in water is injected into the built-in catalyst, transforming the problematical nitrogen oxides into inoffensive nitrogen and water. AdBlue is considered to be a non-toxic and easy to handle chemical. (http://www.omv.com/smgr/portal/jsp/direct1.jsp?p_usr=ext&p_doc=cc&p_site=global&p_cid=-265284&p_mod=cleadin&p_nid=-265284&p_lvl=2&p_uacct=UA-603052-1)

Maintenance costs

The maintenance costs for diesel buses include lubricants, tyres and repair and maintenance. Data for Germany and product type 1 and 2 are gained from LastautoOmnibus (LAO 2007). The ratio of material costs to personnel cost is assumed with 2:1. For product type 3 (minibuses), these data are taken from the ADAC database for the representative minibuses. For all product types the share of personnel costs of the total maintenance costs for Germany will be weighted by using the labour cost indexes to give the maintenance costs for the other selected Member States. The corresponding factors are 124% for Sweden, 60,5% for Spain and 22% for the Czech Republic (EuroStat 2004).

Insurance costs

Further costs that arise in the operation of vehicles are insurance costs, especially liability insurance and comprehensive vehicle insurance. Enquiries made at the manufacturers have demonstrated that these insurances do not basically differentiate between different drive technologies. Insurance providers were not prepared to divulge the amount of such insurances. However, DIW (2005) shows that insurance costs are negligible in comparison to the total costs. For this reason insurance costs were excluded from the LCCA, which does not essentially affect the end result.

End-of-life disposal

It is assumed that the purchasing authority resells the vehicles after a holding period of 10 years (product types 1 and 2) or 5 years (product type 3), with the total vehicle mileage after these years amounting to 600 000 km or 125 000 respectively. In this case the vehicles have a residual value at the end of their service life, for which they are resold.

The residual value for product type 3 is calculated according to ADAC data – these are in turn based on continuous market monitoring conducted by the German Automobile Trust (‘Deutsche Automobil Treuhand’ (DAT)). According to personal expert information the residual value for busses of product types 1 and 2 is assumed to be uniformly 10 000 Euros this disregarding a possible higher residual value of environmental more advantageous busses. This value corresponds well with current residual values of busses available in the internet.[27] For calculation purposes, the residual value of the vehicle is adjusted in each case to a negative entry in the end-of-life disposal (since it is not a matter of costs, but rather of revenues).

[27]http://www.truckscout24.de/search/ger/search.asp?suche=busse&mid=6&vehicletype_id=6&value=search&language=ger

5.2.4 Product type 2.1: Standard public transport buses

5.2.4.1 Functional unit and alternatives to be analysed

The LCC are calculated for the whole assumed holding period of the selected buses. In this study, the public transport buses are assumed to have a service life for the purchasing authority of 10 years with an annual vehicle mileage of 60 000 km, amounting to a total vehicle mileage of 600 000 km within the assumed holding period.

The following versions are analysed:

- **Non green version:** Conventional EURO 4 bus
- **Green version:** Bio-ethanol driven buses (Sweden); CNG driven buses (Germany); EEV buses with the SCR technology (Spain and Czech Republic).

5.2.4.2 System boundaries

The relevant cost elements considered are investment costs, VAT, fuel costs, partly AdBlue costs, maintenance costs and the resale value, which are described in more detail in section 5.2.3. The prices refer to typical prices for these items for a purchasing authority.

Data quality requirements:

- **Time-related coverage:** Only cost data is used, which is not older than two year.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic).

5.2.4.3 Results

The investment costs of the non green version amounts to 222.000 € for a standard public transport bus (LAO 2007). The average fuel consumption of such a bus is 40 l/100km. Maintenance costs in Germany amount to 40,2 cent/km, resulting in annual maintenance costs of 24.120 €. The maintenance costs are weighted by using the labour cost indexes to give the maintenance costs for the other selected Member States (see section 5.2.3). The results of the LCCA for the non green version compared to the green versions are detailed for each of the selected Member States in the following sections.

Sweden

For Sweden, ethanol-driven buses are regarded as the green version. According to data from Scania, this version entails investment costs that are around 5-8% higher compared to the non green version[28]. Regarding the fuel consumption, this follows the lower energy content of ethanol compared to diesel (approx 60% lower) and is thus some 65% higher. The fuel consumption amounts to approximately 66 l/100 km ethanol (Scania 2007). As in the case of passenger cars, ethanol-driven buses profit from a cheaper fuel tax being applied to ethanol. Compared to the passenger cars buses do not fill at the public pump stations but at their own depot. They buy ethanol directly from the producer with no links in between and - as big buyers - they can get a totally different price than fuel stations. Therefore in this case the fuel costs are different from those described in section 3.4.3.2: 0,54 €/l for ethanol and 0,91 €/l for Diesel are assumed for buses in Sweden (ethanolbus.com). As a result of a more frequent replacement of the fuel filter, somewhat higher maintenance costs of around 2.500 € arise in the course of one year (ethanolbus.com). The following table summarises the assumptions.

Table 28 Assumptions on various cost elements for standard public transport buses in Sweden

	Non green version	**Green version**
Purchase price	222.000 €	+ 6,5%
VAT on purchase price	25%	25%
Motor vehicle tax	2.046,93 €	106,39 €
Fuel	Diesel	Bio-ethanol
Fuel costs	0,91 €/l	0,54 €/l
Fuel consumption	40 l/100 km	66 l/100 km
Maintenance costs	24.120 €	+ 2.500 € p.a.

In sum the following costs ensue for the individual elements:

Table 29 LCC of standard public transport buses in Sweden; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment	222.000	236.430	14.430	6,50%
VAT	55.500	59.108	3.608	6,50%
Motor vehicle tax	16.277	846	-15.431	-94,80%
Fuel costs	185.671	181.795	-3.877	-2,09%
Maintenance, material costs	136.703	150.872	14.169	10,36%
Maintenance, personnel costs	84.756	93.541	8.785	10,36%
End-of-life disposal	-6.501	-6.501	0	0,00%
SUM	**694.406**	**716.090**	**21.684**	**3,12%**

[28] For the calculation the median (6,5%) was adopted.

Germany

In the case of Germany, a CNG-driven standard public transport bus is used as an example of a green version. Such buses entail a higher purchase price of around 25.000 € (LAO 5/2003, BMU 2005) compared to a non green version. A reduced VAT rate of 7% is applicable for standard public transport buses in Germany. Buses which are deployed for public transport purposes for more than 50% of the time are also exempt from the motor vehicle tax. In Germany, 19% VAT is levied on fuel; a fuel tax for diesel of 0,47 €/l must also be added (EC 2007 a). In total, costs for diesel fuel amount to 1,14 €/l (April 2007; Oil Bulletin 2007). With regard to the fuel costs, Germany has an unusual rule however: 0,056 €/l of the fuel tax is refunded in the case of diesel with the consequence that only 0,414 €/l of fuel tax is applicable for diesel-driven buses (BMU 2005). The diesel costs for public transport buses amounts to 1,084 €/l. CNG is promoted by a reduced tax rate of 0,165 €/kg up to the year 2018 resulting in a consumer price of 0,84 €/kg (ADAC 2007). In the case of natural gas in addition to the reduced tax rate, 0,012 €/kg are also refunded, meaning that the fuel price only amounts to 0,828 €/kg (BMU 2005). The fuel consumption of CNG buses amounts to around 38,5 kg/100 km (BMU 2005). In contrast to the diesel-driven vehicles, CNG buses accrue annual maintenance costs that are on average 700 € higher than otherwise, as a result of replacement of the gas filters and sparking plugs (BMU 2005). The following table summarises the assumptions.

Table 30 Assumptions on various cost elements for standard public transport buses in Germany

	Non green version	Green version
Purchase price	222.000 €	+ 25.000 €
VAT on purchase price	7%	7%
Motor vehicle tax	exempt	exempt
Fuel	Diesel	CNG
Fuel costs	1,084 €/l	0,828 €/kg
Fuel consumption	40 l/100 km	38,5 kg/100 km
Maintenance costs	24.120 € p.a.	24820 € p.a.

The following table summarises the LCC of the purchase, use and resale of a green and non green version of standard public transport buses in Germany, with an annual vehicle mileage of 60 000 km and a holding period of 10 years.

Table 31 LCC of standard public transport buses in Germany; in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment	222.000	247.000	25.000	11,3%
VAT	15.540	17.290	1.750	11,3%
Motor vehicle tax	0	0	0	-
Fuel costs	224.935	165.371	-59.564	-26,5%
Maintenance, material costs	139.028	143.063	4.035	2,9%
Maintenance, personnel costs	69.514	71.531	2.017	2,9%
End-of-life disposal	-6.501	-6.501	0	0,00%
SUM	**664.516**	**637.754**	**-26.762**	**-4,0%**

Spain and Czech Republic

EEV buses which have SCR technology make up the green version in Spain and the Czech Republic for the product type of the standard public transport bus. According to Evobus, the investment costs for this technology are on average 8.000 € higher than for the conventional EURO 4 buses (LAO 4/2006, Evobus 2007). Since public procurement vehicles are exempt from tax in Spain, no additional vehicle-related taxes apply. Information on registration tax exemptions in the Czech Republic could not be obtained; however, public traffic vehicles are exempt from road tax (Fleet Europe 2006). The fuel consumption is, in return, at least 6% lower for buses with SCR-technology compared to standard buses (LAO 4/2006, Evobus 2007). Nevertheless, costs for AdBlue, which has to be added to the fuel, also have to be taken into account. The consumption level is approximately 1,3 l/100 km (Evobus 2007); the costs for AdBlue amount to 0,62 /l including taxes at refuelling stations in Spain and 0,74 €/l including taxes in the Czech Republic (integer-research 2007). Given that very little experience has been gathered with regard to this new vehicle technology, no statement can yet be made on the possible maintenance costs. For the LCC calculations the same assumptions are used as for the non green version. The following table summarises the assumptions.

Table 32 Assumptions on various cost elements for standard public transport buses in Spain and Czech Republic

	Non green version	Green version
Purchase price	222.000 €	+ 8.000 €
VAT on purchase price	ES: 16% CZ: 19%	ES: 16% CZ: 19%
Motor vehicle tax	ES: exempt CZ: exempt	ES: exempt CZ: exempt
Fuel	Diesel	Diesel
Fuel costs	ES: 0,95 €/l CZ: 0,99 €/l	ES: 0,95 €/l CZ: 0,99 €/l
AdBlue	n.a.	ES: 0,62 €/l CZ: 0,74 €/l
Fuel consumption	40 l/100 km	1,3 l/100 km
Maintenance costs	ES: 24.120 € p.a. CZ: 24.120 € p.a.	ES: 24.120 € p.a. CZ: 24.120 € p.a.

Based on this, the following cost structures ensue for Spain and the Czech Republic:

Table 33 LCC of standard public transport buses in Spain; in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment	222.000	230.000	8.000	3,6%
VAT	35.520	36.800	1.280	3,60
Motor vehicle tax	0	0	0	-
Fuel costs	200.287	192.540	-7.747	-3,9%
Maintenance, material costs	142.002	142.002	0	0,00%
Maintenance, personnel costs	42.956	42.956	0	0,00%
end-of-life disposal	-6.501	-6.501	0	0,00%
SUM	**636.263**	**637.797**	**1.533**	**0,2%**

Table 34 LCC of standard public transport buses in Czech Republic; in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment	222.000	230.000	8.000	3,6%
VAT	42.180	43.700	1.520	3,6%
Motor vehicle tax	0	0	0	-
Fuel costs	206.300	198.933	-7.366	-3,6%
Maintenance, material costs	139.617	139.617	0	0,0%
Maintenance, personnel costs	15.358	15.358	0	0,0%
End-of-life disposal	-6.501	-6.501	0	0,0%
SUM	**618.953**	**621.107**	**2.154**	**0,4%**

5.2.5 Product type 2.2: Articulated public transport buses

5.2.5.1 Functional unit and alternatives to be analysed

The LCCs are calculated for the whole assumed holding period of the selected buses. In this study, the public transport buses are assumed to have a service life for the purchasing authority of 10 years with an annual vehicle mileage of 60 000 km, amounting to a total vehicle mileage of 600 000 km within the assumed holding period.

The following versions are analysed:

- **Non green version:** Conventional EURO 4 bus
- **Green version:** Bio-ethanol driven buses (Sweden); CNG driven buses (Germany); EEV buses with the SCR technology (Spain and Czech Republic).

5.2.5.2 System boundaries

The relevant cost elements considered are investment costs, VAT, fuel costs, partly AdBlue costs, maintenance costs and the resale value, which are described more detailed in section 5.2.3. The prices refer to typical prices for these items for a purchasing authority.

Data quality requirements:

- **Time-related coverage:** Only cost data is used, which is not older than two years.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic).

5.2.5.3 Results

The investment costs of the non green version amounts to 268.000 € for an articulated public transport bus (LAO 2007). The average fuel consumption of such a bus is 50 l/100 km. Maintenance costs in Germany amount to 41,5 cent/km for articulated buses, resulting in annual costs of 24.900 €. The maintenance costs are weighted by using the labour cost indexes to give the maintenance costs for the other selected Member States (see section 5.2.3). The results of the LCCA for the non green version compared to the green versions are detailed for each of the selected Member States in the following sections.

Sweden

For Sweden, as for the standard public transport buses, ethanol-driven buses are regarded as the green version. According to data from Scania, this version entails investment costs that are around 5-8% higher compared to the non green version[29]. The fuel consumption amounts to approximately 82,5 l/100 km ethanol (derived from Scania). The other cost elements are the same as for the standard public transport buses. The following table summarises the new assumptions.

Table 35 Assumptions on various cost elements for articulated public transport buses in Sweden

	Non green version	Green version
Purchase price	268.000 €	+ 25.000 €
VAT on purchase price	25%	25%
Motor vehicle tax	2.371,83 €	106,39 €
Fuel	Diesel	Bio-ethanol
Fuel costs	0,91 €/l	0,54 €/l
Fuel consumption	50 l/100 km	82,5 l/100 km
Maintenance costs	24.120 €	+ 2.500 € p.a.

In sum the following costs ensue for the individual elements:

Table 36 LCC of articulated public transport buses in Sweden; in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment	268.000	293.000	25.000	9,33%
VAT	67.000	73.250	6.250	9,33%
Motor vehicle tax	18.860	846	-18.014	-95,51%
Fuel costs	232.089	227.243	-4.846	-2,09%
Maintenance, material costs	141.124	150.872	9.748	6,91%
Maintenance, personnel costs	87.497	93.541	6.044	6,91%
End-of-life disposal	-6.501	-6.501	0	0,00%
SUM	**808.069**	**832.251**	**24.182**	**2,99%**

Germany

In the case of Germany, a CNG-driven articulated public transport bus is used as an example of a green version. Such buses entail a higher purchase price of around 48.000 € (LAO 5/2003). The fuel consumption of CNG articulated buses amounts to around 51 kg/100 km (BMU 2005, LAO 11/2001). The cost structure of the other cost elements is the same as for the standard buses. The following table summarises the new assumptions.

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[29] Again, the meridian 6,5% was taken into the calculation.

Table 37 Assumptions on various cost elements for articulated public transport buses in Germany

	Non green version	Green version
Purchase price	268.000 €	+ 48.000 €
Fuel	Diesel	CNG
Fuel consumption	50 l/100 km	51 kg/100 km
Maintenance costs	24.900 € p.a.	+ 700 € p.a.

The following table summarises the LCC of the purchase, use and resale of a green and non green version of articulated public transport buses in Germany, with an annual vehicle mileage of 60 000 km and a holding period of 10 years.

Table 38 LCC of articulated public transport buses in Germany; in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment	268.000	316.000	48.000	17,9%
VAT	18.760	22.120	3.360	17,9%
Motor vehicle tax	0	0	0	-
Fuel costs	281.169	219.063	-62.106	-22,1%
Maintenance, material costs	143.524	147.559	4.035	2,8%
Maintenance, personnel costs	71.762	73.779	2.017	2,8%
End-of-life disposal	-6.501	-6.501	0	0,00%
SUM	**776.714**	**772.020**	**-4.694**	**-0,6%**

Spain and Czech Republic

EEV buses which have SCR technology make up the green version in Spain and the Czech Republic for the product type of the articulated public transport bus. According to Evobus, the investment costs for this technology are on average 8.000 € higher than for the conventional EURO 4 buses (LAO 4/2006, Evobus 2007). The composition of the rest of the cost elements is the same as for the standard buses. The following table summarises the new assumptions.

Table 39 Assumptions on various cost elements for articulated public transport buses in Spain and Czech Republic

	Non green version	Green version
Purchase price	268.000 €	+ 8.000 €
Fuel	Diesel	Diesel
Fuel consumption	50 l/100 km	47 l/100 km
Maintenance costs	ES: 24.900 € p.a. CZ: 24.900 € p.a.	ES: 24.900 € p.a. CZ: 24.900 € p.a.

Based on this, the following cost structures ensue for Spain and the Czech Republic:

Table 40 LCC of articulated public transport buses in Spain; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment	268.000	276.000	8.000	3,0%
VAT	42.880	44.160	1.280	3,0%
Motor vehicle tax	0	0	0	-
Fuel costs	250.358	239.607	-10.751	-4,2%
Maintenance, material costs	142.002	142.002	0	0,0%
Maintenance, personnel costs	42.956	42.956	0	0,0%
End-of-life disposal	-6.501	-6.501	0	0,0%
SUM	**739.695**	**738.224**	**-1.471**	**-0,2%**

Table 41 LCC of articulated public transport buses in Czech Republic; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment	268.000	276.000	8.000	3,0%
VAT	50.920	52.440	1.520	3,0%
Motor vehicle tax	0	0	0	-
Fuel costs	257.874	247.414	-10.461	-4,1%
Maintenance, material costs	139.617	139.617	0	0,0%
Maintenance, personnel costs	15.358	15.358	0	0,0%
End-of-life disposal	-6.501	-6.501	0	0,0%
SUM	**725.268**	**724.327**	**-941**	**-0,1%**

5.2.6 Product type 2.3: Minibuses

5.2.6.1 Functional unit and alternatives to be analysed

The LCCs are calculated for the whole assumed holding period of the selected busses. In this study, the busses are assumed to have a service life for the purchasing authority of 5 years with an annual vehicle mileage of 25 000 km, amounting to a total vehicle mileage of 125 000 km within the assumed holding period.

The following versions are analysed:

- **Non green version:** Conventional EURO 4 bus;
- **Green version:** Minibuses with enhanced fuel consumption and a particulate filter (all selected Member States).

The assessment is based on the following minibuses with their stated specifications for all selected Member States:

Table 42 Characterisation of the selected minibuses

	Renault Master Minibus 2.5 dCi 88 kW	**Renault Master Minibus 2.5 dCi 88 kW FAP**	**VW T5 Transporter Kombi 1.9 TDI 75 kW lang**	**VW T5 Transporter Kombi 1.9 TDI 75 kW lang RPF**
Version	Non green	Green	Non green	Green
Construction	Minibus	Minibus	Minibus	Minibus
Engine power	88 kW	88 kW	75 kW	75 kW
Cylinder capacity	2464 ccm	2464 ccm	1896 ccm	1896 ccm
Fuel consumption	8,9 l Diesel / 100 km	8,9 l Diesel / 100 km	7,5 l Diesel / 100 km	7,7 l Diesel / 100 km
CO_2 emission	237 g/km	237 g/km	203 g/km	208 g/km
Vehicle payload	932 kg	932 kg	820 kg	820 kg
Seats for	9 people	9 people	9 people	9 people
Boot volume	2300 l	2300 l	6700 l	6700 l

5.2.6.2 System boundaries

The relevant cost elements considered are investment costs, VAT, motor vehicle tax, fuel costs, maintenance costs and the resale value, which are described in more detail in section 5.2.3. The prices refer to typical prices for these items for a purchasing authority.

Data quality requirements:

- **Time-related coverage:** Only cost data is used, which is not older than one year.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic).

5.2.6.3 Results

Sweden

VAT of 25% is added to the investment costs; consequently, the investment costs for product type 4.3 reach a total of about 32.000 € for the non green version and 33.000 € for the green version. In line with the average fuel consumption of this product type, the fuel consumption per annum accounts with about 2.000 l Diesel for both versions. Maintenance as well as End-of-life-disposal is calculated on the basis of the ADAC database (ADAC 2007).

On this basis the following cost structure results:

Table 43 LCC of minibuses in Sweden; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment	25.910	26.518	608	2,34%
VAT	6.478	6.629	152	2,34%
Motor vehicle tax	1.470	1.470	0	0,00%
Fuel costs	8.597	8.699	102	1,19%
Maintenance, material costs	3.255	3.255	0	0,00%
Maintenance, personnel costs	1.120	1.120	0	0,00%
End-of-life disposal	-7.696	-8.208	-512	6,65%
SUM	**39.134**	**39.484**	**350**	**0,89%**

Germany

Germany also does not levy a registration tax. A reduced VAT rate of 7% is applicable for public transport buses in Germany; thus the investment costs including 7% VAT amount on average to 30.833 € for the non green version and to 31.556 € for the green version. The other cost elements are calculated based on the same assumptions as in Sweden. On this basis the following cost structure is produced:

Table 44 LCC of of minibuses in Germany; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	Relative
Investment	25.910	26.518	608	2,3%
VAT	4.923	5.038	115	2,3%
Motor vehicle tax	0	0	0	-
Fuel costs	10.255	10.379	124	1,2%
Maintenance, material costs	3.280	3.280	0	0,0%
Maintenance, personnel costs	1.137	1.137	0	0,0%
End-of-life disposal	-7.696	-8.208	-512	6,7%
SUM	**37.808**	**38.143**	**335**	**0,9%**

Spain

In the context of investment costs in Spain, 16% VAT must be added to the manufacture costs (Fleet Europe 2006). In Spain, public procurement is exempt from the motor vehicle tax; as a result, it does not have to be taken into account in the LCC calculations (Fleet Europe 2006). The other cost elements are calculated based on the same assumptions as in Sweden. Thus, the following cost structure transpires for Spain:

Table 45 Cost structure of green vs. non green version of minibuses in Spain; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	Relative
Investment	25.910	26.518	608	2,3%
VAT	4.146	4.243	97	2,3%
Motor vehicle tax	0	0	0	-
Fuel costs	9.686	9.811	125	1,3%
Maintenance, material costs	3.311	3.311	0	0,0%
Maintenance, personnel costs	556	556	0	0,0%
End-of-life disposal	-7.696	-8.208	-512	6,7%
SUM	**35.913**	**36.231**	**318**	**0,9%**

Czech Republic

In the Czech Republic, VAT of 19% is added to the costs to make up the base vehicle price (DIW 2005). No registration tax has to be paid (DIW 2005) and vehicles used in public transport are excluded from motor vehicle taxes (PWC 2006). The other cost elements are calculated based on the same assumptions as in Sweden. The cost structure resulting for minibuses in the Czech Republic is displayed in the following:

Table 46 LCC of minibuses in Czech Republic; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	Relative
Investment	25.910	26.518	608	2,3%
VAT	4.923	5.038	115	2,3%
Motor vehicle tax	0	0	0	-
Fuel costs	9.432	9.544	112	1,2%
Maintenance, material costs	3.286	3.286	0	0,00%
Maintenance, personnel costs	201	201	0	0,00%
End-of-life disposal	-7.696	-8.208	-512	6,7%
SUM	**36.055**	**36.379**	**324**	**0,9%**

5.2.7 Summary of results and conclusions

The following tables give an overview of the total LCC of all product types in the selected Member States.

Table 47 Total LCC of of standard public transport buses in the four selected MS; in Euros

	Total LCC		Difference	
	non-green version	green version	Absolute	relative
Sweden	694.406	716.090	21.684	3,1%
Germany	664.516	637.754	-26.762	-4,0%
Spain	636.263	637.797	1.533	0,2%
Czech Republic	618.953	621.107	2.154	0,3%

Table 48 Total LCC of articulated public transport buses in the four selected MS; in Euros

	Total LCC		Difference	
	non-green version	green version	Absolute	relative
Sweden	808.069	832.251	24.182	3,0%
Germany	776.714	772.020	-4.694	-0,6%
Spain	739.695	738.224	-1.471	-0,2%
Czech Republic	725.268	724.327	-941	-0,1%

Table 49 Total LCC of minibuses in the four selected MS; in Euros

	Total LCC		Difference	
	non-green version	green version	Absolute	relative
Sweden	39.134	39.484	350	0,9%
Germany	37.808	38.143	335	0,9%
Spain	35.913	36.231	318	0,9%
Czech Republic	36.055	36.379	324	0,9%

The main results are to be summarised as follows:

- In Spain as well as in the Czech Republic environmental friendly busses of all types are if any hardly more expensive than the non green version. Additional costs are below 1%, which is not considered to be significant. In the case of Germany and Sweden this result is also valid for product type 3 (minibuses).
- Especially in Germany CNG is subsidised through tax reduction, resulting in considerable lower operating costs of the green version compared to the non green

versions. Thus the higher costs for investment and maintenance for busses of type 1 and 2 could be compensated.

- In Sweden the situation is contrary: although bio-ethanol is subsidised and motor vehicle tax for the green version is considerably lower compared to the non green version additional costs for the greener version of product types 1 and 2 are not compensated through lower fuel costs, resulting in higher total costs of around 3% compared to the non green version. Perhaps it must be taken into account that some cities in Sweden require tax roads for non green vehicles. If this tax road will be applied for public transportation too, the cost advantage for non green busses might change. However, within this study this point could not be considered quantitatively und included in the LCCA.

5.3 Product group 3: Passenger cars

5.3.1 Selection of different product types

Transport comprises a share of approximately 20% of the total CO_2 emissions in the European Union and therefore constitutes an important starting point for climate protection measures. Passenger cars make up the greatest share of these emissions. Accordingly, it is important – most notably because of the announcement effect – that the state sets a good example by purchasing green vehicles, reducing CO_2 emissions and other transport bound environmental impacts.

The product group 'Passenger cars' is rather heterogeneous. On the European market there are about 35 makes (or 'brands') and more than 5 000 car models (including versions) available.[30] Against this background it is necessary to define the specific product types accurately.

The three product types within the passenger cars product group were selected with regard to different functionalities of the vehicles. In order to cover the product group as extensively as possible three general types, defined by different sizes, will be taken into consideration:

Product type 1: In terms of public procurement, subcompact and compact cars constitute a major group. They are mostly used by, for example, meter readers and health carers. Therefore, they serve to transport a person who has little equipment generally over short distances within city limits.

30 e.g. 24 versions of the Citroen C3 model are available varying in fuel type, cylinder capacity, engine power etc.

Product type 2: Medium-sized passenger cars (lower middle-sized class) are selected as the second product type; several people can travel in these and longer distances can be covered with them.

Product type 3: In order to guarantee that the functionalities are as broadly covered as possible, as third product type light duty vehicles (LDV) of up to 2.8 tonnes (permissible maximum weight) are taken into consideration. Goods can be transported with this vehicle. At the same time, they are normally registered as passenger cars, meaning that the corresponding fuel consumption data is available.

In the table below the selected three types are characterised more detailed by examples and typical parameters.

Table 50 Specification of the selected product types (product group 'Passenger cars')

	(1) Subcompact and compact cars	**(2) Medium sized cars**	**(3) Light-duty commercial vehicles**
Typical Example	VW Fox / Polo Citroen C3 Opel Corsa Renault Clio Skoda Fabia	Audi A3 Citroen C4 Ford Focus Honda Civic VW Golf	Citroen Jumper Kombi Ford Transit Mercedes Viano, Sprinter Opel Vivaro, Movano Renault Master VW T5 Transporter
Construction	Notchback	Notchback or station wagon	Delivery van
Base price	~ 12.000 €	~ 17.000 €	~ 25.000 €
Engine power (typical value)	40-60 kW	55-100 kW	65-130 kW
Fuel consumption	4,5-5 l / 100 km	6,5-7 l / 100 km	7,5-9 l / 100 km
CO_2 emissions	122-135 g/km	150-190 g/km	205-245 g/km
Permissible maximum weight (typical value)	1.500 kg	2.000 kg	2.600 kg
Vehicle payload (typical value)	450 kg	400 kg	700 kg
Seats for	4-5 people	up to 7 people	up to 9 people
Boot volume	270 l	560 l	5800 l

5.3.2 Green and non green versions

Newly registered passenger cars in the European Union currently have to comply with the Euro 4 emission standard. Since diesel is cheaper than petrol in most Member States as a result of lower tax rates, and due to the comparatively high level of mileage, official/company cars are generally diesel passenger cars.

The green version is selected according to the criteria of energy demand and emission levels. In order to realise a reduction of fuel consumption to the lowest level possible and low CO_2 emissions when a high emission standard is applied, various technologies that are more environmentally-friendly are available:

In principle, an especially efficient passenger car can be selected per passenger car segment. There is a very high level of variance between the CO_2 emissions of newly registered passenger cars. Depending on the type of fuel, performance parameters, gears and further features, the CO_2 emissions of passenger cars vary dramatically. Each passenger car buyer thereby has the opportunity of procuring one that has a **comparatively low level of CO_2 emissions**, in spite of certain requirements of the vehicle (such as its size for example). However, those passenger cars usually have a lower engine power, meaning that the delivered function between those vehicles is not exactly the same. Another important feature of environmental friendlier diesel passenger cars is the **particulate filter** in order to reduce particulate emissions to a level below the planned EURO 5 level of 5 mg/km.

A further possible green version of passenger cars is the **hybrid version**[31]. At present, however, only two hybrid models of passenger cars are available on the European market. As these models are still quite expensive, this alternative is not taken into consideration. As other (relatively cheaper) green versions are available, this would bias the results.

Vehicles driven by **compressed natural gas (CNG)** or **liquefied petroleum gas (LPG)** have clear advantages over diesel passenger cars in terms of NOx and particulate emissions. The greenhouse gas emissions are only a few percent lower than in the case of diesel passenger cars.

Biofuels, like for example bio-ethanol, have an advantage in terms of greenhouse gas emissions of about 40 to 60% compared to diesel (related to the total fuel chain, including the cultivation and production of fuels). Bio-ethanol vehicles require a modified Otto motor and are called ‘flexible fuel vehicles’. Some vehicle models are already available in Europe.

No harmonisation is as yet apparent with regard to the supply of alternative fuels in Europe. As a consequence, the different fuels are not available in each selected Member State of the European Union and the support they are conferred by the individual countries differs substantially. Thus, the use of alternative fuels will be taken into account in this project for those States in which an alternative fuel and the corresponding vehicle technology is adequate available, generally meaning that the introduction of this alternative fuel is being intensively supported by the government.

[31] Hybrid: power is delivered both via an internal combustion engine or electric motor.

Against this background the following green and non green versions are selected:

- A conventional EURO 4 diesel passenger car is selected as the **non green version**.
- The promotion of bio-ethanol in Sweden and the promotion of natural gas in Germany are used as examples for the **green version** in these two member states. As green version in Spain and the Czech Republic (and as second green version in Germany) EURO 4 Diesel passenger cars equipped with a particulate filter are chosen.[32]

The selection is summarised in the following table.

Table 51 Green and non green versions (product group 3: 'Passenger cars')

Version	Sweden	Germany	Spain	Czech Republic
Non green version				
Conventional EURO 4 (diesel) passenger car	X	X	X	X
Green version				
EURO 4 diesel passenger car with particulate filter	X[33]	X[34]	X	X
CNG-driven passenger car		X		
Bio-ethanol driven passenger car	X			

5.3.3 Calculation and cost elements

With regard to vehicles, it is not only investment costs which play a significant role, but also operating costs. The following cost elements therefore are taken into account within the scope of the LCCA:

Investment costs

The investment costs consist of the manufacturer prices (with discounts for bulk purchases subtracted from the sum, where applicable), VAT and, where required, an admission fee and a registration tax. The manufacturer prices vary from country to country. Therefore, data from the ADAC ('Allgemeiner Deutscher Automobil-Club') database are used as a basis for the manufacturer prices and are multiplied with the corresponding cost indexes of the Car Price Report 2006 for the other selected Member States (ADAC 2007, CPR 2006).

32 A stricter green version would be passenger cars with lower engine power resulting in also lower CO_2 emissions. However it is assumed that procurers define a certain engine power in the technical specifications. Therefore no differences in engine power and subsequent CO_2 emissions can be achieved.

33 For product type 3.3 (light duty vehicles).

34 Only in case of product type 3.2 (medium sized cars) and 3.3 (light duty vehicles).

If possible an average of two or three frequently sold passenger cars per product type will be used for the LCC calculations. The models are specified in the sections on the product types.

Amongst the passenger cars, there are substantial differences in terms of the purchase price and residual value; these differences depend on the model and make. The differences between the conventional and the green version of passenger cars which are different makes but have a comparable engine and features can be greater than the differences between the conventional and the green version of the same make. In choosing the vehicles to be examined, attention was paid against this background to consistently selecting conventional and green versions of the same makes.

Motor vehicle taxes

Annual motor vehicle taxes often make up a significant share of the LCC of passenger cars. The assessment basis for these taxes differs between countries and can be based on, for example, the cylinder capacity or the CO_2 emissions. In some countries, public procurement vehicles are exempt from such taxes under certain conditions.

Fuel costs

The fuel costs are based on the costs for the fuel consumed in the course of the service life of the vehicle. The fuel consumption of vehicles registered as passenger cars is officially available, as regulated by the Directive 80/1268/EWG. These data are taken from the ADAC database for the representative passenger car for each product type. The average mean value is calculated from these data for each product type. An annual road performance of 15 000 km and a service life of 5 years is assumed for the purposes of calculating the total fuel consumption.

For fuel prices see section 3.4.3.2.

Maintenance costs

The maintenance costs of the vehicle also need to be taken into account. These are made up of material costs for engine oil, tyres, spare parts and the corresponding labour costs. The labour costs differ between the individual countries, especially in the case of maintenance. In accordance with ADAC (2007), the labour costs are correspondingly set at 60 Euros for all passenger cars per working hour, and weighted with a corresponding factor of 124% for Sweden, 60,5% for Spain and 22% for the Czech Republic (EuroStat 2004).

Insurance costs

Further costs that arise in the operation of vehicles are insurance costs, especially liability insurance and comprehensive vehicle insurance. Enquiries made at the manufacturers have demonstrated that these insurances do not basically differentiate between different drive technologies. Insurance providers were not prepared to divulge the amount of such insurances. However, DIW (2005) shows that insurance costs are negligible in comparison to the total costs. For this reason, insurance costs are excluded from the LCCA, which does not essentially affect the end result.

End-of-life disposal

It is assumed that the purchasing authority resells the vehicles after a holding period of 5 years, with the total vehicle mileage after these 5 years amounting to 75 000 km. In this case the vehicles have a residual value at the end of their service life, for which they are resold.

The residual value is calculated according to ADAC data – these are in turn based on continuous market monitoring conducted by the German Automobile Trust ('Deutsche Automobil Treuhand' (DAT)). For calculation purposes, the residual value of the vehicle is adjusted in each case to a negative entry in the end-of-life disposal (since it is not a matter of costs, but rather of revenues).

Taxes (e.g. motor vehicle or fuel taxes) which vary from country to country are discussed more detailed in the results section of each product type.

5.3.4 Product type 3.1: Subcompact and compact cars

5.3.4.1 Functional unit and alternatives to be analysed

The LCC are calculated for the whole assumed holding period of the selected passenger cars. In this study, the passenger cars are assumed to have a service life for the purchasing authority of 5 years with an annual vehicle mileage of 15 000 km, amounting to a total vehicle mileage of 75 000 km within the assumed holding period.

The following versions are analysed:

- **Non green version:** Conventional EURO 4 diesel vehicles
- **Green version:** Ethanol-driven passenger cars (Sweden); CNG-driven passenger cars (Germany); passenger cars with a particulate filter (Germany, Spain and Czech Republic).

The range of ethanol-driven passenger cars on offer in **Sweden** is still quite slight (7 models from 3 different manufacturers), resulting in the fact that in Sweden no ethanol-driven subcompact and compact car was available. Furthermore within this product type, diesel driven cars are generally unusual in Sweden and therefore diesel driven cars with particulate filter are logically not applicable as green version.

In accordance with the range of CNG-driven vehicles on offer in **Germany**, the calculations are based on the following passenger cars with their corresponding specifications[35]:

Table 52 Characterisation of the selected subcompact and compact cars – Germany

	Citroen C3 HDi 70 Confort	**Citroen C3 1.4 Bivalent Style**
Version	non green	green
Fuel	Diesel	CNG
Construction	Compact Car	Compact Car
Engine power	50 kW	49 kW
Cylinder capacity	1 398 ccm	1 360 ccm
Fuel consumption	4,4 l/100 km	4,95 kg/100 km
CO_2 emission	115 g/km	119 g/km
Vehicle payload	416 kg	352 kg
Seats for	5 people	5 people
Boot volume	305 l	305 l

For **Spain** and the **Czech Republic** the same representative models are considered as described in the following table.

Table 53 Characterisation of the selected subcompact and compact cars – Spain and Czech Republic

	Seat Ibiza 1.4 TDI Reference	**Seat Ibiza 1.4 TDI Reference RPF**	**Skoda Roomster 1.4 TDI 59 kW**	**Skoda Roomster 1.4 TDI 59 kW RPF**
Version	non green	green	non green	green
Fuel	Diesel	Diesel	Diesel	Diesel
Construction	Compact car	Compact car	Mini Van	Mini Van
Engine power	51 kW	51 kW	59 kW	59 kW
Engine capacity	1422 ccm	1422 ccm	1422 ccm	1422 ccm
Fuel consumption	4,7 l / 100 km	4,6 l / 100 km	5,1 l / 100 km	5,2 l / 100 km
CO_2 emission	127 g/km	120 g/km	135 g/km	137 g/km
Vehicle payload	439 kg	439 kg	440 kg	440 kg
Seats for	5 people	5 people	5 people	5 people
Boot volume	267 l	267 l	450 l	450 l

35 For this product type only few cars with both a CNG driven engine and comparable characteristics to non green versions are available on the market. Therefore the comparison could not be carried out for a representative range of cars but for the cars described above.

5.3.4.2 System boundaries

The relevant cost elements considered are investment costs, motor vehicle taxes, fuel costs, maintenance costs, insurance costs and end-of-life disposal (here: resale value), which are described in more detail in section 5.3.3. The prices refer to typical prices for these items for a purchasing authority.

Data quality requirements:

- **Time-related coverage:** Only cost data is used, which is not older than one year.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic).

5.3.4.3 Results

Sweden

As mentioned before, this product type is not available in Sweden.

Germany

Germany does not levy a registration tax; thus the *investment costs*, including 19% VAT and a 25 € admission fee, amount on average to 14.034 € for the non green version and to 13.992 € for the green version. The *motor vehicle tax* is based on the cylinder capacity and the emission standard. The cylinder capacity of this product type is around 1 400 ccm; all of the passenger cars fulfil the EURO 4 emission standard. This leads to an annual motor vehicle tax of about 230 € for the non green and about 95 € for the green version, due to tax reduction. In Germany, 19% VAT is levied on *fuel*; a fuel tax for diesel of 0,47 €/l must also be added (EC 2007 a). In total, costs for diesel fuel amount to 1,14 €/l (April 2007; Oil Bulletin 2007). CNG is promoted by a reduced tax rate of 0,165 €/kg up to the year 2018, resulting in a consumer price of 0,84 €/kg (ADAC 2007). Taking the fuel consumption into account, this yields fuel costs totalling 5,02 €/100 km for diesel and 4,16 €/100 km for CNG-driven subcompact and compact cars in 2007. The assumptions are summarised in the following table.

Table 54 Assumptions on various cost elements for subcompact and compact cars in Germany

	Non green version	Green Version
VAT on purchase price	19%	19%
Admission fee	25 €	25 €
Registration tax	n.a.	n.a.
Motor vehicle tax	230 € p.a.	95 € p.a.
Fuel	Diesel	CNG
Fuel price	1,14 €/l	0,84 €/l
Fuel costs	5,02 € /100 km	4,16 € / 100 km

The following table summarises the LCC of the purchase, use and resale of a green and non green version of product type 1 (subcompact and compact cars) in Germany, with an annual vehicle mileage of 15 000 km and a holding period of 5 years.

Table 55 LCC of subcompact and compact cars in Germany; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment	14.034	13.992	-42	-0,3%
VAT	2.666	2.658	-8	-0,3%
Admission fee	25	25	0	0,00%
Motor vehicle tax	1.021	414	-608	-59,5%
Fuel costs	3.481	2.905	-576	-16,6%
Maintenance, material costs	1.148	1.075	-73	-6,4%
Maintenance, personnel costs	467	403	-64	-13,7%
End-of-life disposal	-4.822	-4.789	33	-0,7%
SUM	**18.020**	**16.682**	**-1.338**	**-7,4%**

Spain and Czech Republic

In the context of *investment costs* in **Spain**, 16% VAT and 69 € admission fee must be added to the investment costs (PWC). As the regarded diesel cars have a cylinder capacity of up to 2 000 cm³, a registration tax of 7%[36] has to be added. (AEAT 2007) In Spain, public procurement is exempt from the *motor vehicle tax*; it therefore does not have to be taken into account in the LCC calculations (Fleet Europe 2006). The diesel *fuel costs* comprise 16% VAT and 0,302 €/l fuel tax (EC 2007 a). In April 2007 they amounted in total to 0,945 €/l (Oil Bulletin 2007). The assumptions are summarised in the following table.

Table 56 Assumptions on various cost elements for subcompact and compact cars in Spain

	Non green version	**Green version**
VAT on purchase price	16%	16%
Admission fee	69 €	69 €
Registration tax	7%	7%
Motor vehicle tax	n.a.	n.a.
Fuel	Diesel	Diesel
Fuel price	0,945 €/l	0,945 €/l

[36] For passenger cars with a cylinder capacity exceeding 2 000 cm³, the registration tax amounts to 12%.

The following table summarises the LCC of the purchase, use and resale of a green and non green version of subcompact and compact cars in Spain.

Table 57 LCC of subcompact and compact cars in Spain; in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment	12.581	13.425	845	6,7%
VAT	2.013	2.148	135	6,7%
Admission fee	69	69	0	0,0%
Motor vehicle tax	0	0	0	-
Fuel costs	3.249	3.249	0	0,0%
Maintenance, material costs	1.298	1.302	5	0,4%
Maintenance, personell costs	400	400	0	0,00%
End-of-life disposal	-5.337	-6.089	-752	14,1%
SUM	**14.272**	**14.504**	**232**	**1,6%**

In the **Czech Republic**, VAT of 19% and an admission fee of 27 € are added to the costs to make up the base vehicle price (DIW 2005). No registration tax has to be paid (DIW 2005). In this country, the *motor vehicle tax* for passenger cars is dependent on the engine's cylinder capacity (Fleet Europe 2006; see following table).

Table 58 Motor vehicle tax for passenger cars in the Czech Republic according to cylinder capacity

Cylinder capacity	Motor vehicle tax
Up to 800 cc	42 € p.a.
800 to 1 250 cc	64 € p.a.
1 250 to 1 500 cc	85 € p.a.
1 500 to 2 000 cc	107 € p.a.
2.000 to 3.000 cc	128 € p.a.
Above 3.000 cc	150 € p.a.

Thus, for the subcompact and compact cars as specified in the study at hand, 85 € motor vehicle tax has to be paid each year. The fuel tax amounts to 0,352 €/l for diesel (EC 2007 a); consequently, the price of diesel at refuelling stations amounted to 0,99 €/l in total in April 2007 (Oil Bulletin 2007). The assumptions are summarised in the following table.

Table 59 Assumptions on various cost elements for subcompact and compact cars in Czech Republic

	Non green version	Green version
VAT on purchase price	25%	25%
Admission fee / registration tax	n.a.	n.a.
Motor vehicle tax	154 €	164 €
Fuel	Super	Bio-ethanol
Fuel price	1,19 €/l	0,94 €/l

The following table summarises the LCC of the purchase, use and resale of a green and non green version of subcompact and compact cars in the Czech Republic.

Table 60 LCC of subcompact and compact cars in Czech Republic; in Euro

	LCC		Difference	
	non green version	green version	absolute	relative
Investment	12.581	13.425	845	6,7%
VAT	2.390	2.551	160	6,7%
Admission fee	27	27	0	0,00%
Motor vehicle tax	374	374	0	0,00%
Fuel costs	3.357	3.357	0	0,00%
Maintenance, material costs	1.288	1.292	5	0,4%
Maintenance, personell costs	144	144	0	0,00%
End-of-life disposal	-5.337	-6.089	-752	14,1%
SUM	**14.824**	**15.082**	**258**	**1,7%**

5.3.5 Product type 3.2: Medium-sized cars

5.3.5.1 Functional unit and alternatives to be analysed

The LCC are calculated for the whole assumed holding period of the selected passenger cars. In this study the passenger cars are assumed to have a service life for the purchasing authority of 5 years with an annual vehicle mileage of 15 000 km, amounting to a total vehicle mileage of 75 000 km within the assumed holding period.

The following versions are analysed:

- **Non green version:** Conventional EURO 4 diesel vehicles
- **Green version:** Ethanol-driven passenger cars (Sweden); passenger cars with a particulate filter as well as CNG-driven passenger cars (Germany); passenger cars with a particulate filter (Spain and Czech Republic).

In accordance with the range of ethanol-driven vehicles on offer in **Sweden**, the calculations are based on the following representative passenger cars with their corresponding specifications:

Table 61 Characterisation of the selected medium-sized cars (Sweden)

	Volvo S40 1.8	**Volvo S40 1.8 FlexiFuel**	**Volvo V50 1.8**	**Volvo V50 1.8 FlexiFuel**
Version	non green	green	non green	green
Fuel	Super	Bio-ethanol	Super	Bio-ethanol
Construction	Saloon car	Saloon car	Estate car	Estate car
Engine power	92 kW	92 kW	92 kW	92 kW
Cylinder capacity	1 798 ccm	1 798 ccm	1 798 ccm	1 798 ccm
Fuel consumption	7,2 l/100 km	7,4 l/100 km	7,2 l/100 km	7,4 l/100 km
CO_2 emission	172 g/km	177 g/km	171 g/km	177 g/km
Vehicle payload	495 kg	495 kg	516 kg	516 kg
Seats for	5 people	5 people	5 people	5 people
Boot volume	404 l	404 l	417 l	417 l

In accordance with the range of CNG-driven vehicles on offer in **Germany**, the calculations are based on the following passenger cars with their corresponding specifications[37]:

Table 62 Characterisation of the selected medium-sized cars (Germany)

	VW Touran 1.9 TDI 77 kW Trendline	**VW Touran 1.9 TDI 77 kW Trendline RPF**	**VW Touran EcoFuel Trendline**
Version	non green	green (1)	green (2)
Fuel	Diesel	Diesel	CNG
Construction	Compact van	Compact van	Compact van
Engine power	77 kW	77 kW	80 kW
Cylinder capacity	1896 ccm	1896 ccm	1984 ccm
Fuel consumption	5,9 l/100 km	6,0 l/100 km	5,8 kg/100 km
CO_2 emission	156 g/km	158 g/km	153 g/km
Vehicle payload	587 kg	587 kg	542 kg
Seats for	5 to 7 people	5 to 7 people	5 to 7 people
Boot volume	695 l	695 l	695 l

37 For this product type only few cars with both a CNG driven engine or a diesel engine with particulate filter respectively and comparable characteristics to non green versions are available on the market. Therefore the comparison could not be carried out for a representative range of cars but for the cars described here.

For **Spain** and the **Czech Republic** the same representative models are considered as described in the following table.

Table 63 Characterisation of the selected medium-sized cars (Spain and Czech Republic)

	Skoda Octavia 1.9 TDI Classic	**Skoda Octavia 1.9 TDI Classic RPF**	**Fiat Stilo 1.9 JTD Multijet 8V Acitve 3-türig**	**Fiat Stilo 1.9 JTD Multijet 8V Acitve 3-türig RPF**
Version	non green	green	non green	green
Fuel	Diesel	Diesel	Diesel	Diesel
Construction	Saloon car	Saloon car	Saloon car	Saloon car
Engine power	77 kW	77 kW	88 kW	88 kW
Cylinder capacity	1896 ccm	1896 ccm	1910 ccm	1910 ccm
Fuel consumption	4,9 l/100 km	5,0 l/100 km	5,3 l/100 km	5,3 l/100 km
CO_2 emission	132 g/km	135 g/km	139 g/km	139 g/km
Vehicle payload	585 kg	585 kg	435 kg	435 kg
Seats for	5 people	5 people	5 people	5 people
Boot volume	560 l	560 l	305 l	305 l

5.3.5.2 System boundaries

The relevant cost elements considered are investment costs, motor vehicle taxes, fuel costs, maintenance costs, insurance costs and end-of-life disposal (here: resale value), which are described more detailed in section 5.3.3. The prices refer to typical prices for these items for a purchasing authority.

Data quality requirements:

- **Time-related coverage:** Only cost data is used, which is not older than one year.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic).

5.3.5.3 Results

Sweden

For medium sized-cars the *investment costs* reach a total of 26.201 € for the non green version and 30.188 € for the green version (incl. VAT). Since the calculation of the *motor vehicle tax* is based on CO_2 emissions, the annual fee for the non green version is 154 € and 164 € for the green version[38].

[38] The green version could be driven both, with Super and bio-ethanol. Therefore taxation in Sweden is related to fuels but not to cars.

The assumptions are summarised in the following table.

Table 64 Assumptions on various cost elements for medium-sized cars in Sweden

	Non green version	**Green version**
VAT or purchase price	25%	25%
Admission fee / registration tax	n.a.	n.a.
Motor vehicle tax	154 €	154 €
Fuel	Super	Bio-ethanol
Fuel price	1,19 €/l	0,94 €/l

The following table summarises the LCC of the purchase, use and resale of a green and non green version of medium-sized cars in Sweden.

Table 65 LCC of medium-sized cars in Sweden; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment	17.201	18.412	1.211	7,0%
VAT	4.300	4.603	303	7,0%
Admission fee	0	0	0	-
Motor vehicle tax	685	692	8	1,1%
Fuel costs	5.870	4.736	-1.134	-19,3%
Maintenance, material costs	1.325	1.325	0	0,0%
Maintenance, personell costs	692	692	0	0,0%
End-of-life disposal	-6.139	-6.571	-432	7,0%
SUM	23.934	23.890	**-44**	**-0,2%**

Germany

For medium-sized cars, the *investment costs* for the non green version amount to 19.405 €; for the green version to 19.901 € (Diesel PF) and 20.138 € respectively (CNG Fuel). The amount of the other cost elements for this product type in Germany is almost the same as for subcompact and compact cars. Since the calculation of the *motor vehicle tax* is based on the cylinder capacity, the annual cost of this element is higher than for the product type 1. The averaged cylinder capacity of this product type is about 1 900 cc; all of the passenger cars fulfil the EURO 4 emission standard. This leads to an annual motor vehicle tax of about 135 to 320 €, depending on fuel type and if equiped with a particulate filter. The assumptions are summarised in the following table.

Table 66 Assumptions on various cost elements for medium-sized cars in Germany

	Non green version	Green version (1)	Green version (2)
VAT on purchase price	19%	19%	19%
Admission fee	25 €	25 €	25 €
Registration tax	n.a.	n.a.	n.a.
Motor vehicle tax	316 €	293 €	135 €
Fuel	Diesel	Diesel	CNG
Fuel price	1,14 €/l	1,14 €/l	0,84 €/kg

The following tables summarise the LCC of the purchase, use and resale of the two green versions and non green version of medium-sized cars in Germany.

Table 67 LCC of medium-sized cars in Germany; in Euros

	LCC		Difference	
	non green version	green version (Diesel PF)	absolute	relative
Investment	19.405	19.901	496	2,6%
VAT	3.687	3.781	94	2,6%
Admission fee	25	25	0	0,00%
Motor vehicle tax	1.391	1.290	-101	-7,3%
Fuel costs	4.702	4.780	78	1,7%
Maintenance, material costs	1.537	1.537	0	0,00%
Maintenance, personell costs	521	471	-50	-9,7%
End-of-life disposal	-8.469	-9.283	-814	9,6%
SUM	**22.799**	**22.502**	**-297**	**-1,3%**

Table 68 LCC of medium-sized cars in Germany; in Euros

	LCC		Difference	
	non green version	green version (CNG Fuel)	absolute	relative
Investment	19.405	20.138	733	3,8%
VAT	3.687	3.826	139	3,8%
Admission fee	25	25	0	0,00%
Motor vehicle tax	1.391	594	-797	-57,3%
Fuel costs	4.702	3.431	-1.272	-27,0%
Maintenance, material costs	1.537	1.445	-91	-6,00%
Maintenance, personell costs	521	499	-23	-4,4%
End-of-life disposal	-8.469	-8.502	-32	0,3%
SUM	**22.799**	**21.456**	**-1.343**	**-5,9%**

Spain and Czech Republic

The average value of the *investment costs* for medium-sized cars in **Spain** is about 15.000 €. The other cost elements are specified identically as described for product type 1. As a result of the higher fuel consumption of medium-sized cars, the following cost structure results for Spain.

Table 69 LCC of medium-sized cars in Spain; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment	15.542	16.046	504	3,2%
VAT	2.487	2.567	81	3,2%
Admission fee	69	69	0	0,00%
Motor vehicle tax	0	0	0	-
Fuel costs	3.420	3.454	35	1,0%
Maintenance, material costs	2.081	2.081	0	0,00%
Maintenance, personnel costs	774	774	0	0,00%
End-of-life disposal	-5.687	-6.356	-669	11,8%
SUM	**18.685**	**18.636**	**-49**	**-0,3%**

The average value of the *investment costs* for medium-sized cars in the **Czech Republic** is 15.034 € for the non green version and 15.538 € for the green version. Since the engine cylinder capacity is 1 900 cc, the annual motor vehicle tax amounts to 107 €. The other cost elements are specified identically as described for product type 1. Taking the higher fuel consumption of medium-sized cars into account, the following cost structure results for the Czech Republic:

Table 70 LCC of medium-sized cars in Czech Republic; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment	15.542	16.046	504	3,2%
VAT	2.953	3.049	96	3,2%
Admission fee	27	27	0	0,00%
Motor vehicle tax	471	471	0	0,00%
Fuel costs	3.546	3.594	49	1,4%
Maintenance, material costs	2.065	2.074	9	0,4%
Maintenance, personnel costs	199	200	1	0,5%
End-of-life disposal	-5.687	-6.356	-669	11,8%
SUM	**19.116**	**19.105**	**-11**	**-0,1%**

5.3.6 Product type 3.3: Light-duty vehicles (LDV)

5.3.6.1 Functional unit and alternatives to be analysed

The LCC are calculated for the whole assumed holding period of the selected passenger cars. In this study the passenger cars are assumed to have a service life for the purchasing authority of 5 years with an annual vehicle mileage of 15 000 km, amounting to a total vehicle mileage of 75 000 km within the assumed holding period.

The following versions are analysed:

- **Non green version:** Conventional EURO 4 diesel vehicles
- **Green version:** LDV with particulate filter (Sweden, Spain and Czech Republic); CNG-driven LDVs (Germany).

Since the range of ethanol-driven vehicles on offer is still quite slight and no ethanol-driven light duty vehicle is on the market as yet in Sweden, the green version for the product type 3 is an efficient LDV with a particulate filter. The calculation for the LDVs is therefore based on the following specifications. For Sweden, Spain and the Czech Republic the same representative models are considered:

Table 71 Characterisation of the selected light duty vehicles (Sweden, Spain and Czech Republic)

	Renault Master 2.5 dCi ND kurz teilv. 6-S., 2,8t	**Renault Master 2.5 dCi FAP ND kurz teilv. 6-S., 2,8t**	**Mercedes Vito Kombi 111 CDI lang**	**Mercedes Vito Kombi 111 CDI lang RPF**
Version	non green	green (PF)	non green	green (PF)
Fuel	Diesel	Diesel	Diesel	Diesel
Construction	Van	Van	Van	Van
Engine power	88 kW	88 kW	85 kW	85 kW
Cylinder capacity	2 464 ccm	2 464 ccm	2 148 ccm	2 148 ccm
Fuel consumption	8,7 l/100 km	8,7 l/100 km	8,1 l/100 km	8,3 l/100 km
CO_2 emissions	230 g/km	230 g/km	217 g/km	221 g/km
Vehicle payload	768 kg	768 kg	n.d.	n.d.
Seats for	6 people	6 people	2 to 9 people	2 to 9 people
Boot volume	5200 l	5200 l	730 l	730 l

In accordance with the range of such vehicles on offer in Germany, the calculations are based on the following representative passenger cars with their corresponding specifications:

Table 72 Characterisation of the selected light duty vehicles (Germany)

	VW Caddy Kombi 1.9 TDI	VW Caddy Kombi 1.9 TDI RPF	VW Caddy Kombi Eco Fuel (natural gas operation)
Version	non green	green (PF)	green (CNG)
Fuel	Diesel	Diesel	CNG
Construction	Delivery van	Delivery van	Delivery van
Engine power	77 kW	77 kW	80 kW
Cylinder capacity	1 896 ccm	1 896 ccm	1 984 ccm
Fuel consumption	6,1 l/100km	6,2 l/100km	5,9 kg/100km
CO_2 emissions	165 g/km	167 g/km	157 g/km
Vehicle payload	607 kg	607 kg	425 kg
Seats for	up to 7 people	up to 7 people	up to 7 people
Boot volume	3 200 l	3 200 l	3 200 l

5.3.6.2 System boundaries

The relevant cost elements considered are investment costs, motor vehicle taxes, fuel costs, maintenance costs, insurance costs and end-of-life disposal (here: resale value), which are described in more detail in section 5.3.3. The prices refer to typical prices for these items for a purchasing authority.

Data quality requirements:

- **Time-related coverage:** Only cost data is used, which is not older than one year.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic).

5.3.6.3 Results

Sweden

For the product type 3 the *investment costs* for the non green version reach a total of 30.738 € and for the green version 31.495 € (including VAT). The specifications of the cost elements for this product type are almost the same as for types 1 and 2. Since the calculation of the motor vehicle tax is based on CO_2 emissions, the annual cost of this element is higher than for the product types 1 and 2. For the non green version the fee is 229 € p.a. and 232 € p.a. for the green version.

The following table summarises the LCC of the purchase, use and resale of a green and non green version of light duty vehicles in Sweden.

Table 73 LCC of light duty vehicles in Sweden; in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment	24.590	25.196	605	2,5%
VAT	6.148	6.299	151	2,5%
Admission fee	0	0	0	-
Motor vehicle tax	1.052	1.066	14	1,4%
Fuel costs	6.300	6.373	73	1,2%
Maintenance, material costs	1.743	1.743	0	0,0%
Maintenance, personnel costs	1.106	1.106	0	0,0%
End-of-life disposal	-8.100	-8.698	-598	7,4%
SUM	**32.840**	**33.085**	**246**	**0,8%**

Germany

For light duty vehicles the *investment costs* reach a total of 18.636 € for the non green version and 19.226 € for the green version (Diesel with particulate filter) and 19.452 € for the green version (CNG-driven) (each incl. VAT and admission fee). The cost elements for this product type are specified almost the same as for subcompact and compact cars. Since the calculation of the *motor vehicle tax* is based on the cylinder capacity, the annual cost of this element is higher than for the product types 1 and 2. All of the LDVs fulfil the EURO 4 emission standard. This results in an annual motor vehicle tax of 135 to 316 The following table summarises the LCC of the purchase, use and resale of a green and non green version of light duty vehicles in Germany.

Table 74 LCC of light duty vehicles in Germany; in Euros

	LCC		Difference	
	non green version	green version (Diesel PF)	absolute	relative
Investment	15.639	16.135	496	3,2%
VAT	2.972	3.066	94	3,2%
Admission fee	25	25	0	0,00%
Motor vehicle tax	1.391	1.290	-101	-7,3%
Fuel costs	4.821	4.899	78	1,6%
Maintenance, material costs	1.313	1.313	0	0,00%
Maintenance, personnel costs	663	663	0	0,00%
End-of-life disposal	-6.525	-7.224	-699	10,7%
SUM	**20.300**	**20.167**	**-133**	**-0,7%**

Table 75 LCC of light duty vehicles in Germany; in Euros

	LCC		**Difference**	
	non green version	green version (CNG Fuel)	absolute	relative
Investment	15.639	16.325	686	4,4%
VAT	2.972	3.102	130	4,4%
Admission fee	25	25	0	0,00%
Motor vehicle tax	1.391	594	-797	-57,3%
Fuel costs	4.821	3.453	-1.368	-28,4%
Maintenance, material costs	1.313	1.313	0	0,00%
Maintenance, personnel costs	663	663	0	0,00%
End-of-life disposal	-6.525	-7.093	-568	8,7%
SUM	**20.300**	**18.383**	**-1.917**	**-9,4%**

Spain and Czech Republic

The average value of the *investment costs* for light duty vehicles in **Spain** is 31.545 € for the non green version and 32.320 € for the green version including the registration tax and the admission fee. The other cost elements are specified as already described for product types 1 and 2. The following table summarises the LCC results for Spain.

Table 76 LCC of light duty vehicles in Spain; in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment	24.590	25.196	605	2,5%
VAT	3.934	4.031	97	2,5%
Admission fee	3.020	3.092	73	2,4%
Motor vehicle tax	0	0	0	n.a.
Fuel costs	5.597	5.662	65	1,2%
Maintenance, material costs	1.773	1.773	0	0,00%
Maintenance, personnel costs	549	549	0	0,00%
End-of-life disposal	-8.100	-8.698	-598	7,4%
SUM	**31.364**	**31.606**	**242**	**0,8%**

The average value of the *investment costs* for light duty vehicles in the **Czech Republic** is 29.290 € for the non green version and 30.010 € for the green version (each including VAT and Admission fee). Since the cylinder capacity is 2 000 to 2 500 cc, the annual road tax totals 128 € per year. The other cost elements are specified as already described for product types 1 and 2. The following table summarises the LCC results for Czech Republic.

Table 77 LCC of light duty vehicles in Czech Republic; in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment	24.590	25.196	605	2,5%
VAT	4.672	4.787	115	2,5%
Admission fee	27	27	0	0,0%
Motor vehicle tax	563	563	0	0,0%
Fuel costs	5.784	5.852	69	1,2%
Maintenance, material costs	1.760	1.760	0	0,0%
Maintenance, personnel costs	198	198	0	0,0%
End-of-life disposal	-8.100	-8.698	-598	7,4%
SUM	**29.495**	**29.686**	**191**	**0,7%**

5.3.7 Sensitivity Analysis

In the preceding sections vehicles were compared in each case that were largely identical in terms of their characteristics (engine, payload, number of seats, boot volume). This meant that in the context of diesel vehicles - which are already very efficient in terms of energy efficiency - the fuel consumption and CO_2 emissions are practically identical for the conventional and green version. Indeed, a slight increase in fuel consumption and CO_2 emissions can be observed in the case of the green version (diesel with a particulate filter).

In the subsequent sensitivity analysis, medium-sized passenger cars are used to demonstrate for Germany that in the case of somewhat smaller engine equipment and a slightly smaller vehicle, the green version is also more efficient – in terms of fuel consumption and CO_2 emissions – than the conventional version. Moreover, this has the effect of reducing the total costs.

Table 78 Characterisation of the selected product type and cars for the sensitivity analysis

	VW Passat Version 2.0 TDI 103 kW Trendline	**VW Passat Version 2.0 TDI 103 kW Trendline RPF**	**VW Golf Plus 1.9 TDI 77 kW Trendline RPF**
Version	non green version	green version (1, PF)	green version (2, smaller engine and PF)
Fuel	diesel	Diesel	Diesel
Construction	estate car	estate car	estate car
Engine power	103 kW	103 kW	77 kW
Cylinder capacity	1968 ccm	1968 ccm	1896 ccm
Fuel consumption	6,0 l/100 km	6,0 l/100 km	5,6 l/100 km
CO_2 emission	162 g/km	162 g/km	148 g/km
Vehicle payload	555 kg	555 kg	530 kg
Seats for	5 people	5 people	5 people
Boot volume	603 l	603 l	395 l

The assumptions regarding the various cost elements are specified as already described for product type 2 (medium sized cars). The results in the following tables clearly document that shifting to a car with slightly smaller engine equipment leads to considerably lower life cycle costs.

Table 79 LCC of passenger cars (sensitivity analysis 1)

	LCC		Difference	
	non green version	green version (1)	absolute	Relative
Investment	22.651	23.146	495	2,2%
VAT	4.304	4.398	94	2,2%
Admission fee	25	25	0	0,00%
Motor vehicle tax	1.462	1.356	-106	-7,2%
Fuel costs	4.624	4.702	78	1,7%
Maintenance, material costs	1.898	1.898	0	0,00%
Maintenance, personnel costs	512	512	0	0,00%
End-of-life disposal	-9.751	-10.681	-930	9,5%
SUM	**25.726**	**25.357**	**-369**	**-1,4%**

Table 80 LCC of passenger cars (sensitivity analysis 2)

	LCC		Difference	
	non green version	Green version (2)	absolute	relative
Investment	22.651	18.168	-4.483	-19,8%
VAT	4.304	3.452	-852	-19,8%
Admission fee	25	25	0	0,00%
Motor vehicle tax	1.462	1.290	-172	-11,8%
Fuel costs	4.624	4.469	-156	-3,4%
Maintenance, material costs	1.898	1.491	-407	-21,5%
Maintenance, personnel costs	512	489	-23	-4,5%
End-of-life disposal	-9.751	-8.353	1.397	-14,3%
SUM	**25.726**	**21.031**	**-4.695**	**-18,3%**

5.3.8 Summary and conclusions

The following tables give an overview of the total LCC of all product types in the selected Member States.

Table 81 Total LCC of subcompact and compact cars in the four selected MS; in Euros

	Total LCC		Difference	
	non green version	green version	absolute	relative
Sweden	n.a.	n.a.	-	-
Germany	16.670	15.367	-1.303	-7,80%
Spain	12.758	12.810	52	0,40%
Czech Republic	13.353	13.430	77	0,60%

Table 82 Total LCC of medium-sized cars in the four selected MS; in Euros

	Total LCC		**Difference**	
	non green version	green version	absolute	relative
Sweden	26.040	26.183	143	0,55%
Germany	20.511	20.017 (Diesel PF) 19.212 (CNG)	-494 -1.299	-2,40% -6,30%
Spain	15.612	15.441	-171	-1,10%
Czech Republic	16.368	16.213	-156	-0,95%

Table 83 Total LCC of light duty vehicles in the four selected MS; in Euros

	Total LCC		**Difference**	
	non green version	green version	absolute	relative
Sweden	30.618	30.718	100	0,33%
Germany	18.477	18.173 (Diesel PF) 16.475 (CNG)	-303 -2.002	-1,60% -10,80%
Spain	29.048	29.144	95	0,33%
Czech Republic	27.244	27.289	45	0,20%

The main results are to be summarised as follows:

- Neither in Spain nor in the Czech Republic environmental friendly cars or fuel are supported via tax reduction. Nevertheless the life cycle costs of the here defined green versions (diesel driven cars equipped with particulate filters) are if any hardly more expensive than the non green version. Additional costs are below 1%, which is considered to be not significant.
- In Sweden as well as in Germany bio-ethanol and CNG are subsidised through tax reduction, resulting in considerable lower costs of the green version compared to the non green versions.
- The residual value of diesel driven cars equipped with particulate filter is higher than the residual value of comparable cars without this filter. This has to be considered when judging the purchase prices of those cars.

In the case of passenger cars, the procurement of green version in no case leads to substantial higher costs, but rather to slightly lower costs. The procurement of environmental friendlier passenger cars thus does not lead to higher costs, but also the cost reductions which can be expected are rather small and additionally depend on the tax policy of the Member States.

In any case, procurers should take special care when defining the engine power of the passenger cars to be purchased, to reduce CO_2 emissions to a minimum. It should always be tried to keep it as low as possible. The higher the engine power the higher the fuel consumption and CO_2 emissions of the passenger cars.

Vice versa, in the case of somewhat smaller engine equipment and a slightly smaller vehicle, the green version is also more efficient – in terms of fuel consumption and CO_2 emissions – than the conventional version. Moreover, this has the effect of reducing the total costs (see sensitivity analysis).

5.4 Product group 4: Cleaning products and services

5.4.1 Selection of different product types

The product group 'Cleaning products and services' comprises a quite big variety of cleaning products (detergents or care products) and cleaning processes in order to maintain the value and hygienic properties of buildings (floors, surfaces, windows, etc.), dishes, clothes and so on. Each of these subcategories again comprises a variety of different products and processes or steps.

For this study three types of cleaning processes were selected with regard to the following criteria:

- The process shall be relevant for most public authorities in the selected Member States;
- The cleaning process shall have high importance for public authorities (in terms of monetary value or frequency of cleaning);
- Environmental friendly detergents to be used for the cleaning process shall be available, i.e. detergents fulfilling the criteria set by the EU Eco-label scheme or a national labelling scheme in the selected Member States.

The following table gives an overview of the number of products, labelled with one of the EU or national eco-labels for cleaning products.

Table 84 Number of cleaning products with eco-labels

Organisation	Product type	Sweden	Germany	Spain	Czech Republic
EU Eco-label	All-purpose, sanitary, window cleaner	6	24	26	5
EU Eco-label	Dishwashing detergents	1	1	0	0
EU Eco-label	Hand dishwashing detergents	1	2	1	1
EU Eco-label	Laundry detergents	0	0	0	0
Nordic Swan	Cleaning products (both for private and large-scale consumers)	68	n.a.	n.a.	n.a.
Bra Miljöval	All-purpose, sanitary, window cleaner, for large-scale consumers	49	n.a.	n.a.	n.a.
Czech Eco-Label	Liquid cleaning agent (Tekuté čisticí přípravky)	n.a.	n.a.	n.a.	13

This compilation clearly shows that the only product group, where a significant number of products have an EU eco-label in each selected Member State, is the product group on all-purpose cleaners and cleaners for sanitary facilities, which also comprises window cleaners (see Commission Decision 2005). In Sweden and the Czech Republic, compared to Germany and Spain, only fewer all-purpose, sanitary and window cleaners have an EU eco-label. This can be explained by the existence of quite successful regional or national labelling schemes (Nordic Swan, Bra Miljöval, and Czech Ecolabel).

Against this background, a cleaning process which complies with the above mentioned criteria is the **maintenance cleaning** of buildings. The maintenance cleaning, conducted on a regular basis in certain intervals (e.g. daily, every two days, twice a week, etc.), is the most important cleaning process in industrial and institutional cleaning[39], and comprises various processes like cleaning of the floor covering, ceilings, walls, radiators, sanitary facilities or objects of the room setup. Additional services which are conducted during maintenance cleaning are e.g. equipment of devices with tissue paper or toilet paper, replacement of towels, etc. As the main parameters for calculating the costs, i.e. the duration of the work and the amount of detergent needed for these processes, heavily depend on the framework conditions, for instance the type of the building (e.g. administrative building, school, kindergarten, etc.), the type of the rooms to be cleaned (office space, corridors, sanitary facilities, etc.), the materials of the surfaces (hard elastic floor covering, textile covering, tiles, etc.), the applied cleaning method, the cleaning intervals, the soiling and so on, **two well specified examples** will be selected.

Another cleaning process which complies with the above mentioned criteria is the **cleaning of windows**. It is usually conducted more seldom, i.e. once or twice per year, and comprises the cleaning of the window panes, sometimes including the cleaning and maintenance of the frames or blinds.

Special cleaning processes like first cleaning (directly after the completion of a building), basic cleaning in certain longer intervals (e.g. stripping of floors to remove coatings) or laundry processes are only conducted seldom, play a minor role in the procurement of cleaning products and services or are relevant only for certain procuring authorities (e.g. hospitals). Additionally, the use of film forming sealers and the subsequent floor stripping should be avoided best possible, as heavy duty detergents have to be used and components from the coating are dissolved, both heavily contaminating the waste water. Therefore these processes are not selected for the LCCA.

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[39] For example, maintenance cleaning makes up for some 80% of the total turnover of the branch of building cleaner craft in Germany (REWI 2005)

In short, the following processes are selected for the LCCA:

- Maintenance cleaning of office space;
- Maintenance cleaning of sanitary facilities;
- Annual cleaning of windows.

A more detailed description of the processes is given in the sections on each product type.

All cleaning processes can either be conducted by the public authority itself, or the authority can contract certain cleaning processes to a cleaning company; the latter becoming more and more important in recent years.[40] In case the cleaning process is conducted by the authorities themselves, the procurement process is restricted to cleaning equipment and detergents. In case the cleaning processes shall be conducted by a cleaning company, the whole service has to be tendered for. In both cases, however, the detergents only make up a very small share of the total costs connected to the cleaning process: Cleaning is a very people-intensive process, thus the direct and indirect personnel costs make up most of the share.[41] This fact is most obvious if the cleaning processes are tendered to an external service provider.

As tendering for cleaning services becomes more important, and as the real cost structure of cleaning processes is more obvious in this case, the calculations are conducted according to the calculations usually conducted by a cleaning company (see also section 5.4.3).

5.4.2 Green and non green versions

The main environmental impacts from this product group result from the use of detergents. Their active and other ingredients can cause air pollution or ground level ozone formation (e.g. volatile organic compounds used as solvent or cleaning agent) or might have hazardous effects on aquatic environment as the waste water including soil and detergents is drained in the sewage system after the cleaning process (typical ingredients which might have hazardous effects on the aquatic environment and/or have the potential of bioaccumulation are surfactants, builders, complexing agents, perfumes, colouring agents, biocides etc.).

40 The European cleaning sector has continuously increased since 1989. In 2003 it generated a turnover of 44,5 billion Euros, which represents an increase of 9% compared with the turnover of the previous year (GDP growth was 1,3%). It is assumed that the market penetration reached 61% in 2003, which means that only 39% of all cleaning processes are conducted by the owners of the premises themselves. Also the total number of cleaning companies grew by some 8% to 94 000 in 2003 (compared to 2002), employing more than 3 million employees. Most of the companies (86%) had less than 50 employees, meaning the sector is strongly dominated by small and very small companies. (all information: EFCI 2007)

41 According to EFCI (2007) about 75% of the total employers' costs are labour costs. For a detailed cost structure see also section 5.4.3.

Other environmental impacts are, for example, use of resources for and waste generation from packaging and water or energy demand of the cleaning processes themselves (e.g. electricity and water demand of cleaning machines, dishwashers or washing machines). In addition some ingredients might also have a negative impact on the occupational health of employees using the detergents.[42]

To 'green-up' cleaning processes the main leverages are to reduce the absolute consumption of cleaning products (e.g. through correct dosage), to totally avoid certain cleaning products (e.g. disinfection agents for maintenance cleaning, highly acidic or alkaline products, air fresheners, toilet bleach blocks, etc.) or to use more environmental friendly detergents (e.g. detergents containing less harmful substances). The differences between 'regular' and 'correct' dosage or cost differences through reduced variety of used cleaning products are very difficult to quantify. The only greening measure of cleaning processes which can be systematically operationalised with regard to costs is the **use of more environmental friendly detergents**.

In the study at hand, it is therefore assumed that in the green cleaning processes detergents are used, which comply with the criteria set by the following eco-labels:[43]

- EU Eco-label for all-purpose cleaners and cleaners for sanitary facilities (Decision 2005/344/EC);
- Nordic Swan (Nordic Ecolabelling of cleaning products);
- Bra Miljoval (Good Environmental Choice Criteria 'Chemical Products');
- Czech Eco-label (ekologicky šetrných výrobků).

As non green cleaning processes, equivalent 'conventional' detergents are used, which do not comply with the criteria set by one of these eco-labels.

As limitation it has to be stated that especially the EU eco-label is meant for cleaning products for use in private households and it might not be applied to all detergents used for industrial or institutional cleaning purposes, as in professional cleaning partly other cleaning products are used. However, it is assumed that, if purchasing authorities tender for cleaning products that comply with a set of criteria which are at least similar to the criteria of the above mentioned eco-labels, the price difference will be comparable to the price difference

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42 See e.g. Oehme and Klade (2003), ICLEI 2007; Bouwer et al. 2006.

43 The Catalonian Eco-label ("Guarantee of Environmental Quality") does not set criteria for cleaning products.

determined in this market research. In addition, especially with regard to maintenance cleaning, detergents meant for private and those meant for institutional use are relative similar or even identical.

5.4.3 Calculation and cost elements

Even though the detergent is the sole difference between the green and the non green version of the cleaning processes as specified above, it does not make sense to only look at the purchasing costs for the detergents as they make up for only a minor share of the total costs of cleaning processes (see also section 5.4.1). A sole focus on this cost element would give a wrong picture of the relative cost differences between the two versions. Therefore all direct and indirect costs connected to the cleaning process shall be considered.

The costs for cleaning services are usually calculated by the time used for the various cleaning processes times the hourly rate of the building cleaner (including all direct and indirect costs for the cleaning process):

Costs for cleaning = time used for cleaning x hourly rate of the building cleaner

The **time used for the cleaning process** depends highly on the framework conditions, such as age and type of the building, type of the rooms to be cleaned, type of materials of the surfaces, the applied cleaning method, frequency of cleaning, and so on. The time will be calculated for three different cleaning processes which are exemplary for cleaning processes conducted in public buildings (see also selection of the product types (section 5.4.1) and sections on the selected products).

To calculate the **hourly rate**, building cleaners start from the wage for an employee actually cleaning and add surcharges for all direct and indirect costs they have to bear (including the costs for detergents) as well as a surcharge for risk and profits.

The following table show the typical simplified cost structure of a cleaning service provider in Sweden, Germany and Spain, giving a typical costs structure of the cleaning service.

Table 85 Typical calculation of the hourly rate by Swedish, German and Spanish cleaning service providers

	Sweden		**Germany**		**Spain**	
Standard wage per hour	100%	10,62 €	100%	7,87 €	100%	6,71 €
Social insurance (old age-, health-, unemployment- and other insurances)	33%	3,44 €	24%	1,86 €	34%	2,27 €
Other labour costs (continuation of payments during holidays and bank holidays, or to sick workers)	31%	3,29 €	32%	2,54 €	18%	1,21 €
Wages for supervisory, technical and administrative staff	11%	1,17 €	10%	0,76 €	1%	0,06 €

	Sweden		Germany		Spain	
Costs for cleaning products and incidentals[44]	8%	0,85 €	3%	0,25 €	5%	0,36 €
Costs for cleaning machines and their running costs	9%	0,96 €	2%	0,17 €	0%	0,00 €
Other costs (taxes, certification, liability insurance, other administrative costs, works council etc.)	8%	0,85 €	4%	0,32 €	16%	1,05 €
Risk and profits	6%	0,64 €	5%	0,39 €	12%	0,82 €
Total hourly rate	**206%**	**21,81 €**	**180%**	**14,17 €**	**186%**	**12,48 €**

Information sources:

- **Sweden**: Shares and absolute figures in Swedish Krona received from Almega.[45]
- **Germany**: Shares derived from information received from Pfiff Institut GmbH and from a German cleaning company submitting an offer to a German procuring authority in 2007. Standard wage per hour: Tariff group 1 for staff employed for indoor and maintenance cleaning processes (according to the 'Lohntarifvertrag' for the employees in building cleaner craft, valid from 01 April 2004 in the western federal states of the Federal Republic of Germany).
- **Spain**: Shares derived from training module on the web portal '1a3soluciones.com – El Portal Oficial de la limpieza professional'. The hourly wage for Spain (rate for Madrid) was received from European Federation of Cleaning Industries (EFCI).
- **Czech Republic**: In spite of consequent inquiry e.g. at 'IP managering'[46], information on a typical cost structure could not be received. It is additionally assumed that outsourcing of cleaning services is not so common in the Czech Republic compared to the other Member States, but that most authorities still conduct the cleaning processes with own staff. In case of the Czech Republic, only the prices of detergents with and without eco-labels are compared.

To calculate the costs for the green and non green version, all costs are assumed to be identical, except the 'costs of cleaning products and incidentals'. Even though this category comprises more than just the detergents, these costs will be changed according to the

44 Except water and electricity which are usually supplied by the contracting authority.

45 Almega is a Swedish organisation that supports service companies in Sweden; www.almega.se.

46 IP managering is a privately owned company that does everything about cleaning - selling cleaning products, making lectures and seminars how cleaning should be organised for large clients (both for cleaning companies and for their clients).

relative difference between the costs of conventional and eco-labelled detergents, determined by a market research in the four Member States. This simplification is acceptable as the 'costs of cleaning products and incidentals' only make up for a minor share of the overall costs (resulting in only a small error).

The **market research for prices of detergents** builds upon different information sources, like demanding offers or price lists from suppliers and internet research. Only recent prices not older than one year have been included. The prices are drawn from manufacturers or suppliers and consider the typical size of the trading unit the supplier offer.

The following table shows the scope of the market research by indicating the sample size.

Table 86 Market research - standard deviation and sample size

Product type	Sample size (n°. of products)
All-purpose cleaners	60
Cleaners for sanitary purposes	31
Window cleaners	28

5.4.4 Limitations

Regarding the determination of the prices of detergents several difficulties were encountered, which lead to some limitations regarding the reliability of the results:

- The market research was started with manufacturers of eco-labelled products and manufacturers which are organised in the national industry associations for detergent manufacturers of the selected Member States.[47] As especially companies which do not offer eco-labelled detergents were quite reluctant to tell the prices for their products (because of no real purchase intention), the market research was successively extended to an internet research on various manufacturers' websites and web-portals for cleaning products. This means, however, that the prices collected by this market research might differ from prices a purchasing authority or a cleaning company would have to pay, as they usually would buy bigger volumes or have longer business relationships, resulting in lower prices. Due to the financial and time limits of this study, it had not been possible to gain more comprehensive price data.

[47] Spain: Asociación de Empresas de Detergentes y de Productos de Limpieza, Mantenimiento y Afines (ADELMA), Germany: Industrieverband Hygiene und Oberflächenschutz (IHO), Sweden: The Swedish Association of Industrial and Institutional Hygiene Products (IIH); Czech Republic: Czech Soap and Detergent Products Association (CSDPA).

- The comparison of the prices of *all purpose cleaners and cleaners for sanitary facilities* is quite difficult, as their concentration varies to a large extend, resulting in different surface areas which can be cleaned per litre or kilogram or cleaning product. As the prices have to be compared for the same function to be delivered, they are as far as possible calculated per one litre of suds (wash water), i.e. considering the recommended dosage of the products. The dosage, however, depends on the degree of soiling. Manufacturers therefore usually give bandwidths. In these cases the mean dosage was taken for calculation.
- In case of *window cleaners* only prices of products were compared which are purely applied. The costs were consequently calculated per litre pure product (which is in accordance to the specification of the EU eco-label, where the criteria for window cleaners are calculated in relation to 100 g of the product).
- Talking with professional window cleaners, they usually do not use special window cleaners, but hand dishwashing detergent instead (diluted in water, using squeegees, scrapers, etc.). However, in all selected Member States only one hand dishwashing detergent bearing the EU eco-label is on offer.
- Last not least it is impossible to say anything about the cleaning performance that can be achieved with the different detergents (using the same cleaning methods in either case).

5.4.5 Product type 4.1: Cleaning of office space

5.4.5.1 Functional unit and alternatives to be analysed

In the study at hand the annual costs for cleaning an exemplary office space shall be calculated. The following table describes the equipment and cleaning frequency of the office space.

Table 87 Specification of office space and cleaning technique and frequency

Surfaces, furniture and equipment to be cleaned/equipped	Cleaning specification and frequency
Surface area: size	29 m^2
Preparatory operations	Every working day (5 x per week)
2 desks and chairs	Surface to be cleaned twice a week
2 radiators	Surface to be cleaned once a week
Built-in cupboard	Soil traces every working day (5 x per week), complete cleaning once a month
Window sill and paintings	Surface/frame to be cleaned once a week
Door leafs	Handle and surrounding to be cleaned every working day (5 x per week)
Ceiling lamp	To be cleaned once a month
Floor (hard elastic floor covering, e.g. PVC, linoleum)	29 m^2, single stage mopping twice a week

2 dust bins	To be equipped with bags every work day (5 x per week)
Personal allowance	6%

As described in section 5.4.2 the following alternatives are regarded:

- **Non green version:** Cleaning with conventional cleaners, i.e. non-labelled cleaning products (all purpose cleaners, floor cleaning and floor care products)
- **Green version:** Cleaning with detergents (all purpose cleaners, floor cleaning and floor care products) labelled with one of the following eco-labels:
  - EU Ecolabel for all-purpose cleaners (Decision 2005(344/EC);
  - Nordic Swan (Nordic Ecolabelling of cleaning products);
  - Bra Miljoval (Good Environmental Choice Criteria ‘Chemical Products);
  - Czech Ecolabel (ekologicky šetrných výrobků).

5.4.5.2 System boundaries

All costs which are usually accounted for by a cleaning service provider are considered, except for the Czech Republic, where only costs for the detergents could have been determined (for included cost elements see section 5.4.3).

Data quality requirements:

- **Time-related coverage:** For this LCC study only cost data is used which is not older than 1 year.
- **Geographical coverage:** For this LCC study cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic).
- **Allocation procedures:** General and administrative costs which cannot directly attributed to the cleaning process itself (e.g. costs for technical or administrative staff, taxes, etc.) are added to the direct costs for the cleaning process according a typical cost calculation of cleaning companies. The detailed calculation structure is laid down in section 5.4.3.

5.4.5.3 Results

Annual working hours

With an assumed average number of 252 working days per year,[48] the total surface area to be cleaned sums up to 7 308 m^2 per year. According to REFA time studies (REFA 2007), the

[48] i.e. without weekends and bank holidays.

performance index for cleaning of such an office space is 249 m^2 per hour. It is assumed that the performance index can be applied to all selected Member States. A typical cleaning service provider thus will charge 29,35 hours per year to clean this office space. The following table summarises the assumptions and calculations.

Table 88 Calculation of annual working hours to clean the defined office space

Item	Specification	Source
Surface area: size	29 m^2	assumption
Number of work days per year	252	typical figure
Surface area to be cleaned per year	7.308 m^2	calculated
Performance index	249 m^2/h	REFA time studies
Working hours needed for cleaning per year	29,35 h	calculated

Prices for detergents

The following table summarises the prices of the non green and green version of all-purpose cleaners and floor care products in the selected Member States.

Table 89 Prices of all-purpose cleaners and floor care products in the selected Member States

	Price per 100 litres suds (use concentration)		Difference	
	non green version	green version	absolute	relative
Sweden	3,97 €	2,80 €	-1,17 €	-29%
Germany	2,80 €	3,90 €	1,10 €	39%
Spain	38,97 €	65,06 €	26,10 €	67%
Czech Republic	2,02 €	5,54 €	3,52 €	175%

The prices for all-purpose cleaners and floor care products in Spain are much higher than the prices in all other regarded Member States. This results from the much higher recommended dosage for the products. For example, the dosage instructions in Sweden, Germany and Czech Republic vary between approximately 10 and 180 ml cleaning product per 10 litres water, resulting in 56 to 1 000 litres of suds per litre cleaning product. In Spain, however, most all-purpose cleaners and floor care products have to be applied purely or only diluted to a very small extend, e.g. 1 litre of product would give 1 to 8 litre of suds (with exceptions). The prices per litre of cleaning product however were very similar, resulting in much higher prices per litre of suds.

The following tables gives the annual costs for the green and non green version of this cleaning process, differentiated according to the typical cost structure of a building cleaner in Sweden, Germany and Spain.

Table 90 Cost structure for cleaning the defined office space in Sweden (rounded figures)

	Cost structure		Difference	
	non green version	green version	absolute	relative
Wages cleaning staff	312 €	312 €	0,0	0%
Social insurance	101 €	101 €	0,0	0%
Other labour costs	97 €	97 €	0,0	0%
Wages other staff	34 €	34 €	0,0	0%
Cleaning products	25 €	18 €	-7,3	-29%
Machines	28 €	28 €	0,0	0%
Other costs	25 €	25 €	0,0	0%
Risk and profits	19 €	19 €	0,0	0%
SUM	**640 €**	**633 €**	**-7,3**	**-1%**

Table 91 Cost structure for cleaning the defined office space in Germany

	Cost structure		Difference	
	non green version	green version	absolute	relative
Wages cleaning staff	231 €	231 €	0,0	0%
Social insurance	55 €	55 €	0,0	0%
Other labour costs	75 €	75 €	0,0	0%
Wages other staff	22 €	22 €	0,0	0%
Cleaning products	7 €	10 €	2,9	39%
Machines	5 €	5 €	0,0	0%
Other costs	9 €	9 €	0,0	0%
Risk and profits	12 €	12 €	0,0	0%
SUM	**416 €**	**419 €**	**2,9**	**1%**

Table 92 Cost structure for cleaning the defined office space in Spain

	Cost structure		Difference	
	non green version	green version	absolute	relative
Wages cleaning staff	197 €	197 €	0,0	0%
Social insurance	67 €	67 €	0,0	0%
Other labour costs	35 €	35 €	0,0	0%
Wages other staff	2 €	2 €	0,0	0%
Cleaning products	11 €	18 €	7,1	67%
Machines	n.a.	n.a.	n.a.	n.a.
Other costs	31 €	31 €	0,0	0%
Risk and profits	24 €	24 €	0,0	0%
SUM	**366 €**	**373 €**	**7,1**	**2%**

5.4.6 Product type 4.2: Cleaning of sanitary facilities

5.4.6.1 Functional unit and alternatives to be analysed

In the study the costs for cleaning of an exemplary sanitary facility (28,5 m^2) for one year shall be calculated. The following table describes the equipment and cleaning frequency of the sanitary facility.

Table 93 Specification of sanitary facility and cleaning technique and frequency

Surfaces, furniture and equipment to be cleaned / equipped	Cleaning specification and frequency
Surface area: size	28,5 m^2
Preparatory operations	Every work day (5x per week)
2 washbasins	Interior to be cleaned 4x per week, complete cleaning once a week
2 mirrors	Surface to be cleaned every work day (5x per week)
3 toilets / toilet cabins	Interior of toilet to be cleaned 4x per week (including surrounding tiles), complete cleaning once a week; cabin to be cleaned every work day (5x per week)
1 radiator	Surface to be cleaned 4x per week, complete cleaning once a week
3 small dustbins (in cabins) and 1 large dustbin (at washbasins)	To be equipped with bags every work day (5x per week)
Window sill	Surface to be cleaned once a week
Door leafs	Handle and surrounding to be cleaned 4x per week, complete cleaning once a week
3 ceiling lamps	To be cleaned once a week
Floor (hard elastic floor covering, e.g. PVC, linoleum)	28,5 m^2, single stage mopping twice a week
Personal allowance	6%

As described in section 5.4.2 the following alternatives are regarded:

- **Non green version:** Cleaning with conventional, i.e. non-labelled cleaning products (all purpose cleaners, floor cleaning and floor care products)
- **Green version:** Cleaning with cleaners for sanitary facilities labelled with one of the following eco-labels:
  - EU Eco-label for sanitary cleaners (Decision 2005/344/EC),
  - Nordic Swan (Nordic Ecolabelling of cleaning products),
  - Bra Miljoval (Good Environmental Choice Criteria ‘Chemical Products’),
  - Czech Eco-label (ekologicky šetrných výrobků).

5.4.6.2 System boundaries

All costs which are accounted for by a typical cleaning service provider are considered (for included cost elements see section 5.4.3).

Data quality requirements:

- **Time-related coverage:** For this LCC study only cost data is used, which is not older than 1 year.
- **Geographical coverage:** For this LCC study cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic).
- **Allocation procedures:** General and administrative costs which cannot directly attributed to the cleaning process itself (e.g. costs for technical or administrative staff, taxes, etc.) are added to the direct costs for the cleaning process according a typical cost calculation of cleaning companies. The detailed calculation structure is laid down in section 5.4.3.

5.4.6.3 Results

With an assumed average number of work days per year of 252 days,[49] the total surface area to be cleaned sums up to 7 182 m^2 per year. According to REFA time studies (REFA 2007), the performance index for the cleaning of such an office space is 87,3 m^2 per hour. It is assumed that the performance index can be applied to all selected Member States. A typical cleaning service provider thus will charge 29,4 hours per year to clean this office space. The following table summarises the assumptions and calculations.

Table 94 Calculation of annual working hours to clean the defined office space

Item	Specification	Source
Surface area: size	28,5 m^2	assumption
Number of work days per year	252	typical figure
Surface area to be cleaned per year	7.182 m^2	calculated
Performance index	87,3 m^2/h	REFA time studies
Working hours needed for cleaning per year	82,27 h	calculated

The following table summarises the prices of the non green and green version of sanitary cleaning products in the selected Member States.

49 i.e. without weekends and bank holidays.

Table 95 Prices of sanitary cleaning products in the selected Member States

	Price per 100 litre suds (use concentration)		**Difference**	
	non green version	green version	absolute	relative
Sweden	6,16 €	0,82 €	-5,33 €	-87%
Germany	2,92 €	7,24 €	4,31 €	148%
Spain	51,00 €	78,05 €	27,05 €	53%
Czech Republic	1,99 €*	1,37 €*	-0,62 €	-31%

* Price per litre of product

As with all-purpose cleaners, the prices for cleaners for sanitary facilities in Spain are much higher than the prices in the other regarded Member States. This again results from the mostly much higher recommended dosage for the products (see also section 5.4.5.3).

Unfortunately, for the Czech sanitary cleaners with eco-label no dosage information could be received. For comparability reasons the prices for sanitary cleaners in the Czech Republic therefore refer to 1 litre of cleaning product.

The following tables give the annual costs for this cleaning process conducted in the selected Member States, differentiated according to the typical cost structure of a building cleaner.

Table 96 Cost structure for cleaning the defined sanitary facility in Sweden

	Cost structure		**Difference**	
	non green version	green version	absolute	relative
Wages cleaning staff	873 €	873 €	0,0	0%
Social insurance	283 €	283 €	0,0	0%
Other wage connected costs	271 €	271 €	0,0	0%
Wages other staff	96 €	96 €	0,0	0%
Cleaning products	70 €	9 €	-60,5	-87%
Machines	79 €	79 €	0,0	0%
Other costs	70 €	70 €	0,0	0%
Risk and profits	52 €	52 €	0,0	0%
SUM	**1.794 €**	**1.734 €**	**-60,5**	**-3%**

Table 97 Cost structure for cleaning the defined sanitary facility in Germany

	Cost structure		Difference	
	non green version	green version	absolute	relative
Wages cleaning staff	647 €	647 €	0,0	0%
Social insurance	153 €	153 €	0,0	0%
Other wage connected costs	209 €	209 €	0,0	0%
Wages other staff	63 €	63 €	0,0	0%
Cleaning products	21 €	51 €	30,6	148%
Machines	14 €	14 €	0,0	0%
Other costs	27 €	27 €	0,0	0%
Risk and profits	32 €	32 €	0,0	0%
SUM	**1.165 €**	**1.196 €**	**30,6**	**3%**

Table 98 Cost structure for cleaning the defined sanitary facility in Spain

	Cost structure		Difference	
	non green version	green version	absolute	relative
Wages cleaning staff	552 €	552 €	0,0	0%
Social insurance	187 €	187 €	0,0	0%
Other wage connected costs	99 €	99 €	0,0	0%
Wages other staff	5 €	5 €	0,0	0%
Cleaning products	30 €	45 €	15,7	53%
Machines	0 €	0 €	n.a.	n.a.
Other costs	87 €	87 €	0,0	0%
Risk and profits	67 €	67 €	0,0	0%
SUM	**1.027 €**	**1.043 €**	**15,7**	**2%**

5.4.7 Product type 4.3: Window cleaning

5.4.7.1 Functional unit and alternatives to be analysed

In the study the costs for cleaning a certain number of exemplary windows shall be calculated. The following table describes the specifications and cleaning frequency of the windows.

Table 99 Specification of cleaning of an exemplary window

Surfaces, furniture and equipment to be cleaned / equipped	Cleaning specification and frequency
Type	Single window
Dimension	Width: 0,9 m; hight: 1,8 m; surface: 1,62 m^2
Preparatory operations, incl. clearing window sills and place items back	Once per window
Cleaning of pane	Both sides of the window
Cleaning of frame and rebates	Once per window
Personal allowance	6%

As described in section 5.4.2 the following alternatives are regarded:

- **Non green version:** Cleaning with conventional, i.e. non-labelled window cleaners
- **Green version:** Cleaning with window cleaners labelled with one of the following eco-labels:
  - EU Eco-label for all-purpose cleaners (Decision 2005(344/EC)),
  - Nordic Swan (Nordic Ecolabelling of cleaning products),
  - Bra Miljoval (Good Environmental Choice Criteria 'Chemical Products'),
  - Czech Eco-label (ekologicky šetrných výrobků).

5.4.7.2 System boundaries

All costs which are accounted for by a typical cleaning service provider are considered (for included cost elements see section 5.4.3).

Data quality requirements:

- **Time-related coverage:** For this LCC study only cost data is used, which is not older than 1 year.
- **Geographical coverage:** For this LCC study cost data is used which is representative for purchasing authorities in the selected member states (Sweden, Germany, Spain and Czech Republic)
- **Allocation procedures:** General and administrative costs which cannot directly attributed to the cleaning process itself (e.g. costs for technical or administrative staff, taxes, etc.) are added to the direct costs for the cleaning process according a typical cost calculation of cleaning companies. The detailed calculation structure is laid down in section 5.4.3.

5.4.7.3 Results

In contrast to maintenance cleaning, the cleaning of the above described window is usually only conducted once or twice per year. Therefore the costs per cleaning procedure are calculated.

The window surface area to be cleaned is 1,62 m^2 per window. According to REFA time studies (REFA 2007), the performance index for the cleaning of the described window is 26,3 m^2 per hour. It is assumed that the performance index can be applied to all selected Member States. A typical cleaning service provider thus will charge 0,06 hours per window. With an example of 50 windows to be cleaned, the total time sums up to 3,08 hours. The following table summarises the assumptions and calculations.

Table 100 Calculation of annual working hours to clean the defined window(s)

Item	Specification	Source
Surface area per window	1,62 m^2	calculated from assumed dimensions
Performance index	26,3 m^2/h	REFA time studies
Working hours needed for cleaning per window	0,06 h	calculated
Example: working hours needed for 50 windows	3,08 h	calculated

The following table summarises the prices of the non green and green version of window cleaners in the selected Member States.

Table 101 Prices of window cleaners in the selected Member States

	Price per litre product		Difference	
	non green version	green version	absolute	relative
Sweden	4,96 €	2,60 €	-2,36 €	-48%
Germany	4,02 €	2,57 €	-1,45 €	-36%
Spain	1,18 €	2,28 €	1,10 €	94%
Czech Republic	2,65 €	3,87 €	1,21 €	46%

In contrast to the prices for all-purpose cleaners and cleaners for sanitary facilities, the prices for window cleaners are given per litre of product. Only prices for window cleaners supposed to be applied purely were considered.

The following tables give the cost structure for this cleaning process conducted in the selected Member States, differentiated according to the typical cost structure of a building cleaner.

Table 102 Cost structure for cleaning the defined number of windows in Sweden

	LCC structure		Difference	
	non green version	green version	absolute	relative
Wages cleaning staff	33 €	33 €	0,0	0%
Social insurance	11 €	11 €	0,0	0%
Other wage connected costs	10 €	10 €	0,0	0%
Wages other staff	4 €	4 €	0,0	0%
Cleaning products	3 €	1 €	-1,2	-48%
Machines	3 €	3 €	0,0	0%
Other costs	3 €	3 €	0,0	0%
Risk and profits	2 €	2 €	0,0	0%
SUM	**67 €**	**66 €**	**-1,2**	**-2%**

Table 103 Cost structure for cleaning the defined number of windows in Germany

	LCC structure		Difference	
	non green version	green version	absolute	relative
Wages cleaning staff	24 €	24 €	0,0	0%
Social insurance	6 €	6 €	0,0	0%
Other wage connected costs	8 €	8 €	0,0	0%
Wages other staff	2 €	2 €	0,0	0%
Cleaning products	0,8 €	0,5 €	-0,3	-36%
Machines	1 €	1 €	0,0	0%
Other costs	1 €	1 €	0,0	0%
Risk and profits	1 €	1 €	0,0	0%
SUM	**44 €**	**43 €**	**-0,3**	**-1%**

Table 104 Cost structure for cleaning the defined number of windows in Spain

	LCC structure		Difference	
	non green version	green version	absolute	relative
Wages cleaning staff	21 €	21 €	0,0	0%
Social insurance	7 €	7 €	0,0	0%
Other wage connected costs	4 €	4 €	0,0	0%
Wages other staff	0 €	0 €	0,0	0%
Cleaning products	1 €	2 €	1,0	94%
Machines	n.a.	n.a.	n.a.	n.a.
Other costs	3 €	3 €	0,0	0%
Risk and profits	3 €	3 €	0,0	0%
SUM	**38 €**	**39 €**	**1,0**	**3%**

5.4.8 Summary and conclusions

The following tables summarise the total costs and the differences between the green and the non green version for the 3 defined product (service) types in Sweden, Germany and Spain (no overall costs could have been calculated for the Czech Republic).

Table 105 Total costs for cleaning of office space in Sweden, Germany and Spain

Office space	Total costs		Difference	
	non green version	green version	absolute	relative
Sweden	640 €	633 €	-7,3	-1%
Germany	416 €	418 €	2,4	1%
Spain	366 €	373 €	7,1	2%

Table 106 Total costs for cleaning of sanitary facilities in Sweden, Germany and Spain

Sanitary facilities	Total costs		Difference	
	non green version	green version	absolute	relative
Sweden	1.794 €	1.737 €	-60,5	-3%
Germany	1.165 €	1.196 €	30,6	3%
Spain	1.027 €	1.054 €	15,7	2%

Table 107 Total costs for cleaning of windows in Sweden, Germany and Spain

Windows	Total costs		Difference	
	non green version	green version	absolute	relative
Sweden	67 €	67 €	-0,6	-1%
Germany	44 €	43 €	-0,3	-1%
Spain	38 €	39 €	1,0	3%

With regard to the results and the limitations outlined in section 5.4.4, the following conclusions can be drawn:

- The costs for cleaning processes are highly dominated by labour costs. The costs for cleaning products only make up for a small share in the selected Member States (between 3 and 8%, including even other incidentals).
- The overall differences of cleaning processes if ‘conventional’ or eco-labelled cleaning products are used are not considered to be significant.
- The prices for detergents labelled with one of the above mentioned eco-labels are partly lower and partly higher than the prices for equivalent non-labelled cleaning products. It cannot be universalised that eco-labelled cleaning products are in general more or less expensive than equivalent non-labelled cleaning products. The prices vary

to a similar extend, due to the amount purchased and due to the brand name of the product compared.

- To compare prices for detergents is a difficult task. Not only the price per litre or kg of product, but also the concentration and with that, the recommended dosage varies between the products on the market. In addition, no measure of the performance of the detergents is given.
- A frequent comment encountered during the market research was, that the detergents labelled with the EU eco-label are only meant for private purposes and not for industrial or institutional cleaning. This is true for some professional cleaning processes; however in some cases detergents for private use are generally used also for professional purposes. However it seems to be useful to develop eco-label criteria for professional cleaning and care products.
- Other means of greening cleaning processes are supposed to result in cost reductions in any case, e.g. the consequent use of concentrates, the correct dosage of the products by proper use of dosage devices or the avoidance of special cleaning products, which are neither environmental friendly nor necessary for maintenance cleaning. However, it is not possible to quantify the savings though these measures on a general basis.

5.5 Product group 5: Clothing

5.5.1 Selection of different product types

For the investigation of life cycle costs in clothing procurement it was considered most important to select products which are relevant for public clothing procurement in the four selected Member States (1). Furthermore, to get a broad overview of life cycle costs, products were selected which are used in different operational areas (e.g. in hospitals, in canteens) (2), and a green and a non green version had to exist (3).

A first analysis showed that – taking these criteria into account – the following products would make sense for the analysis of life cycle costs in clothing procurement: coats for hospital staff, apron dresses for cooks, and police shirts. The Commission suggested integrating military clothing, as there was evidence that in Switzerland GPP is regularly applied in the defence sector. Thus, a typical clothing product for military clothes (underpants) was integrated in the analysis instead of apron dresses for cooks.

In the following, the reasons for the selection are given:

- The proposed products are typical for clothing procurement in the four selected Member States:
  The proposed products are quite typical for public clothing procurement: every country has a police or armed forces and public hospitals. The selected products are typical clothing for the selected operational areas.
  The demand for the three proposed products – coats for hospital staff, military clothing and police shirts – in public procurement is different: it could be assumed that the demand for military clothing for the armed forces is high, whereas the demand for police shirts for the countries police forces and for coats for hospital staff is lower. The amount of clothing demanded could have an influence on the life cycle costs (or even on the existence of a green alternative). In general, the variety of clothing needed by public procurers is quite huge and the specific needs differ from institution to institution.
- The proposed products belong to three different operational areas: hospitals, armed forces and police.
- The proposed products have green and non green alternatives:
  It has to be stated that it is quite easy to define a 'green' version for clothing – but, and this is very important for procurers, the green versions are still niches on the global clothing market. Regarding the standard offers of manufacturers, green clothing is quite rare.

5.5.2 Green and non green versions

As mentioned above it is quite easy to define criteria for a green alternative, as various textile labels exist which set standards for green textiles.

In general, green procurement in the textile/clothing sector means the procurement of clothing fulfilling the 'Öko-Tex Standard 100'. This is called 'light green'[50]. The 'Öko-Tex standard 100' criteria address aspects relevant for human toxicology in the end product. Ecological aspects concerning the production process, e.g. the reduction of problematic chemicals, are not element of 'Öko-Tex standard 100'. Thus, fulfilling the criteria of 'Öko-Tex standard 100' could not be seen as a real green alternative in textile/clothing procurement.

Most relevant criteria for Europe for environmentally sound purchasing of clothing, however, are the criteria of the European Eco-label (the EU flower[51]) for textiles, which will be set as

50 http://www.gpp-europe.net/GPPdata/01c00e98700d83208/index.html

51 http://ec.europa.eu/environment/ecolabel/product/pg_clothing_textiles_en.htm

basis for the green alternative in this study. These criteria are defined in the annex to the Commission decision of 15 May 2002 (2202/371/EC) and were valid until 31 May 2007.

The green and non green versions are specified as follows:

- **Non green version**: conventional products which do not fulfil any standards.
- **Green version**: products which fulfil at least the EU Eco-label standards for textiles (2002/371/EC). A certificate for fulfilling the standards is needed. This can be proven by labels (e.g. the 'EU-flower') or by comparable certificates which indicate that the clothing's manufacturing took place in accordance with the mentioned standard.

5.5.3 Calculation and cost elements

The analysis will only refer to the purchasing costs. It does not include costs deriving from the washing of the clothing (e.g. energy and water costs or costs for staff). Main reason is that these cost factors do not always occur; sometimes the clothing will be washed privately, sometimes the public authority is responsible for the washing. Furthermore, in some cases the public authority has its own laundry, and normally personnel costs are not calculated in the procurement of clothing.[52] As those costs will not be different for the green and the non green version their exclusion will not change the results.

5.5.4 Results of the market research

Green procurement in the textile/clothing sector usually is equated with the procurement of clothing fulfilling the 'Öko-Tex Standard 100', which is called 'light green'. However, as already outlined above (see section 5.5.2) this standard does not cover environmental aspects but merely aspects regarding human toxicology in the end product. Thus, in this study it was tried to obtain cost data for really green alternatives (EU flower and/or organic cotton). For this market research both procurers and suppliers have been contacted.[53]

In the market research we tried to get cost data for the products which were selected in the beginning:

- Cotton/polyester coats for hospital staff, typical for the countries' preferences concerning colour and fabrics;
- Cotton/polyester underpants for military use, typical for the countries' preferences concerning colour, size and fabrics;
- Cotton/polyester police shirts, typical for the countries' preferences concerning colour, size and fabrics.

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[52] This is the case e.g. for some hospitals.

[53] A detailed list of survey contacts is shown in the annex.

As the market research for these products showed that it would be quite difficult to obtain cost data, we also tried to get cost data for other products. For example, we searched the EU flower website for suppliers fulfilling the EU flower criteria for textiles. This investigation led to a list of companies (cf. annex) which were analysed concerning their product portfolio, both with regard to the products selected and also with regard to other clothing products relevant to public procurers. The analysis showed that only one company offers products relevant for public procurement: F. Engel K/S in Denmark. Their product portfolio includes **work wear**, e.g. overalls for refuse collection staff.

Because of the unedifying research results concerning concrete cost data it was also tried to obtain cost data for the procurement of **cotton roll towels** for a green and a non green alternative.

The green versions had to fulfil at least the EU Eco-label standards for textiles (2002/371/EC) or standards for organically grown cotton and Öko-Tex Standard 100 for the production process.

Unfortunately, the research results showed that currently green clothing textiles play no role in public procurement at all; except for certain pilot projects (e.g. City police of Zurich, see below). Thus, no concrete figures on costs could have been obtained for clothing. Furthermore, due to the findings with regard to the Zurich pilot project on police shirts, it was decided that it is not applicable to use cost data for clothing for private consumers instead, because for private consumers green clothes are in general much more expensive than conventional clothes. This would give a wrong picture on the (low) cost differences between green and non green versions which can be expected in public procurement.

However, some interesting findings on availability, costs and purchasing habits in the product group ‘Clothing’ could be obtained which are described in detail in the following paragraphs.

- Hospitals in general purchase clothing/textiles in ‘packages’, meaning that **coats for hospital staff** are purchased together with e.g. bed linen and other textiles. Thus, the hospitals’ tendering will disclose all products to be procured together, and – and this is quite important for the analysis of life cycle costs – the price offers will be given for the whole ‘package’. This makes it impossible to get the procurement costs from hospitals for only one product. Furthermore, the contacted persons in the hospitals – even in the as to environmental belongings quite innovative University Medical Center in Freiburg, Germany (‘Universitätsklinik Freiburg’) – explained that neither textiles/clothing made from organically grown cotton, nor textiles/clothing fulfilling the EU flower criteria are used. The reason is that Eco-clothing (organic cotton or EU flower) generally is not offered on the market.

- According to information of the official company managing the whole clothing administration of the German armed forces[54] (i.e. both the procurement of new clothing as well as organisation of the laundry services), the **procurement of military clothing** has to be announced EU-wide (TED). Indicated as business secrets, supplier's addresses could not be obtained from the 'LH Bundeswehr Bekleidungsgesellschaft'. Analysing the announcement on the TED Website[55], no calls for procurement of military clothing could be found.
- The research concerning cost data for the procurement of green and non green **police shirts** led to no result, as cost data currently are not available. The procurement of green police shirts is a pilot project of the city police of Zurich in collaboration with manufacturers (Mazan n.d.). Even though it was not possible to get any concrete figures at this stage of the on-going project, the intermediate results are quite encouraging (N.N. 2006):
  - Performance tests came to the result that the green police shirts, made of organic cotton, are even better than the conventional shirts which are made of blended fabrics:
    - 87% respectively 89% of the users at Zurich police indicated that wearing comfort of the green police shirts is slightly or much better than of the conventional ones;
    - 75% respectively 87% indicated that the breath ability and ability to transport humidity of the green police shirts is slightly or much better than that of the conventional ones;
    - 91% respectively 84% indicated that green shirt feels much better on the skin regarding softness, structure, etc. than the conventional ones.
  - Laboratory tests also came to the result that the green police shirts are at least of the same quality concerning durability and physical properties compared to the conventional ones; in some points the green shirts are even better.
  - Furthermore it is assumed by both the procurer[56] and the manufacturer[57] that the purchasing costs for the green police shirts will be in the same order of magnitude as those of the conventional one. As for private consumers, green clothes in general are more than twice as expensive as conventional clothes – this result is quite astonishing. It can be explained, however, by the fact that the costs for textile

[54] LH Bundeswehr Bekleidungsgesellschaft; www.lhbw.de

[55] http://ted.europa.eu/Exec?Template=TED/homepage.htm&DataFlow=hRead.dfl&hpt=ALL&StatLang=DE

[56] Personal communication by Samuel Mazan, City police of Zurich.

[57] Personal communication by Heidi Mastro-Metzler, Firma Metzler.

finishing are lower than those for the conventional shirts, which therefore levels out the higher purchasing costs for the organic cotton. Both contact persons indicated that perhaps at the beginning of the market introduction of the green shirts the costs will be slightly higher, due to the low demand[58]. Thus, Zurich city police tries to bundle the demand of different procuring institutions (e.g. Swiss Bundesbahn and hospitals).

- Regarding **work wear**, e.g. overalls for refuse collection staff, the producer F. Engel K/S in Denmark was contacted. Unfortunately, no data for this product could be obtained (cf. annex). However, the contact person from F. Engel K/S stated that the costs for public authorities for work wear with EU flower label are in the same order of magnitude as the costs for conventional work wear, meaning that the green version would be competitively priced compared to the non green version.[59]
- The contacted persons from a big European textile service company indicated that no **cotton roll towels** made of organic cotton are available on the market.

5.5.5 Conclusions

Especially the preliminary results of the pilot project at city police of Zurich show that the necessary efforts for public procurers to obtain green clothes are worthwhile: not only the costs for the green alternative will be in the same order of magnitude, but also the quality and using comfort of the green alternative is even better than that of the conventional one. But having the possibility to purchase green clothing at all will also depend on the amount of clothing to be purchased: for small amounts the efforts for manufacturers to produce green clothing are quite high. Therefore they will not offer green clothing if not strictly tendered for, and/or the prices might be higher compared to conventional clothing. Vice versa, if a quite large amount is going to be purchased, the additional efforts become lower and the prices more competitive. Especially public procurers as opposed to private consumers do have the possibility to procure large amounts of clothing and thus to paving the way for competitively priced green clothing.

The authors therefore strongly suggest that further pilot projects in different EU countries for green clothing/textile procurement would be helpful to enforce (real) green clothing procurement.

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[58] E.g. due to the low demand, the costs for cleaning spinning machines are a quite relevant cost factor, which leads to higher costs. If the demand was higher, these costs would decrease to the same level of costs for processing conventional cotton.

[59] Personal communication by Kim Christiansen, F. Engel K/S, Denmark.

5.6 Product group 6: Electricity

5.6.1 Selection of different product types

Product group 6 ('Electricity') is relevant for probably all kinds of public institutions, due to the general need of supply of electrical power. Power supply for public institutions is organised for one or several consumer units like, for example, particular buildings (or rather the corresponding meters). With ongoing liberalisation of electricity markets and implementation of the European Directive 2003/54/EC (Internal Market Directive) differentiation of power products becomes more relevant.

In contrast to all other product groups, in case of the product group 'Electricity' it is not reasonable to define three different product types with a green and a non green version each. Instead, the LCC of one non green version (conventional electricity) has been compared with three different green versions.

5.6.2 Green and non green versions

Although electricity generated by different primary power sources is physically identical for consumers, ecological impact differs significantly. Through the expansion of electricity production using renewable energy sources (RES-E) and high-efficient combined heat and power generation (HE-CHP), conventional fossil and nuclear power generation, with its climate impact and nuclear risks, can be replaced.

The reference case for power supply is considered to be 'grey' electricity. This means, the electricity fuel mix is of no particular relevance for purchasing decisions and therefore usually accords to the particular national electricity fuel mix. This electricity fuel mix is considerably different for the European Member States.

Green electricity definitions, however, can comprise various requirements. This fact is reflected by the variety of different green purchasing guidelines on electricity. For the time being, no common standard has been established. This is partly due to the different baseline in the particular countries (different fuel mix as reference case). As criteria for the selection of green power supply options the following aspects have been considered:

- Different supply options should cover the range of main requirements which are currently applied or proposed for the definition of green electricity. This mainly includes the possibility to include criteria for active extension of green electricity production (additionality) and for criteria on ecological aspects, beside effects on climate change above and beyond legal requirements (eligibility). Such criteria may serve as important element to ensure sustainable generation of the electricity supplied.
- Differentiation of supply options shall be limited to some relevant aspects in order to gain meaningful and comparable results for all considered countries.

- Assessment of different supply options shall be manageable for responsible purchasing bodies.
- Characterisation of power demand and contracted volume shall reflect a relevant scenario for public institutions.

Several suppliers do offer partly supply with green electricity, and public tenders often refer with ecological criteria only to a certain share of the total bid. However, in this analysis for all supply options, application of the respective criteria on the **total contracted volume** will be assumed. This allows for a meaningful comparison of the different criteria. Conventional fossil and nuclear power is automatically excluded from the green versions. Possible purchasing habits requiring green electricity only for part of the total power demand can be conducted independently by responsible purchasing bodies based on this study.

The option of **installation of own power devices** was not considered as this does not reflect a realistic option for green public purchasing; at least not as a relevant and comparable scenario under the scope of this study. This is mainly due to technical restrictions, purchasing habits and related transaction cost. Also, ongoing unbundling of electricity markets and privatisation of electricity suppliers no longer being directly bound to public bodies, support this decision.

RES-E and HE-CHP are generally defined according to the European Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources and to the European Directive 2004/8/EC on the promotion of cogeneration, respectively. Additional specifications for definition of different product types have been set on top of this.

According to the set of selection criteria given above, the following non green and green electricity supply options have been chosen for assessment (conventional fossil and nuclear power is automatically excluded):

- **Non green version:** 'Grey' electricity means that the electricity fuel mix is of no particular relevance for purchasing decisions and therefore can be considered to accord approximately to the particular national electricity fuel mix.
- **Green version 1:** 100% RES-E according to the European Directive 2001/77/EC without any accessory requirements.

- **Green version 2:** 100% RES-E and HE-CHP[60], whereas HE-CHP may account to not more than 50%, including accessory requirements. These accessory requirements result in a defined environmental leverage effect, which is not (necessarily) guaranteed by green version 1. The accessory requirements refer to either eligibility[61] or additionality[62]. Requirements on these criteria might refer directly to the supplying power plants or to a fund[63] fed by the green product.
- **Green version 3:** 100% RES-E, including accessory requirements. Again, the accessory requirements refer to either eligibility[61] or additionality[62], whereas requirements on these criteria might refer directly to the supplying power plants or to a fund[63] fed by the green product.

5.6.3 Functional unit

The assessment of LCC for electricity is based on Megawatt hours (MWh) as quantified functional unit.

The price for electricity supply for large consumers, such as industrial consumers or public institutions, depends on the volume of electricity covered by the contract. Therefore, the considered specifications for the public procurement of electricity of a reference city were defined as follows:

- Overall purchasing volume of 10 GWh p.a.;
- Ordered capacity of 2.500 kW;
- Contract period of 1 year.

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60 As reference values for calculation of efficiency of CHP plants according to the CHP Directive (Article 4) have only been published by the European Commission in February 2007, national implementation of the Directive and corresponding calculation procedures is delayed. Therefore, the assessment within this study also allowed for CHP in general in case no sufficient data on efficiency of CHP plants is available.

61 Eligibility comprises requirements in order to reduce the environmental impact of specific renewable energy sources (such as hydropower or biomass) or technologies and usually refers to nature conservation

62 Additionality means that the consumption of the green product has to stimulate directly an expansion of RES-E and HE-CHP generation. Thus, requirements have been specified that at least 50% of the electricity must be produced in plants not being older than 12 years, whereas at least 25% must be produced in plants not being older than 6 years.

63 Funds ensure that a certain amount of the electricity price is invested in the erection of new renewable power plants. As first estimation, one can assume that the environmental leverage effect of 1 ct/kWh is in the same order of magnitude as the defined additionality criterion (see above). This could be proved within the Öko-Institut's EcoTopTen project
(cf. 'Hintergrundpapier Strom' at http://www.ecotopten.de/download_forschungsberichte.php)

Due to the fact that the overall purchasing volume usually has to be allocated to several major consumption points (e.g. town hall, pumping station, etc.), the inquired prices and the results of the analysis refer to 2 GWh. This consumer class (also used by Eurostat) is in the order of magnitude considered to be most feasible for the major consumption points.

5.6.4 System boundaries

As derived in section 4, the analysis covers the **Member States** Sweden, Germany, Slovenia and Czech Republic.

The only relevant **cost element** for the product group ‘Electricity’ is the purchase price for the public institutions. The purchase price encompasses the production of electricity, including distribution to the consumer, and is expressed in €/MWh. Further, LCC related processes (e.g. purchase of consumables, disposal) are not applicable for this product type.

Regarding **data quality requirements**, only current data from 2007 was inquired and used. However, the figures for conventional electricity refer to 2006, as this is the most recent information available from Eurostat. Basically, the integration of existing Eurostat data was considered as an important goal for the analysis, due to its reliability and comparability between the selected Member States.[64] Furthermore, only data was used which is regarded to be representative for purchasing authorities in the selected member states.

The **sources of information** (inquired suppliers, products, contact persons, etc.) are documented in the annex.

[64] Direct information of contacted suppliers usually referred to typical surcharges for the green product rather than to a total price for it. Therefore, no representative figures for ‘grey’ electricity have been gained by bilateral request.

5.6.5 Results

The following table shows the results of the comparison of the prices for green and non green versions of electricity.

Table 108 Additional charges for the three green versions (GV) relative to 'grey' electricity[65]

Member State	Baseline price [€/MWh]		Additional charge [€/MWh]		Comment
	'grey' electricity	GV 1	GV 2	GV 3	
Sweden	70,70	0,1-0,8	–	0,4-1,0	GV 3: comprehensive requirements on eligibility
	100%	0,1-1,1%	–	0,6-1,4%	
Germany	118,60	0-4	0	1-21	GV 3: requirements on additionality (fund or new plants)
	100%	0-3,4%	0%	0,8-17,7%	
Slovenia	76,10	0	–		GV 3: requirements on additionality (fund)
	100%	0%	–	5,6%	
Czech Republic	88,20	–	–	3,6	GV 3: requirements on additionality (fund)
	100%	–	–	4,1%	

The additional charges for the three green product versions, relative to the baseline price for grey electricity, account for 0-18% of the baseline price, depending on the Member State and the green version. The green versions 1 and 2 are characterised by very low additional charges, which tend towards zero. In Germany, for example, a supplier of green electricity successfully provides offers for procurement tenders of conventional electricity. Besides offers with a very low surcharge, the highest additional charges (up to 21 €/MWh in Germany) were found for green version 3, which is the version with the highest environmental leverage effect. For those products which include a fund for the support of green electricity, it is essential to have a surcharge compared to grey electricity. As first estimation, one can assume that the additional value for the environment is proportional to the surcharge feeding the fund.

All additional charges quoted in Table 104 refer to the procurement of 100% green electricity. If a lower share of green electricity is procured, the corresponding figures can be assumed to decrease proportionally.

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65 According to information provided by the contacted suppliers in the regarded Member States

5.6.6 Conclusions

In general, according to these results, green electricity has proved to be a product group, which is available for public procurement on a competitive basis.

Furthermore, the table shows that certain green versions defined for the comparison are not explicitly offered in each selected Member State. Reason for this phenomenon is that all offers of RES-E products are strongly depending on the national electricity market:

Sweden, for example, already has a high share of hydropower. Thus, fossil CHP, being part of green version 2, is not perceived as a green option at all. Similar, additionality criteria aiming at further extension of RES-E production capacities are not requested by consumers. The focus of green electricity in Sweden lies on eligibility aspects in order to decrease negative environmental impacts related to hydropower and use of biomass. Data on prices for green version 3 therefore comprises offers according to the well-established Bra Miljöval standard for ‘electricity supplies’ (SNF 2001).

In **Germany**, however, the focus is on decreasing CO_2 emissions, which is also reflected by German electricity labels like ‘Grüner Strom Label’ and ‘ok-power’ (EnergieVision & Grüner Strom Label 2000). Hence, green electricity products are characterised by strong additionality aspects. HE-CHP is perceived as green, as CHP plants have a significant potential to reduce CO_2 emissions compared to the coal-dominated national electricity mix.

The same would be applicable for **Slovenia** and the **Czech Republic**. However, due to incomplete liberalisation of electricity markets and low interest of consumers in green electricity, the markets for green options are still under development in these Member States. Therefore, only very few green offers are available. For the time being, these offers are to a large extent coordinated between the different suppliers. In Slovenia, for instance, the only product that meets the criteria for green version 3 is offered by several major suppliers as distribution partners under the same conditions. This again shows the limited market for green electricity and the low incentive for suppliers to set up own green products. According to suppliers, products for green version 1 can only be offered without additional charges, due to the consumers’ unwillingness to monetarily acknowledge the additional value. This restricts possible product offers to a smaller volume of existing generation plants which are profitable under current conditions.

Especially in Slovenia and the Czech Republic, but also in Sweden and Germany, the contacted suppliers were quite reluctant calculating an electricity product according to the request, which, however, is generally possible in case of real requests by public authorities. Such particular product design is enhanced by the possibility to trade the green value of electricity production apart from physical electricity flows by Guarantees of Origin (GO) for RES-E (e.g. as implemented according to the Renewables Directive) and for HE-CHP. While systems for RES-E GO are already in place and operational in most EU Member States, CHP-GOs have to be implemented by Member States of the European Union according to the CHP-Directive, by August 2007 the latest. However, due to the market situation, the consulted suppliers clearly indicated that such individual product design is not a relevant option for them to consider for the time being (at least for the discussed volume). All information provided by them refers to existing products.

Due to the differences between national electricity markets and awareness of ecological impacts of electricity consumption, it seems reasonable to keep a degree of flexibility within recommendations for green public procurement.

The principles of eligibility and particularly additionality, as included in the green version 2 and 3, are the only way to assure that active choice of consumers really makes a difference for the environment. Therefore, they should be taken into account for purchase decisions and strongly be promoted by the European Commission within responsible stakeholder groups in order to raise awareness for these aspects.

5.7 Product group 7: IT devices – computers and monitors

5.7.1 Selection of different product types

In the EU, the share of the IT market was 297 billion Euros in 2004. The share of the public sector was estimated to be around 20% in 2004 (amounting to about 60 billion Euros), with growing tendency (EITO 2005). The three product types of the product group 'IT Devices: computers and computer displays' have been selected with regard to the following criteria:

- The products shall be relevant for most public authorities in the selected Member States;
- The products shall have high importance for public authorities (in terms of monetary value or frequency of purchase);
- Environmental friendly versions of the products shall be available in the selected Member States.

With regard to these criteria, desktop computers (product type 7.1), mobile computers (notebooks; product type 7.2) and computer displays (product type 7.3) have been selected. These products are relevant in all Member States and their procurement is necessary on a regular basis. Procurement of infrastructure elements, however, such as networks or servers, occurs less often due to the longer product life time and – even more important – as smaller numbers are procured. The example of the city of Stuttgart may illustrate this: In 2004 Stuttgart (550 000 inhabitants, 17 766 public employees) had a procurement volume of 1 190 desktop computers, 162 notebooks and 1 224 computer displays.

5.7.2 Green and non green versions

Environmental impacts from computers originate to a considerable extent from the production of the devices, the energy demand during usage and the end of life phase (electronic waste issue). In order to minimise the environmental impacts three aspects shall be addressed in the following:

- The dimension of the chosen product should be in accordance with the users' needs, which means that the capability of the product should not be higher then necessary (e.g. a graphics processing unit (GPU) with own memory is not necessary for common office work, saving money and energy at the same time);
- A device should be chosen with low energy demand in idle mode, standby and off mode;
- A long lifetime of the device should be aimed for.

Eco-labels may be useful to facilitate the purchasing process. The subsequent table shows for which of the eco-labels on EU and national level certified products are available.

Table 109 Overview of the European and national eco-labels for IT devices

	EU Eco-label	**Blue Angel**	**Nordic Swan**	**The Flower – Květina**	**AENOR**
	EU	Germany	Sweden	Czech Republik	Spain
Desktop computers / notebook computers / computer displays	European Union Eco-label (March 2007): 013 Personal computers	Computer RAL-UZ 78	Swan labelling of Personal computers, Version 4.1; 10 June 2005 – 18 June 2008	The Flower – Květina (duben 2007) 36-2006 ; same criteria as European Union Eco-label (March 2007): 013 Personal computers	European Union Eco-label (March 2007): 013 Personal computers
Number of labelled products (number of manufacturers)					
Desktop computers	-	4 (1)	6 (1)	-	-
Notebooks	-	-	1 (1)	-	-
Computer displays	-	-	4 (1)	-	-

As the table shows, at present only few products from only one manufacturer are certified with an eco-label. This situation is partly due to the consolidation and update of the criteria for the Blue Angel in Germany.

In the future it can be expected that more manufacturers take part in the labelling schemes. For the study at hand, however, it does not seem useful to concentrate the LCCA on the few labelled products.

Not shown in the table are the TCO label (Sweden)[66] and the Energy Star label (Europe)[67], which indeed are of significant relevance for part or all of the considered product types in the product group 'IT Devices'. Therefore, both labels will be used for the definition of the green versions.

Desktop computers and notebooks

For desktop computers it seemed to be reasonable to base the criteria for the definition of the green version on (1) the Energy Star specification and (2) a prolongation of producers' warranty.

Energy Star was chosen because the criteria recently got updated and tightened. The aim of the new criteria is that 25% of the products on the market are able to meet them. For the first time, a restriction is defined for the energy consumption of a desktop and notebook system in idle mode. Unfortunately, the new criteria (version 4.0) are only valid from July 20th 2007 on. That leaves us in a kind of transition period at the moment (May 2007). Producers only slowly start bringing new products on the market that comply with Energy Star (version 4.0). For that reason, a hypothetical approach was chosen which is based on the statements of representatives of the computer industry concerning the additional costs for computers complying with the Energy Star criteria, compared to non-compliant ones.

The on site service to the next working day (for a time period of 4 years) was chosen as a criterion for the green version, because a long product life helps to reduce environmental impacts from production, as fewer devices have to be produced. This criterion is cost relevant as producers charge for this service.

The criteria for the non green and green version of desktop computers and notebooks are summarised in the following tables.

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66 The TCO label is an eco-label developed by 'TCO Development' especially for the IT equipment. TCO Development is a company owned by TCO, the Swedish Confederation for Professional Employees (see www.tcodevelopment.se).

67 The Energy Star is a labelling scheme for energy efficient office equipment. The labelling in Europe is managed by the European Commission. The scheme was initially started by the US Environmental Protection Agency (EPA) in the US in 1992 (see http://www.eu-energystar.org/en/index.html).

Table 110 Definition of the non green and the green version of product type 7.1 'desktop computer'

	Desktop computer	
	non green version	**green version**
Compliance with applicable regulations	✓	✓
On site service to the next working day (if required on the basis of an extra fee)	3 years standard for business devices	4 years minimum
Power consumption on / idle mode*	No restriction	≤ 50W
Power consumption sleep mode*	No restriction	≤ 4W
Power consumption off mode*	No restriction	≤ 2W

* Measured according to Energy Star Program Requirements for Computers, Version 4.0
http://www.eu-energystar.org/downloads/specifications/20061023/Computer%20V4.0%20Final%20Spec.pdf

Table 111 Definition of the non green and the green version of product type 7.2 'notebook computer'

	Notebook computer	
	non green version	**green version**
Compliance with applicable regulations	✓	✓
On site service to the next working day (if required on the basis of an extra fee)	not included	4 years minimum
Power consumption on / idle mode*	no restriction	≤ 14W
Power consumption sleep mode*	no restriction	≤ 1,7W
Power consumption off mode*	no restriction	≤ 1W

* Measured according to Energy Star Program Requirements for Computers Version 4.0
http://www.eu-energystar.org/downloads/specifications/20061023/Computer%20V4.0%20Final%20Spec.pdf

Computer displays

A few years ago it would have been simple to define a non green versus a green version of computer displays: a cathode ray tube (CRT) display would have been the non green version, due to its high energy consumption; an LCD flat screen would have been the green version, due to its low energy consumption. In the meantime, however, cathode ray tubes have almost disappeared from the market, although the remaining products are quite cheap. As a consequence they are not a realistic alternative for public procurement anymore. The energy demand of LCD flat screens (of the same size), however, does not differ very much (the majority of the 17'' and the 19'' displays on the market are certified according to TCO'03, a label considering quality and environmental aspects).

A second trend of environmental relevance is the increase in display size of the sold LCD screens: a few years ago the 15'', then the 17'' flat screen models have been the top-selling size, however, with decreasing prices, the 19'' displays are becoming the top-selling size in general. It can be expected that the large screens will also become more important in public procurement. The environmental impacts of the production and the electricity consumption of computer displays, however, increase with display size.

Against this background it seems to be reasonable to choose a 17'' flat screen as the green version and a 19'' display as the non green version (see also the following table), as it can be assumed that in most cases of public procurement of computer displays a 19'' screen is not necessary for the users' needs.

Table 112 Definition of the non green and the green version of product type 7.3 'computer display'

	Computer display	
	non green alternative	**green alternative**
Description	19" flat screen labelled with TCO'03*	17" flat screen, labelled with TCO'03*
Compliance with applicable regulations	✓	✓
Manufacturer warranty	3 years minimum	3 years minimum

* For TCO'03 see
http://www.tcodevelopment.se/tcodevelopment1200/Datorer/TCO03_Displays/TCO03_FPD_version_3_0.pdf
http://www.tcodevelopment.com/pls/nvp/Document.Show?CID=1200&MID=92

5.7.3 Calculation and cost elements

To calculate the LCC of the selected product types, most of the following relevant cost elements were considered.

Investment costs

The investment costs include purchase costs of the hardware itself, the costs for installation of basic software (e.g. the operating system) and for shipment. A possible prolongation of the on site service would also be charged at the time of purchasing (in case of green version). Discount rates for larger purchase quantities were not considered, as they also depend on the negotiation capabilities of the specific tenderer and are assumed to be identical for both the green and the non green version.

Jönbrinck and Zackrisson (2007) stated that in 2005 the typical retail price for an office desktop computer was 620 Euros, for a notebook 1.242 Euros in EU 25 (excl. VAT). According to a common statement of the PC-industry, an additional cost of 15 Euros (excl. VAT) has to be expected for both desktop computers and notebooks that are compliant with Energy Star (version 4.0). It is expected that retail prices will increase by the same amount.

For the computer displays data on purchase prices was collected by a market research within this study (on 17'' and 19'' computer displays).

Software

Major costs of computers during their life cycle are caused by software (e.g. purchase, installation, training, updates, reinstallations, etc.). Software demand and costs depend on the individual necessities and do not differ between the green and the non green version.

For this reason it was neglected in this analysis. Only the purchase and installation of the basic operating system was included (see above, investment costs).

Energy demand during use phase

The electricity demand during the use phase of the computer is calculated with a defined time in idle mode, stand-by and off mode. At the moment, not all producers use the procedure described in Energy Star (version 4.0) in order to measure energy consumption in idle mode but every producer has its own measurement procedure. As a consequence, data found in product data sheets of different producers are not comparable. In order to avoid mistakes due to deviating measurement procedures and widely missing products compliant with the Energy Star criteria on the market, a pragmatic approach was chosen to define the time and the power consumption in the different modes which is outlined for the selected product types in the following tables:

Table 113 Time and power consumption in different modes (8.1 'desktop computers')

	Time in mode	Non green version	Green version
Data source	Average values of current studies as calculated by (Jönbrinck and Zackrisson (2007).	Data for power consumption of the 2006 European market survey (Energy Star) (Jönbrinck and Zackrisson 2007):	Limits for power consumption given in Energy Star (version 4.0)
On / idle mode	2 279 hours	81,7 W	50,0 W
stand-by	3 196 hours	3,2 W	4,0 W
off mode	3 285 hours	2,0 W	2,0 W

Table 114 Time and power consumption in different modes (8.2 'notebooks')

	Time in mode	Non green version	Green version
Data source	Average values of current studies as calculated by Jönbrinck and Zackrisson (2007)	Base cases defined in Jönbrinck and Zackrisson (2007) as typical for 2006	Limits for power consumption given in Energy Star (version 4.0)
On / idle mode	2 613 hours	32,0 W	24,0 W[68]
stand-by	2 995 hours	3,0 W	1,7 W
off mode	3 153 hours	1,5 W	1,0 W

68 According to Energy Star (version 4.0), energy consumption of notebooks in idle mode is measured with the display off. In order to consider the typical situation in idle mode, 10 W were added flat for a notebook display in on mode.

Table 115 Time and power consumption in different modes (8.3 'computer displays')

	Time in mode	Non green version	Green version
Data source	Average values of current studies as calculated by Jönbrinck and Zackrisson (2007)	Average of the survey within this study (19'' displays)	Average of the survey within this study (17'' displays)
On mode	2 586 hours	36,0 W	34,0 W
stand-by	3 798 hours	1,6 W	1,4 W
off mode	2 375 hours	1,0 W	1,0 W

Costs for repairs and maintenance

Jönbrinck and Zackrisson (2007) could show that an average computer (both desktop computer and notebook) causes repair costs of about 125 Euros over its whole lifetime. For business notebooks typically no on site service is offered as standard, whereas for business desktop computers an on site service of three years typically is included in the purchase price. In the calculations of the LCC it is assumed that for both product types the average repair costs are included in the non green version whereas no additional costs occur for the green version as the on site service already includes these costs.

In case of computer displays it is currently common that they come with a 3 years warranty of the producer. In the EuP study on personal computers and computer displays it is stated that an average repair – should it be necessary – costs about 120 Euros for one display. Compared with an average retail price in Europe of 200 Euros (Jönbrinck and Zackrisson 2007) it seems unlikely that computer displays ever get repaired, but rather new ones are purchased. For that reason, repair costs were neglected in the LCCA of computer displays.

Upgrading costs

Computers can be upgraded to fulfil a better performance by changing processors, hard disk drives, graphics cards and other parts. The average costs for an upgrade was estimated to be about 200 Euros during the life time. Jönbrinck and Zackrisson (2007) stated from industry data that an estimated 2% of customers use the opportunity of upgrading. The costs for upgrading are calculated on an average basis, that the estimated 200 Euros for upgrading are spent by 2% of the customers, resulting in an average cost for upgrading of 4 Euros per computer.

Disposal costs

As the WEEE directive is being operated in the 4 countries that are analysed, no disposal costs were taken into account (Jönbrinck and Zackrisson 2007).

Not included are **roll out costs** (e.g. setting up, training of employees) and additionally available **services** (e.g. regular update services). Some public authorities decide to lease computers from a system vendor. As the system vendor can only realise a small interest margin for hardware (around 1 to 2 percent approximately), costs for the pure hardware do not differ very much from our investigation. System vendors earn their money with the additional services.

For the investigation of the costs, major producers were contacted (for a list of contacted manufacturers see annex) and data was gathered from their internet platforms resp. authorised retailers.

The investigated product prices are current prices from 2007. As specified in section 3.4.3.1, the current electricity prices are increased with electricity specific inflation rates of the regarded Member States.

5.7.4 Product type 7.1: Desktop computer

5.7.4.1 Functional unit and alternatives to be analysed

The functional unit encompasses the purchase and the usage of one desktop computer (incl. shipping) over an assumed product life time of four years.

In order to get comparable cost data the desktop computers shall meet the following technical specifications: current processor (e.g. dual core processor with ±1,8 GHz; Pentium D with 3,0 GHz), on board graphic, ±160 GB SATA 7.200 rpm hard drive, 1024 MB RAM (upgrade to 2048 MB is possible), DVD writer, ±3 USB 2.0, VGA and/or DVI, 100MBit LAN, WLAN.

As described in section 5.7.2 more in detail, the following alternatives are regarded:

- **Non green version:** Average desktop computer that does not comply with Energy Star (version 4.0) and on site service of three years.
- **Green version:** Energy Star (version 4.0) compliant desktop computer with on site service to the next working day for 4 years.

5.7.4.2 System boundaries

The analysis covers the selected Member States (Sweden, Germany, Spain and the Czech Republic).

The following costs elements were considered: purchase costs (including installation of basic software and shipment), fees for the on site service (in case of green version), costs for electricity demand during use phase, costs for repairs (in case of non green version) and upgrading costs. Not included are costs for software, disposal, roll out or additional services. For details see section 5.7.3.

For the investigation, major producers were contacted (for a list of contacted producers see annex) and data was gathered from their internet platforms resp. authorised retailers.

5.7.4.3 Results

The following tables show the results on the LCCA of desktop computers in the selected Member States.

Table 116 LCC of desktop computers (Sweden)

	LCC		Difference	
	non green version	green version	absolute	relative
Investments costs	795	813	19	2%
Costs for 4 years on site service	0	172	172	-
Costs for electricity demand	54	35	-18	-34%
Costs for repairs	144	0	-144	-100%
Costs for upgrading	5	5	0	0%
SUM	**997**	**1.025**	**28**	**3%**

Table 117 LCC of desktop computers (Germany)

	LCC		Difference	
	non green version	green version	absolute	relative
Investments costs	802	820	18	2%
Costs for 4 years on site service	0	132	132	-
Costs for electricity demand	86	56	-29	-34%
Costs for repairs	138	0	-138	-100%
Costs for upgrading	4	4	0	0%
SUM	**1.030**	**1.012**	**-18**	**-2%**

Table 118 LCC of desktop computers (Spain)

	LCC		Difference	
	non green version	green version	absolute	relative
Investments costs	808	826	17	2%
Costs for 4 years on site service	0	99	99	-
Costs for electricity demand	65	42	-22	-34%
Costs for repairs	135	0	-135	-100%
Costs for upgrading	4	4	0	0%
SUM	**1.013**	**971**	**-41**	**-4%**

Table 119 LCC of desktop computers (Czech Republic)

	LCC		Difference	
	non green version	green version	absolute	relative
Investments costs	749	766	18	2%
Costs for 4 years on site service	0	78	78	-
Costs for electricity demand	65	43	-22	-34%
Costs for repairs	138	0	-138	-100%
Costs for upgrading	4	4	0	0%
SUM	**956**	**892**	**-64**	**-7%**

5.7.4.4 Conclusions

The differences between the green and the non green version are calculated to amount to 3% higher to 7% lower costs for the green version. However, there are a number of uncertainties that might have significant influence on the results:

- *Usage behaviour* is highly variable and at the moment there is no consensus among experts on a reasonable scenario for usage hours in the different operation modes (idle mode, standby and off mode). The usage hours assumed in this analysis represent the average of a number of studies analysed by Jönbrinck and Zackrisson (2007). It is possible that in the follow up process of the EuP preparatory study on computer and computer displays a common scenario for usage behaviour will be defined. For reasons of comparability this scenario should then be used for further calculations.
- *Costs for repair*. Again figures shown above are based on data gathered by Jönbrinck and Zackrisson (2007). No country specific data was available on the average number of repairs occurring over the lifetime of a desktop computer.
- *Influence of the on site service for the overall product lifetime*. It might be expected that devices with an on site service last longer than products without it, as in the third or fourth year of the life time products might rather get replaced than repaired. This hypothesis can not be supported by accordant data at the moment, so a possible shorter product life time of the non green version was neglected. This is a conservative assumption with regard to the goal of the study. In case the product life time of the green version is longer, its environmental impacts and LCC are lower compared to the figures shown above. As a consequence of the described uncertainties, the overall differences of the annual costs of the green and the non green version are not considered to be significant. Expressed in a positive way, this means, that the green version is not significantly more expensive than the non green version. On the other hand this also means that no major cost reductions can be expected for the green version.

- *Fast changes in the market* (e.g. due to prices and variability of components) lead to fast changing product composition and product prices. One producer that has been contacted stated that the prices given on the internet platform are adapted every week. The above calculated costs must be seen under these premises.

5.7.5 Product type 7.2: Mobile computers / notebooks

5.7.5.1 Functional unit and alternatives to be analysed

The functional unit encompasses the purchase and the usage of one notebook (incl. shipping) with an assumed product life time of 4 years.

In order to get comparable cost data the notebooks shall meet the following technical specifications: Current processor (e.g. dual core processor ±1,6 GHz), on board graphic, ±80 GB SATA 5.400 rpm/7.200 rpm hard drive, 1024 MB RAM (upgrade to 2048 MB is possible), DVD writer, ±USB 2.0, VGA and/or DVI, 100 MBit LAN, WLAN.

As described in section 5.7.2 in more detail the following alternatives are regarded:

- **Non green version:** Notebook that does not comply with Energy Star (version 4.0) and without additional warranty.
- **Green version:** Functionally equivalent to the non green notebook Energy Star (version 4.0) compliant notebook with an on site service to the next working day for 4 years.

5.7.5.2 System boundaries

The analysis covers the selected Member States (Sweden, Germany, Spain and the Czech Republic).

The following costs elements were considered: purchase costs (including installation of basic software and shipment), fees for the on site service (in case of green version), costs for electricity demand during use phase, costs for repairs and upgrading costs. Not included or relevant are costs for software, disposal, roll out or additional services. For details see section 5.7.3.

For the investigation, major producers were contacted (for a list of contacted producers see annex) and data was gathered from their internet platforms resp. authorised retailers.

5.7.5.3 Results

The following tables show the results on the LCC of notebooks in the selected Member States.

Table 120 LCC of notebooks (Sweden)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investments costs	1.393	1.412	19	1%
Costs for 4 years on site service	0	316	316	-
Costs for electricity demand	26	19	-7	-27%
Costs for repairs	144	0	-144	-100%
Costs for upgrading	5	5	0	-1%
SUM	**1.567**	**1.751**	**184**	**12%**

Table 121 LCC of notebooks (Germany)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investments costs	1.398	1.416	18	1%
Costs for 4 years on site service	0	505	505	-
Costs for electricity demand	41	30	-11	-27%
Costs for repairs	138	0	-138	-100%
Costs for upgrading	4	4	0	0%
SUM	**1.581**	**1.955**	**374**	**24%**

Table 122 LCC of notebooks (Spain)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investments costs	1.586	1.603	17	1%
Costs for 4 years on site service	0	306	306	-
Costs for electricity demand	31	23	-8	-27%
Costs for repairs	139	0	-139	-100%
Costs for upgrading	4	4	0	0%
SUM	**1.760**	**1.936**	**177**	**10%**

Table 123 LCC of notebooks (Czech Republic)

	LCC		Difference	
	non green version	green version	absolute	relative
Investments costs	1.598	1.616	18	1%
Costs for 4 years on site service	0	204	204	-
Costs for electricity demand	31	23	-8	-27%
Costs for repairs	116	0	-116	-100%
Costs for upgrading	4	4	0	0%
SUM	**1.750**	**1.848**	**98**	**6%**

5.7.5.4 Conclusions

The differences between the green and the non green version are calculated to amount to about 6 to 24%, with the green version being more expensive than the non green version. Looking at the different cost factors, the following is obvious:

The additional purchase costs, together with additional costs for the on site service, cause the cost difference between the green and the non green version. The energy savings of the green version have no major influence on the overall costs.

For the results, however, the same uncertainties apply as outlined in the section on desktop computers.

A sensitivity analysis was performed concerning the additional costs for the on site service. It was assumed that a notebook without additional warranty will only have a product life of 3 years (non green version) in comparison to a product life time of 4 years for the green version. Even with the relatively high additional costs that were found for Germany a slight cost advantage can be indicated for the green version over a period of 12 years encompassing the purchase of 4 non green notebooks and 3 green notebooks (see table below).

Table 124 Sensitivity calculation for LCC of notebooks (Germany)

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	4.886	3.778	-1.108	-23%
Additional on site service	0	1.346	1.346	n.a.
Costs usage (electric energy)	106	78	-29	-27%
Annual repair costs	377	0	-377	-100%
Annual costs upgrading	4	12	8	174%
SUM	**5.374**	**5.214**	**-160**	**-3%**

5.7.6 Product type 7.3: Computer displays

5.7.6.1 Functional unit and alternatives to be analysed

The functional unit encompasses the purchase and the usage of the computer display (incl. shipping) with an assumed product life time of 6 years. (Jönbrinck and Zackrisson 2007).

As described in section 5.7.2 more in detail, the following alternatives are regarded:

- **Green version:** 17'' flat screen certified with TCO'03 (including Energy Star) and with a producers' warranty of 3 years.
- **Non green version:** 19'' flat screen certified with TCO'03 (including Energy Star) and with a producers' warranty of 3 years.

5.7.6.2 System boundaries

The analysis covers the selected Member States (Sweden, Germany, Spain and the Czech Republic).

The following cost elements were considered: investment costs (including shipping) and costs for electricity demand during use phase. For details see section 5.7.3.

The investigated product prices are current prices from 2007 (own investigation); electricity prices relate to 2007.

For the investigation, major producers were contacted (for a list of contacted producers see annex) and data was gathered from their internet platforms resp. authorised retailers.

5.7.6.3 Results

The following tables show the results on the LCC of computer displays in the selected Member States.

Table 125 LCC of computer displays (Sweden)

	LCC		Difference	
	non green version	green version	absolute	relative
Purchase price device	347	266	-81	-23%
Costs for electricity demand	29	28	-1	-5%
SUM	**376**	**294**	**-83**	**-22%**

Table 126 LCC of computer displays (Germany)

	LCC		Difference	
	non green version	green version	absolute	relative
Purchase price device	317	255	-62	-20%
Costs for electricity demand	47	45	-2	-5%
SUM	**364**	**299**	**-65**	**-18%**

Table 127 LCC of computer displays (Spain)

	LCC		Difference	
	non green version	green version	absolute	relative
Purchase price device	317	263	-54	-17%
Costs for electricity demand	35	34	-2	-5%
SUM	**353**	**297**	**-56**	**-16%**

Table 128 LCC of computer displays (Czech Republic)

	LCC		Difference	
	non green version	green version	absolute	relative
Purchase price device	257	229	-28	-11%
Costs for electricity demand	36	34	-2	-5%
SUM	**292**	**263**	**-30**	**-10%**

5.7.6.4 Conclusions

The calculated differences between the green and the non green version amount to 10 to 22%, with the green version being less expensive than the non green version. Looking at the different cost factors the following is obvious:

- The *investment costs* have to be pointed out as the main cost factors – the non green version being more expensive then the green version.
- *Costs during usage* are only slightly lower for the green than for the non green version. Similar to desktop and notebook computers the real usage is variable and reduced usage hours might slightly reduce possible advantages of the green version (in absolute numbers).

5.8 Product group 8: IT devices – printers and copiers

5.8.1 Selection of different product types

The product types in this product group are selected with regard to their representativeness for the product category as well as to their relevance for public procurement. The following paragraphs therefore give an overview of major product categories and market trends.

According to Energy Star (2006) following definitions apply to printers and copiers:

Printers are commercially available imaging products that serve as hard copy output devices, and are capable of receiving information from single-user or networked computers, or other input devices (e.g. digital cameras). The unit must be capable of being powered from a wall outlet, or from a data or network connection. This definition is intended to cover products that are marketed as printers, including printers that can be upgraded into Multifunctional Devices (MFD) in the field.

Copiers are commercially available imaging products whose sole function is the production of hard copy duplicates from graphic hard copy originals. The unit must be capable of being powered from a wall outlet, or from a data or network connection. This definition is intended to cover products that are marketed as copiers or upgradeable digital copiers.

One of the main trends regarding office imaging equipment is the shift from Single Function Devices (SFD) towards Multifunctional Devices (MFD). According to Energy Star 2006, **Multifunction Devices (MFD)** are commercially available imaging products which are physically integrated devices or a combination of functionally integrated components, that perform two or more of the core functions of copying, printing, scanning, or faxing. The copy functionality as addressed in this definition is considered to be distinct from single sheet convenience copying offered by fax machines. The unit must be capable of being powered from a wall outlet, or from a data or network connection.

According to Fraunhofer IZM (2007), most forecasts for the European imaging equipment market predict that printer-, copier- and fax-based MFDs will overtake SFDs in volume of sales by 2006, meaning that from 2006 on *printer*-based MFDs will account for the largest market segment in imaging equipment. Also *copier*-based MFDs have already entered the market on a large scale, whereas the market share of *single-function* copiers seem to decline over the next five years. For this reason, Öko-Institut will not select single-function copiers as a specific product type but rather distinguish between single-function printers and multifunctional printers with at least an integrated copy function.

To create a hardcopy image, different marking technologies are used. Electro photographic and inkjet printing are the most dominating marking technologies in the market[69].

Electro photography (EP) is a marking technology characterised by illumination of a photoconductor in a pattern representing the desired hard copy image via a light source, development of the image with particles of toner using the latent image on the photoconductor to define the presence or absence of toner at a given location, transfer of the toner to the final hard copy medium, and fusing to cause the desired hard copy to become durable. Colour EP is distinguished from monochrome EP in that toners of at least three different colours are available in a given product at one time.

Ink Jet (IJ) is a marking technology where images are formed by depositing colorant in small drops directly to the print media in a matrix manner. Colour IJ is distinguished from monochrome IJ in that more than one colorant is available in a product at any one time.

According to Fraunhofer IZM (2007), a general market trend towards colour capable imaging equipment is evident. Colour EP printers and MFDs become more mainstream due to their improved price ratio and performance. Nevertheless, the volume of monochrome images will still remain substantially larger compared to colour images. Öko-Institut takes these developments into account for the selection of different product types.

Further criteria for the differentiation of imaging equipment are speed (images per minute), image quality (monochrome and colour) as well as various image sizes. Most printers are standard format (Letter, A3 and A4 format), whereas large format printers include those designed for A2 media and larger which will not be taken into the scope of this study. Regarding size, it can be distinguished between desktop devices and printers standing on the floor. Finally, printers can provide access only to a single user or can possess a network connection.

Against the described background, the following three product types are selected:

Product type 8.1 represents colour inkjet printers used by single users. They are mostly expected to be in small and medium enterprises and authorities with decentralised structures (‘each employee has his own printer’).

Product type 8.2 represents small monochrome laser printers which can be used by single-users or in a network (network-capable), being common both in small and medium as well as in large enterprises and authorities. A medium speed of 15-24 images per minute was

[69] Further marking technologies are Direct Thermal, Thermal Transfer, Dye Sublimation, Solid Ink, Stencil, and Impact Technology.

chosen, because this speed category covers a large part of the installed EP printers (see Figure 4).

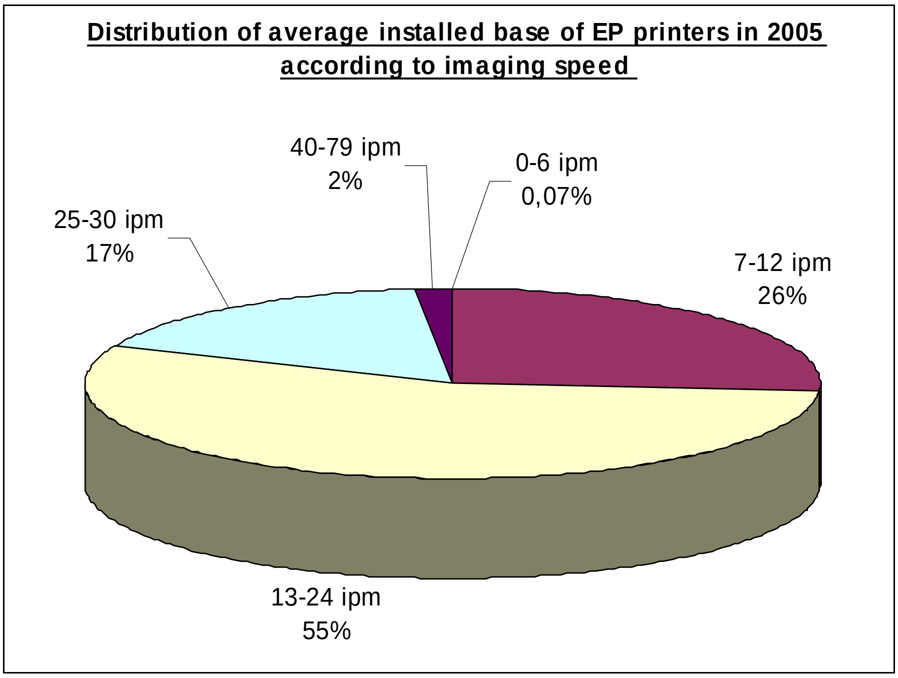

Figure 4 Distribution of average installed base[70] of EP printers in Western Europe in 2005 according to imaging speed (based on data from InfoTrends (2006))

Product type 8.3, finally, represents multifunctional EP products with fast speed and high image creation volume. They are mainly used in larger enterprises and authorities with access by several employees (network).

The selected product types cover a broad range of different product types and technical features and take into account latest market trends (both EP and inkjet printers, SFDs and MFDs, monochrome and colour printers, and different speed classes). The following table summarises the specifications.

[70] Average Installed Base is the time-averaged number of units in use during the calendar year. This is calculated by averaging the year-end installed base of the past two years (current and previous year).

Table 129 Selected product types within the product category 8 (IT devices – printers and copiers)

	Product type 8.1 Single-function printer (ink jet)	**Product type 8.2 Single-function printer (electro photography)**	**Product type 8.3 Multifunctional device (electro photography)**
Functionality	SFD	SFD	MFD
Marking technology	Inkjet	EP	EP
Monochrome <=> colour	colour	mono	mono
Imaging Speed	slow to medium (10-20 ipm)	medium (15-24 ipm)	fast (50-75 ipm)
Single user <=> network	single user	network-capable	network
Desktop <=> Floor	desktop	desktop	floor

5.8.2 Green and non green versions

Environmental impacts from imaging equipment originate to a considerable extent from the production of the devices, the energy, paper and ink demand during usage and the end-of-life phase (electronic waste). These environmental impacts are covered by criteria of several eco-labels and purchasing guidelines:

For imaging equipment, no European Eco-label (‘Flower’) exists, however, several other labelling schemes are available. Most relevant are the EU Energy Star Programme (focus only on energy consumption), the German Blue Angel and the Nordic Swan (both multi criteria label). Using their criteria in procurement processes is recommended in several guidelines for green purchasing (e.g. in European Commission (2004a), Berliner Energieagentur (n.d.), Umweltministerium BaWü (2006), Bouwer et al. (2006)). Environmental aspects and criteria for office products being addressed in eco-labels as well as in other guidelines can be categorised as follows:[71]

- *Longevity*: Modularity; upgradeability; warranty; availability of spare parts after end of production;
- *Materials*: Restricted use auf hazardous substances like PVC, flame retardants or heavy metals; use of recycled materials or renewable natural resources; construction suitable for recycling; packaging;

[71] See e.g. IT-Eco-Declaration, Check it (Austria); EKU Environmental Requirements Specification for IT-products; Bouwer et al. 2005; A Green Office Guide designed for the staff of the Barcelona City Council n.d.)

- *Energy consumption* (e.g. according to limit values of Energy Star, GEEA, or other eco-labels);
- *Emissions*: Limitations with regard to VOC, ozone, dust (e.g. according to limit values of environmental labels);
- *Acoustic noise* (e.g. according to limit values of environmental labels);
- *Use*: Automatic duplex unit; possibility of using recycling paper;
- *End-of-life*: Possibility of leasing the machine including the return of the machine once its use is exhausted; take-back-schemes; recycling or waste treatment of photoconductors, toner, ink ribbons and cartridges (selenium, cadmium sulphite).

Generally, the printing technologies have slightly different environmental impacts. This could also have an influence on the selection of environmental criteria in a procurement process.

- **IJ printers** usually have a shorter life span compared to EP products, which means that resource and material consumption are an environmentally important factor (=> criteria for longevity, material and recycling requirements). From an environmental point of view, Energy consumption of IJ printers only plays a minor role compared to paper consumption (=> requirements for recycling paper and automatic duplex unit). As inkjet printers are usually located near the workplace, high noise emissions could lead to discomfort (=> criteria for noise emissions; for IJ printers, noise requirements of TCO'99 are stricter compared to Blue Angel).
- **Small EP printers** are assumed to be used for a shorter life time (period of amortisation: three years) than e.g. large EP products which are mostly covered by long-term leasing contracts (=> criteria for longevity and recycling requirements). Energy consumption plays a major role compared to inkjet printers, but also the paper consumption is quite relevant (=> requirements for recycling paper and automatic duplex unit). EP printers can cause ozone and dust emissions (=> criteria for substance emissions). As small EP printers might be located near the workplace, high noise emissions can lead to discomfort (=> criteria for noise emissions).
- **Large EP printers** are usually covered by long-term leasing contracts, which include maintenance, repair, and spare parts. In some cases, they are even reused in other environments after the first use cycle. Energy consumption plays a major role, but also the paper consumption is quite relevant. EP printers can cause ozone and dust emissions (=> criteria for substance emissions). As large EP printers are frequently used, high noise emissions can lead to discomfort (=> criteria for noise emissions).

For the calculation of LCC it turned out to be difficult to specify green and non green product types. Both, discussions with manufacturers as well as research on their websites, resulted in the finding, that there are hardly any products comparable in their technical specifications.

At the same time, products vary in single green and non green aspects, e.g. being different in energy consumption, emissions or acoustic noise. Additionally, at the time of data inquiry (end of April 2007), only some products of few manufacturers were published in the Energy Star database, due to the change of program requirements per 1 April 2007[72]. Finally, eco-labels like Blue Angel, Nordic Swan or TCO predominantly cover electro photographic, but no inkjet printers.

Due to these restrictions, the LCC of green versus non green printing devices were calculated including the cost elements purchase price and costs for the consumption of electricity, paper and toner according to the assumptions outlined in the following paragraphs.

5.8.3 Calculation and cost elements

Purchase and installation

Starting from the technical specifications of the three selected product types, the average purchase price (or leasing rate) of a sample of products has been taken as the purchase price (or leasing rate) of the conventional, i.e. non green product version. To ensure the comparability of results in this project, information on the recommended retail prices published at the websites of Europe-wide operating manufacturers has been chosen as primary data source. However, as this approach resulted in various data gaps, several online shops had to be taken as additional research basis for purchase prices (see annex). One major disadvantage: market prices often deviate from the recommended retail prices.

As there are hardly any ‘real’ products comparable in their technical specifications, and as products, at the same time, vary in green aspects (see above), it is difficult to determine the difference of purchase prices between real green and non green versions of printers (e.g. higher prices of products with lower energy consumption, emissions or acoustic noise). However, a relevant spread can be seen for printers with an automatic duplex printing unit. In case of product type 8.1 and 8.2, where **automatic duplex printing units** are required for the green version, these differences in purchase prices had been taken into account:

- **Product type 8.1:** Separately bought duplex units for inkjet printers cost around 50 Euros in Germany. This value has been taken as additional costs for the green version in all selected Member States.

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72 Source: www.eu-energystar.org/en/en_database.htm; per 23.04.2007, only five manufacturers had published Energy Star certified printers and MFD (Canon, Develop, Konica Minolta, Rowe, Sagem).

- **Product type 8.2:** Separately bought duplex units for small electro photographic printers cost around 100 Euros in Germany. This value had also been taken for the other Member States.

Different from other product groups, no representative ***annual procurement volume*** of printers had been determined for printers. In practice, some institutions change the overall printing equipment after a certain usage cycle and e.g. can negotiate rebates, but it seems more usual that single or several devices are replaced when necessary, i.e. when the device breaks down. This means that the annual procurement volume would be in such a range that possible ***sales discounts*** usually won't apply. It is further assumed that there is no difference in the level of rebates between green and non green devices. Therefore, they are not taken into account in the LCCA.

A typical ***replacement period*** for printers is four years; some devices are used even longer.

The decision for ***purchasing or leasing*** of printing devices depends on the preferences of the procuring authority and on the printer category. Inkjet printers commonly seem to be purchased directly, due to their low prices. For small electro photographic printers, both versions are applied – in this study, purchasing has been taken as basis for the calculations. Especially large MFD are usually elements of a leasing contract on the basis of fixed monthly fees including a certain number of printed pages, full service and maintenance. For pages going beyond the agreed printing volume, an extra fee has to be paid on the basis of price per page.

Some manufacturers recommend a ***demand-oriented consulting service*** to define the optimal (possibly 'green') solution for a procuring authority. Instead of purchasing a certain number of printing devices, the average printing demand (number of pages, mono vs. colour etc.) builds the starting point for an overall equipment concept which is supposed to be most efficient (e.g. network solutions instead of several single devices, possibly leading to savings in energy consumption and costs). To calculate the LCC according to this approach would require a detailed specification of the average printing demand of the whole purchasing authority (not only of one printer), which would not be representative for other than the specified examples.

Costs for electricity (power consumption)

The costs for electricity are calculated with the electricity consumption and the price per kilowatt-hour (kWh).

Printers can usually enter various power modes with different power consumption values. According to Energy Star, one can differentiate between:

- **Active mode:** Power state in which the product is connected to a power source and is actively producing output, as well as performing any of its other primary functions.

- **Ready mode:** Power state when the product is not producing output, has reached operating conditions, has not yet entered into any low-power modes, and can enter ‘active mode’ with minimal delay. All product features can be enabled in this mode and the product is able to return to active mode by responding to any potential inputs. Potential inputs include external electrical stimulus (e.g. network stimulus, fax call or remote control) and direct physical intervention (e.g. activating a physical switch or button).
- **Sleep mode:** Reduced power state entered automatically after a period of inactivity. All product features can be enabled in this mode and the product must be able to enter ‘active mode’ by responding to any potential inputs; however, there may be a delay. The product must maintain network connectivity while in ‘sleep mode’, waking up only if necessary.
- **Stand-by mode:** Lowest power consumption mode which cannot be switched off (i.e. influenced) by the user and that may persist for an indefinite time when the product is connected to the main electricity supply and used in accordance with the manufacturer’s instructions. For imaging equipment products, the stand-by power level usually occurs in the ‘off mode’, but can occur in ‘ready’ or ‘sleep mode’. A product cannot exit the ‘stand-by mode’ and reach a lower power state unless it is physically disconnected from the main electricity supply as a result of manual manipulation.
- **Off mode:** Power state that the product enters when it has been manually or automatically switched off but is still plugged in and connected to the mains. This mode is exited when stimulated by an input, such as a manual power switch or clock timer to bring the unit into ‘ready mode’.

The distribution (i.e. how much time a printer spends in each mode) depends on the power management presetting of the device (how fast it changes into or ‘wakes up’ from a lower power mode) and on the user behaviour (frequency, distribution and volume of print jobs).

For product type 8.2 (single-function EP printers) and product type 8.3 (multifunctional devices) the definitions of the standardised Energy Star test procedure for the ‘Typical Electricity Consumption’ (TEC) are used for the calculations.[73]

The TEC focuses on the quantity of electricity consumed by a product during a representative period of time (one week). For measuring the TEC, Energy Star defines a certain number of jobs per day and images per job depending on the imaging speed of the

[73] The TEC is a broadly agreed and accepted standard for measuring and comparing the energy consumption of different printing devices.

printer, a test image and a measurement procedure. To take into account power-management default-delay times, the product has to be measured according to the configuration as shipped and recommended for use. The TEC-specifications might differ from real usage; however, they guarantee different imaging equipment devices being measured under same conditions and thus being comparable. To qualify for the Energy Star label, certain limit values have to be met by the devices. As only some products of few manufacturers are published in the Energy Star database, due to the recent change of program requirements, these limit values are taken as basis for the calculation of electricity demand of the green version.

The limit values for EP printers falling into the category 'Printers, standard-size; mono EP' and an imaging speed between 15 and 24 ipm lies between 2,0 and 3,8 kWh respectively. For calculating the energy consumption of the non green version, an energy demand which is 25 percent higher than the TEC limit value is assumed.

The following table summarises the assumptions regarding the energy demand of the green and the non green version of product type 8.2.

Table 130 Specification of the power level of the green and non green version of single-function EP printers

	Power level non green version (25% above maximum TEC)	Power level green version (Maximum TEC)
Electricity demand	3,6 kWh/week	2,9 kWh/week

The limit values for EP printers falling into the category 'Multifunctional device, standard-size; monochrome 21 and 69 ipm' lies between 6,44 and 27,56 kWh/week respectively. For calculating the energy consumption of the non green version, an energy demand which is 25 percent higher than the TEC limit value is assumed.

The following table summarises the assumptions regarding the energy demand of the green and the non green version of product type 8.3.

Table 131 Specification of the power level of the green and non green version of single-function EP printers

	Power level non green version (25% above maximum TEC)	Power level green version (Maximum TEC)
Electricity demand	26,8 kWh/week	21,4 kWh/week

Inkjet printers (product type 8.1) are not covered by the TEC test procedure but instead by the Energy Star 'Operational Mode Approach' (OM). OM is a method of testing and comparing the energy performance of imaging products; it focuses on the products' energy consumption in various low-power modes. According to Energy Star, the energy consumption of inkjet printers is mainly due to the various low power modes. The time span of the printer being in on mode is extremely short (i.e. a few minutes per day); therefore it will not be taken into account into the LCCA. To qualify for the Energy Star, certain maximum power levels for inkjet printers[74] have to be met by the devices. As only some products of few manufacturers are published in the Energy Star database, due to the recent change of program requirements, the OM limit values are taken as basis for the calculation of the electricity demand for the green version.

According to Fraunhofer ISI 2005, the average power consumption of inkjet printers in 2004 has been 6 Watt in sleep-mode and 3 Watt in off mode. These average values have been taken as basis for the calculation of a non green version.

Table 132 Specification of the power level of the green and non green version of IJ printers

Power mode	Power level non green version (Fraunhofer ISI 2005)	Power level green version (Energy Star requirements)
On mode	n.a.	n.a.
Sleep mode	6 W	3 W
Stand-by mode = Off mode[75]	3 W	1 W

The **electricity prices** for the selected Member States are outlined in section 3.4.3.1.

Costs for paper consumption

Costs for paper depend on the paper consumption and the price per sheet.

The **paper consumption** depends mostly on the user behaviour (printing demand, single or duplex printing). The Energy Star job table, used for product type 8.2 (EP printers), does not apply for product type 8.1 (inkjet printers), especially as the IJ printing volume generally is much lower. Therefore, a paper consumption of four pages per day according to Graulich (2007) has been taken as basis for the calculations. Assuming the printers are used on 240 days per year, this leads to 960 printed images per year. For the green version, having an automatic duplex unit, it is assumed that 75% of the pages are printed in duplex mode resulting in a reduced number of sheets per year.

For product type 8.2 (EP printers) the job table of the standardised Energy Star test procedure for the 'typical electricity consumption' (TEC) will be used for the calculations in the study at hand (see electricity demand). The number of images printed by an EP printer with an imaging speed between 15 to 24 ipm lies between 105 and 288 images per day

74 Falling into the category 'All Small Format and Standard-size OM products without Fax Capability'

75 According to Energy Star, the stand-by mode is defined as lowest power consumption mode which cannot be switched off by the user; for imaging equipment this is usually the off mode.

(mean value: 190). Assuming the printers are used on 240 days per year, this results in 45 480 printed images per year. For the green version, having an automatic duplex unit, it is assumed that 75% of the pages are printed in duplex mode, resulting in a reduced number of sheets per year.

The following table summarises the paper consumption in the green and the non green versions of product type 8.1, 8.2 and 8.3.

Table 133 Paper consumption of the green and non green version of the product types 8.1, 8.2 and 8.3

	Paper consumption	
	non green version	**green version**
Product type 8.1 (IJ printers)	960 sheets per year	600 sheets per year
Product type 8.2 (single-function EP printers)	45 480 sheets per year	28 425 sheets per year
Product type 8.3 (multifunctional devices)	240 000 sheets per year	150 000 sheets per year

To evaluate the influence of using recycling paper for Germany a **sensitivity analysis** has been carried out, where all used paper is in recycling quality (both with using a non green and a green version of the regarded printer).

According to the results of product group 10 ‘Paper’, current **prices for copying paper** in the selected member states are outlined in the following table. For calculating the future price development of paper, the average inflation rates of the selected Member States were used (see also section 0).

Table 134 Total costs of copying paper in the four selected MS

Copying paper (DIN A4, 80g/m²)	**Total costs per 1 tonne (400 reams of 500 sheets) (in Euros)**		**Total costs per sheet (in Euro-Cent)**	
	non green version	green version[76]	non green version	green version
Sweden (SV)	2.835,-	2.935,-	1,418	1,468
Germany (DE)	2.402,-	1.844,-	1,201	0,922
Spain (ES)	1.578,-	1.642,-	0,789	0,821
Czech Republic (CS)	1.287,-	1.284,-	0,644	0,642

[76] Including recycled and eco-certified copying paper.

Costs for the consumption of ink or toner

Costs for ink or toner depend on the ink mileage and price of the cartridges as well as on the number of printed pages.

For **inkjet printers**, it is nearly impossible to calculate a 'real', representative consumption:

- Most printing devices (even if being from the same manufacturer) use different ink cartridge systems. Their volume and capacity varies strongly, e.g. for black cartridges the range is between 5 to 42 millilitres, for single colour cartridges between 2,5 and 13 millilitres.
- One cannot proportionally deduce the number of printable pages (ink mileage) from the volume of the cartridges. It depends on
  - The specific usage behaviour (e.g. contents of the printed matter, draft or high quality printing mode),
  - The specific technical system of the printer. Some printers, for example, consume a certain amount of ink after new installation, adjusting or for a system maintenance, i.e. for the cleaning of nozzles when the printer has not been used for a longer period.
- Especially for inkjet printers, information on the capacity of cartridges has been quite rare and furthermore hardly comparable, because there has not been a standardised measurement procedure released recently. And even standardised values may differ strongly from the real consumption, due to the aforementioned reasons.
- Information on ink mileage is not published by every manufacturer, and data is partly incomplete.
- Additionally some manufacturers give rebates, e.g. on large-size cartridges, or local authorities may also decide for using refilled or recycled cartridges by alternative suppliers.

However, for each of the analysed inkjet printers the costs for ink have been calculated taking the specific ink mileage and the purchase prices of the associated ink cartridges into account. From these specific costs, the average costs for ink in the selected Member States have been calculated. This average value has been taken for the LCCA of both the green and the non green version. Due to the restrictions mentioned above, these calculations should only be considered as indication on the costs for ink cartridges, showing that costs for ink consumption build a significant part of the total life cycle costs of inkjet printers.

For **EP printers** a standardised measurement process (ISO/IEC 19752) exists since 2004 and is used for the determination and declaration of toner mileages. Compared to inkjet printers, it is therefore easier to calculate representative toner consumption. Nevertheless, also EP printers (even if being from the same manufacturer) use different toner cartridge systems with varying capacity and purchase prices. As with inkjet printers, the ‘real’ number of printable pages (toner mileage) finally does not only depend on the volume of the cartridges, but also on the specific usage behaviour (e.g. contents of the printed matter, draft or high quality printing mode). To calculate the costs for toner for EP printers, the costs per page of 15 different toner cartridges with a capacity between 2 000 and 3 500 pages have been calculated according to the specific toner mileage and the purchase price of the associated toner cartridges. As in case of inkjet printers, the average costs for ink in the selected Member States have been calculated from these specific costs. This average value has been taken for the LCCA of both the green and the non green version.

In both cases no differences in the specific costs for ink or toner between the green and the non green version have been assumed.

Costs for service and maintenance

Inkjet printers typically do not get repaired but rather are substituted in case of a defect.

For EP printers it depends on the costs for a new device whether repair is available. The more expensive the purchase of a new EP printer is, the more likely it is that a defect device gets repaired instead of substituted.

Against this background no repair and maintenance costs for the product types 8.1 and 8.2 were included in the calculation.

Contracts for large multifunctional devices usually include two parts: on one hand the leasing contracts for the financing of the device and on the other hand a full service agreement for the time of the leasing contract. The latter includes all costs for toner, maintenance and repair up to a number of pages per month as specified in the contract (e.g. 20 000 pages per month). Costs for electricity, paper and costs for pages that exceed the agreed number are not included.

Costs for disposal

Waste electrical and electronic equipment (WEEE), including printers and copiers, can be disposed free of charge from public authorities in the EU if this waste is similar in nature and quantity to that of private households.[77] This mainly applies for smaller devices, e.g. IJ printers which are often directly disposed via local waste disposal companies. Laser printers and particularly large multifunctional copiers and printing devices, however, are often covered by leasing contracts with take back systems being included free of extra charge.

For the calculation of life cycle costs of printers and copiers, no disposal costs are included.

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[77] Article 3 (k) WEEE Directive defines „WEEE from private households“ as „WEEE which comes from private households and from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households“.

5.8.4 Product type 8.1: Single-function printers (ink jet)

5.8.4.1 Functional unit and alternatives to be analysed

The functional unit encompasses the purchase and usage of one colour inkjet printer as specified in section 5.8.1 (single-function; speed: 10 to 20 ipm; single user; desktop) with an assumed life span of four years. The use pattern is specified as follows:

- Average number of printed pages: 4 images per day[78] (= 80 images per month)
- Average use in office environment: 240 days per year. 8 hours in stand-by mode. 16 hours in off mode

The following alternatives are regarded:

- **Non green version:** Average printer.
- **Green version:** Printer complying with the following criteria:
  - Complying with Energy Star criteria[79] regarding energy consumption;
  - Having an automatic duplexing unit as optional accessory; and
  - Being capable of processing recycled paper (see also section 5.8.2).
- **Sensitivity Analysis**: Use of recycled paper

5.8.4.2 System boundaries

The analysis covers the selected Member States (Sweden, Germany, Spain and the Czech Republic).

The following costs elements were considered: Purchase costs, costs for electricity, paper and ink cartridges. For details see section 5.8.3.

For the investigation, nine inkjet printers of three major producers were analysed in the selected Member States (see annex); data was gathered from their internet platforms, authorised retailers, as well as from a recent project of Öko-Institut (Graulich 2007). Only current prices as gained in the market research are used.

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[78] See e.g. Fraunhofer IZM (2007a) and Graulich (2007).

[79] The new Energy Star Program Requirements for Imaging Equipment entered into force as from April 2007.

5.8.4.3 Results

Most important cost elements

The following table shows the life cycle costs for the non green version in the selected Member States and the cost structure in percent.

Table 135 Cost structure of inkjet printers in the selected Member States (in Euros and %)

	Sweden		Germany		Spain		Czech Republic	
	LCC	shares	LCC	shares	LCC	shares	LCC	shares
Investment costs	111	27%	131	36%	111	36%	122	45%
Costs for electricity	9	2%	14	4%	11	4%	11	4%
Costs for ink	244	59%	175	48%	158	51%	114	42%
Costs for paper	50	12%	43	12%	28	9%	23	8%
SUM	**414**	**100%**	**363**	**100%**	**308**	**100%**	**270**	**100%**

Besides the purchase price with 27 to 45% of the life cycle costs, the costs for ink represent with 42 to 59% the most relevant cost driver. Costs for paper consumption are in a range of 8 to 12%, whereas the electricity costs only represent 2 to 4% of the overall life cycle costs.

In Germany, the average purchase price at first sight seems higher than in the other Member States. However, it is assumed that the price difference derives from using recommended retail prices in Germany and market prices from online databases in the other Member States (the recommended retail prices could not be obtained there).

Comparison of green and non green versions

The following tables show the comparison of the LCC of the green and the non green version of product type 8.1 (inkjet printers) for the selected Member States.

Table 136 LCC of 'inkjet printers' (Sweden, in Euros)

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	111	161	50	45%
Costs for electricity	9	3	-5	-61%
Costs for ink	244	244	0	0%
Costs for paper	50	31	-19	-38%
SUM	**414**	**440**	**26**	**6%**

Table 137 LCC of 'inkjet printers' (Germany, in Euros)

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	131	181	50	38%
Costs for electricity	14	5	-8	-61%
Costs for ink	175	175	0	0%
Costs for paper	43	27	-16	-38%
SUM	**363**	**388**	**26**	**7%**

Table 138 LCC of 'inkjet printers' (Spain, in Euros)

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	111	161	50	45%
Costs for electricity	11	4	-7	-61%
Costs for ink	158	158	0	0%
Costs for paper	28	18	-11	-38%
SUM	**308**	**341**	**33**	**11%**

Table 139 LCC of 'inkjet printers'; (Czech Republic, in Euros)

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	122	172	50	41%
Costs for electricity	11	4	-7	-61%
Costs for ink	114	114	0	0%
Costs for paper	23	14	-9	-38%
SUM	**270**	**305**	**35**	**13%**

Sensitivity Analyses

For Germany, two sensitivity analyses have been conducted:

- Use of a non green printer with either conventional or with recycling paper
- Use of a non green printer with conventional paper vs. use of a green printer with recycling paper

The following table compares the LCC if an authority uses the non green version of the IJ printer either with 'conventional' paper or with recycling paper.

Table 140 Sensitivity analysis (1): use of recycling paper (using a non green printer version); in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	131	131	0	0%
Costs for electricity	14	14	0	0%
Costs for ink	175	175	0	0%
Costs for paper	43	33	-10	-23%
SUM	**363**	**353**	**-10**	**-3%**

The following table compares the LCC of a non green version (for both the printer and the copying paper) with the LCC of a ‘double green version’ (for both the printer and the copying paper).

Table 141 Sensitivity analysis (2): use of recycling paper (using a non green printer and a green printer version); in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	131	181	50	38%
Costs for electricity	14	5	-8	-61%
Costs for ink	175	175	0	0%
Costs for paper	43	20	-22	-52%
SUM	**363**	**382**	**19**	**5%**

5.8.5 Product type 8.2: Single-function printers (electro photography)

5.8.5.1 Functional unit and alternatives to be analysed

The functional unit encompasses the purchase and usage of one monochrome electro-photographic printer as specified in section 5.8.1 (single-function; speed: 15-24 ipm; network-capable; desktop) with an assumed life span of 4 years. The use pattern is specified as follows:

- Average number of printed pages: 190 images per day (= 3 790 images per month)[80]
- Average use in office environment: 240 days per year.

[80] Energy Star 2006a provides a test procedure for the typical energy consumption (TEC) of electro photographic printers defining the number of jobs per day and images per job according to different speed classes.

The following alternatives are regarded:

- **Non green version:** Average printer.
- **Green version:** Printer complying with the following criteria:
  - Complying with Energy Star criteria[81] regarding energy consumption;
  - Automatic duplexing unit must be offered as a standard feature; and
  - Being capable of processing recycled paper (see also section 5.8.2).
- **Sensitivity Analysis:** Use of recycled paper.

5.8.5.2 System boundaries

The analysis covers the selected Member States (Sweden, Germany, Spain and the Czech Republic).

The following cost elements were considered: Purchase costs, costs for electricity, paper and toner cartridges. For details see section 5.8.3.

For the investigation, EP printers of 12 major producers were analysed (see annex). In Germany, purchase prices of 30 electro photographic printers were taken as basis for the calculations. In Spain, prices for 25 of those printers could be investigated, in Sweden for 24 and in Czech Republic for 17 printers. Recommended retail prices were gathered from the websites of the manufacturers. Further market prices were researched via online shops. Only current prices as gained in the market research are used.

5.8.5.3 Results

Most important cost elements

The following table shows the life cycle costs for the non green version in the selected Member States and the cost structure in percent.

Table 142 Cost structure of electro photographic printers (in Euros and %)

	Sweden		**Germany**		**Spain**		**Czech Republic**	
	LCC	shares	LCC	shares	LCC	shares	LCC	shares
Investment costs	202	3%	271	4%	214	4%	224	4%
Costs for electricity	51	1%	81	1%	64	1%	67	1%
Costs for toner	4955	65%	4.438	65%	3.785	70%	4.177	75%
Costs for paper	2372	31%	2.022	30%	1.338	25%	1.085	20%
SUM	**7.580**	**100%**	**6.812**	**100%**	**5.400**	**100%**	**5.552**	**100%**

[81] The new Energy Star Program Requirements for Imaging Equipment enter into force as from April 2007.

For electro photographic printers, toner costs represent with 65 to 75% the most relevant cost driver, followed by the costs for paper consumption (20 to 30%). The investment costs are in a range of 3 to 4%, whereas the electricity costs only represent about 1% of the overall life cycle costs.

In Germany, the average purchase price at first sight seems higher than in the other Member States. However, it is assumed that the price difference derives from using recommended retail prices in Germany and market prices from online databases in the other Member States due to data gaps.

Comparison of green and non green versions

The following tables show the comparison of the LCC of the green and the non green version of product type 8.2 (EP printers) for the selected Member States.

Table 143 LCC of 'EP printers' (Sweden, in Euros)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment costs	202	252	50	25%
Costs for electricity	51	41	-10	-20%
Costs for toner	4.955	4.955	0	0%
Costs for paper	2.372	1.483	-890	-38%
SUM	**7.580**	**6.730**	**-850**	**-11%**

Table 144 LCC of 'EP printers' (Germany, in Euros)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Investment costs	271	321	50	18%
Costs for electricity	81	65	-16	-20%
Costs for toner	4.438	4.438	0	0%
Costs for paper	2.022	1.264	-758	-38%
SUM	**6.812**	**6.088**	**-724**	**-11%**

Table 145 LCC of 'EP printers' (Spain, in Euros)

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	214	264	50	23%
Costs for electricity	64	51	-13	-20%
Costs for toner	3.785	3.785	0	0%
Costs for paper	1.338	836	-502	-38%
SUM	**5.400**	**4.936**	**-464**	**-9%**

Table 146 LCC of 'EP printers' (Czech Republic, in Euros)

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	224	274	50	22%
Costs for electricity	67	53	-13	-20%
Costs for toner	4.177	4.177	0	0%
Costs for paper	1.085	678	-407	-38%
SUM	**5.552**	**5.182**	**-370**	**-7%**

Sensitivity Analyses

For Germany, two sensitivity analyses have been conducted:

- Use of a non green printer with either conventional or with recycling paper;
- Use of a non green printer with conventional paper vs. use of a green printer with recycling paper.

The following table compares the LCC if an authority uses the non green version of the EP printer either with 'conventional' paper or with recycling paper.

Table 147 Sensitivity analysis (1): use of recycling paper (using a non green printer version); in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	271	271	0	0%
Costs for electricity	81	81	0	0%
Costs for toner	4.438	4.438	0	0%
Costs for paper	2.022	1.552	-470	-23%
SUM	**6.812**	**6.342**	**-470**	**-7%**

The following table compares the LCC of a non green version (for both the printer and the copying paper) with the LCC of a 'double green version' (for both the printer and the copying paper).

Table 148 Sensitivity analysis (2): use of recycling paper (using a non green printer and a green printer version); in Euros

	LCC		Difference	
	non green version	green version	absolute	relative
Investment costs	271	321	50	18%
Costs for electricity	81	65	-16	-20%
Costs for toner	4.438	4.438	0	0%
Costs for paper	2.022	970	-1.052	-52%
SUM	**6.812**	**5.794**	**-1.018**	**-15%**

5.8.6 Product type 8.3: Multifunctional devices (electro photography)

5.8.6.1 Functional unit and alternatives to be analysed

The functional unit encompasses the leasing and usage of a monochrome electro-photographic printer as specified in section 5.8.1 (multi-function; speed: 50-75 images per minute; network-capable; floor-standing). The use pattern is specified as follows:

- Average number of printed pages: 1 000 images per day (= 20 000 images per month)[82]
- Average use in office environment: 240 days per year.

The following alternatives are regarded:

- **Non green version**: average printer.
- **Green version**: printer complying with one or more of the criteria regarding energy consumption and printing process outlined below.

[82] Energy Star 2006a provides a test procedure for the typical energy consumption (TEC) of electro photographic printers defining the number of jobs per day and images per job according to different speed classes. For printers with a speed of 50 to 75 images per minute, an average of approximately 2 000 images per day is defined.

Requirements for green version of product type 8.3 (see also section 5.8.2):

- Energy consumption: According to Energy Star criteria[83]
- Use phase: Automatic duplexing must be offered as a standard feature and is used in 75% of all prints as it is set as standard configuration by the network-administrator of the purchasing authority;[84] printers must be capable of processing recycled paper.

5.8.6.2 System boundaries

The analysis covers the selected Member States (Sweden, Germany, Spain and the Czech Republic).

The following costs elements were considered: leasing costs (duration 48 months), costs for full service agreement costs for electricity and paper. For details see section 5.8.3.

For the investigation, multifunctional devices of 2 major producers were analysed (see annex). In Germany, purchase prices of 2 multifunctional devices were taken as basis for the calculations. In Sweden for 2 and in Czech Republic for 1 multifunctional device costs were investigated. Leasing offers were obtained from retailers. Unfortunately no data could be gathered for Spain.

Only current prices as gained in the market research are used.

5.8.6.3 Results

Most important cost elements

The following table shows the life cycle costs for the non green version in the selected Member States and the cost structure in percent.

Table 149 Cost structure of inkjet printers in the selected Member States; (in Euro and %)

	Sweden		**Germany**		**Czech Republic**	
	LCC	shares	LCC	shares	LCC	shares
Costs for leasing and full service	16.287	56%	23.869	68%	16.033	59%
Costs for electricity demand	369	1%	587	2%	447	2%
Costs for paper	12.524	43%	10.669	30%	10.669	39%
SUM	**29.181**	**100%**	**35.126**	**100%**	**27.148**	**100%**

[83] The new Energy Star Program Requirements for Imaging Equipment enter into force as from April 2007.

[84] It is important that this configuration is preset for the users, in order they don't have to change the configuration to duplex printing themselves.

Besides the costs for leasing and full service with 56 to 68% of the life cycle costs, the costs for paper represent with 30 to 43% the most relevant cost driver. Costs for electricity consumption only represent 1 to 2%, of the overall life cycle costs.

Comparison of green and non green versions

The following tables show the comparison of the LCC of the green and the non green version of product type 8.3 (multifunctional devices) for the selected Member States.

Table 150 LCC of 'Multifunctional Devices' (Sweden, in Euros)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Costs for Leasing and full service	16.287	16.287	0	0%
Costs for electricity demand	369	296	-74	-20%
Costs for paper	12.524	7.827	-4.696	-38%
SUM	**29.181**	**24.410**	**-4.770**	**-16%**

Table 151 LCC of 'Multifunctional Devices' (Germany, in Euros)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Costs for Leasing and full service	23.869	23.869	0	0%
Costs for electricity demand	587	470	-117	-20%
Costs for paper	10.669	6.668	-4.001	-38%
SUM	**35.126**	**31.007**	**-4.118**	**-12%**

Table 152 LCC of 'Multifunctional Devices' (Czech Republic, in Euros)

	LCC		**Difference**	
	non green version	green version	absolute	relative
Costs for Leasing and full service	16.033	16.033	0	0%
Costs for electricity demand	447	357	-89	-20%
Costs for paper	5.729	3.581	-2.148	-38%
SUM	**22.209**	**19.971**	**-2.238**	**-10%**

Sensitivity Analyses

For Germany, two sensitivity analyses have been conducted:

- Use of a non green MFD with either conventional or with recycling paper;
- Use of a non green MFD with conventional paper vs. use of a green MFD with recycling paper.

The following table compares the LCC if an authority uses the non green version of the MFD either with 'conventional' paper or with recycling paper.

Table 153 Sensitivity analysis (1): use of recycling paper (using a non green MFD version); in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Costs for leasing and full service	23.869	23.869	0	0%
Costs for electricity demand	587	587	0	0%
Costs for paper	10.669	8.190	-2.478	-23%
SUM	**35.126**	**32.647**	**-2.478**	**-7%**

The following table compares the LCC of a non green version (for both the printer and the copying paper) with the LCC of a 'double green version' (for both the printer and the copying paper).

Table 154 Sensitivity analysis (2): use of recycling paper (using a non green printer and a green MFD version); in Euros

	LCC		**Difference**	
	non green version	green version	absolute	relative
Costs for Leasing and full service	23.869	23.869	0	0%
Costs for electricity demand	587	470	-117	-20%
Costs for paper	10.669	5.119	-5.550	-52%
SUM	**35.126**	**29.458**	**-5.667**	**-16%**

5.8.7 Summary and conclusions

The following tables give an overview of the total LCC of all product types in the selected Member States.

Table 155 Total LCC single-function IJ printers in the four selected MS; in Euros

	Total LCC		**Difference**	
	non green version	**green version**	**absolute**	**relative**
Sweden	414	440	26	6%
Germany	363	388	26	7%
Spain	308	341	33	11%
Czech Republic	270	305	35	13%

Table 156 Total LCC of single-function EP printers in the four selected MS; in Euros

	Total LCC		**Difference**	
	non green version	green version	absolute	relative
Sweden	7.580	6.730	-850	-11%
Germany	6.812	6.088	-724	-11%
Spain	5.400	4.936	-464	-9%
Czech Republic	5.552	5.182	-370	-7%

Table 157 Total LCC of multifunction EP devices in the four selected MS; in Euros

	Total LCC		**Difference**	
	non green version	green version	absolute	relative
Sweden	29.181	24.410	-4.770	-16%
Germany	35.126	31.007	-4.118	-12%
Czech Republic	22.209	19.971	-2.238	-10%

The main results are to be summarised as follows:

- The green version of single-function IJ printers as specified in this study (i.e.: automatic duplex unit and meeting energy star requirements) are more expensive than the conventional (‘non green’) version. This is mainly due to the quite high price of the automatic duplex unit (between 38 and 45 % higher as the non green version). As the printing volume is quite low, these higher costs cannot be compensated for by the lower paper consumption.
- In contrast, the LCC of the green version of the single-function EP printers as specified in this study (i.e.: automatic duplex unit and meeting energy star requirements) is between 7 and 11 % lower than the LCC of the non green version. Even though the purchase price of the printers with automatic duplex unit is between 20 and 25% higher than the price of the non green version, the lower costs during the use phase overcompensates this difference due to the much lower paper consumption.
- With about 38% for multifunctional EP devices the most important cost saver is the use of the duplex function. Large multifunctional EP devices come with a duplex unit, so no extra costs have to be assigned to this function. It is more critical weather users

actually use the duplex function or rather obstain from using it. Cost savings due to a better electricity standard are negligible.

- In all cases it can be seen that the use of recycling paper leads to cost reductions as the price for recycling paper in Germany is lower compared to the price for conventional paper. Combining the use of the green version of the printers with the use of recycling paper leads to lower additional costs in case of the IJ printers and to higher savings in case of the EP printers.

5.9 Product group 9: Food

5.9.1 Selection of different product types

For the investigation of life cycle costs in food procurement it is most important to select products which have a relevance for nutrition in the four countries selected for the survey – and therefore also for public food procurement. Furthermore, to get a broad overview of life cycle costs, it is important to select products which belong to different product categories (e.g. drinks, vegetables, meat) and a green and a non green version has to exist.

The selection criteria in brief:

- The products selected are typical for food procurement in the four countries under survey;
- The products selected belong to different product categories;
- Green and non green versions of the selected products do exist.

Taking these criteria into account the proposed products to be analysed for food procurement are: Coffee, tomatoes, potatoes, and chicken.

In 2004, 2 870 508 tonnes of **coffee** were consumed in the EU 25. In the four countries under investigation, coffee consumption varies depending on the number of cups consumed in average per year, but also on different consumer habits concerning coffee preparation. The coffee consumption in Germany amounts to 591 000 tonnes per year which is an average of 7,2 kg per capita and year. In spite of the fact that Germany has the highest absolute consumption of coffee, Finland has the highest consumption per capita: it amounts to 11,8 kg per year with increasing tendency. This is by far the highest per capita coffee consumption worldwide. The coffee consumption in Spain and the Czech Republic is, with 3,6 and 2,9 respectively in 2004, at the lower end compared with other European countries. (FAO 2006) Nevertheless, for all selected countries coffee is a relevant product for public procurement as nearly all canteens offer coffee.

Even though the amount of tomato consumption differs, **tomatoes** play an important role in the diet of nearly all European countries. Furthermore, tomatoes can be used in a huge variety of different preparations: salads, soups, sauces, juice, etc. The preparation forms of tomatoes are endless, and they are combinable with a lot of other comestibles. In Spain, one of the main tomato producing countries in the EU, tomato consumption amounts to 1 800 000 tonnes per year which is an average of 44 kg per capita and year. Germany, Finland and Czech Republic consume around 16 kg per capita and year.

Also **potatoes** play an important role in nutrition in all of the selected countries. The consumption per capita is nearly the same in the four selected countries, about 70 kg per capita and year. Nevertheless, the preferred preparation form of potatoes varies: southern European countries prefer deep-fried potatoes, central European countries prefer cooked potatoes and east European countries prefer potato dumplings. A potato product typical for all four selected countries is potato chips, which are eaten all over Europe.

From an economic and ecological point of view meat plays a prominent role regarding the total costs of food. Against the background of increasing problems with adiposity in most European societies, the interest for meat with lower calories increased in the last years. Also canteens stay abreast of these changes. Thus, the consumption of **chicken meat** per capita shows an increasing demand in Spain, Finland and the Czech Republic. In Germany the consumption stayed approximately the same over the past 10 years.

For the development of the consumption of coffee, tomatoes, potatoes and chicken in the four selected Member States between 1995 and 2004 (in total and per capita), see annex.

5.9.2 Organic food in the selected Member States

The following section presents a general overview on organic food markets in the selected countries. All information in this section was obtained from the websites www.oekolandbau.de and www.organic-europe.org.

5.9.2.1 Finland

The Finnish Ministry for Agriculture planned in 2001 to enforce the ecological cultivation. Aim is to reach a share of 15% of ecological cultivated land by 2010. While the absolute number of eco-farmers is decreasing, the share of land cultivated according to the criteria of ecological agriculture is increasing. Those large-scale organic farmers became more and more competitive during the last years.

Green food has only a small market share in Finland, and some products are quite difficult to get in eco-variant. Even though about 20% of Finnish consumers - most of them living in and around Helsinki - buy organic food, the market share is about 3,5%.

Due to the low population density in Finland (except for the capital, Helsinki), small sized bio food retailers are dominating the market. According to expert opinions in the next years, direct sale and wholefood shops will increase their market share. Furthermore, it is estimated that canteens will increase the share of green food in their meals to about 15%.

In Finland, three different labels for organic food exist: one governmental label and two private labels. The governmental label 'Luomu' is granted by Evira. The 'Ladybird quality' logo is owned and administrated by the Finnish Association for Organic Farming, Luomuliitto. It is granted e.g. to farmers and food processors producing organic food according to the quality standards of Luomuliitto. The Luomuliitto's standards go beyond the standards of the Council Regulation (EEC) No. 2092/91 and consist of compulsory requirements and recommendations. Furthermore, it is required that all animal manure used for growing products intended directly for human consumption must be composted. The basic ingredients of processed products must be 100% of Finnish origin and at least 75% of ingredients in total.

The Finnish Biodynamic Association owns the international Demeter label for bio-dynamic products. The association has its own standards for Finnish bio-dynamic production, based on the international standards for bio-dynamic agriculture.

5.9.2.2 Germany

In Germany, the governmental goal is to increase the share of land cultivated organically to 20% by 2010. In spite of this quite ambitious goal the market share of green food is quite small: In 2006 green food had a market share of about 3% with increasing tendency[85]. The turnover of organic food had a value of 4,5 billion Euros in 2006. This implicates a growth of 16% in relation to 2005. Especially the retail trade dominates the bio market. Since 2000 the share of retail markets has trebled.

In Germany, nine ecological cultivation associations exist (Biokreis, Bioland, Biopark, Demeter, Ecoland, Ecovin, Gäa, Naturland, Verbund Ökohöfe), each of them having its own criteria for ecological farming. Together they represent about 9 000 farms cultivating an area of 550 000 ha (in 2007). The associations support sustainable quality through ecological quality standards and labels additional to the EU-Regulation-Form. The abidance by the standards is controlled by controlling authorities.

According to the German Farmer Association, ecological food with a regional heritage is of high interest for consumers. For some regional eco-products, e.g. milk, potatoes and chicken, supply shortfalls could be documented (Bauernverband 2007[86]).

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[85] From the beginning of 2007 the demand for bio food began to increase rapidly.

[86] www.bauernverband.de (download from 04 May 2007)

5.9.2.3 Spain

After the introduction of a public financial support program for organic farmers in 1995 which was launched later than comparable programs in other European countries, an increase in organic farming could be noted: the number of organic farms has augmented twelve-fold between 1994 and 1999.

In 2002, the organic sector included 15 607 producers (1,5% of all farms), 914 processing companies, 16 521 operators (farmers, processors, importers) and about 2% of the total cultivated agricultural area (485 087,87 ha). Most of the organic farms are located in the Extremadura (7 121 farms), followed by Andalusia (3 983 farms). Especially in the winter season, about 80% of the Spanish organically grown crops are exported, mostly to central and northern European countries. Because of the climatic conditions, the organic production is better developed than the domestic market in Spain.

The payment of the farmers is fixed per crop, year and by each autonomous region, and it is, in most cases, lower than in other European countries. Presently, there are only a few organic producer associations in Spain. A national federation of associations is promoting organic farming (FANEGA), which involves 14 different regional organisations. The bulk of organic producers is organised within the conventional farmers organisations in the organic sections.

Currently it is difficult to find organic products in the conventional distribution network and only few organic products can be found in Spanish supermarkets.

5.9.2.4 Czech Republic

The goal of the governmental Czech Action Plan for the Development of Organic Farming by 2010 is to achieve a share of 10% of organic farmed land of the total cultivated land in the Czech Republic. Additionally, it is aimed for improving production structures and raising consumer interest in organic products.

Since 1998, the number of farms and the acreage of organically cultivated agricultural land have increased In the Czech Republic. In 2005, 829 organic farms cultivated a total of 254 982 ha or 5,98% of the total agricultural land, and 1 268 operators were engaged in the organic farming sector.

The organic food market is developing rapidly, due to the increasing demand by Czech consumers. However, this demand is predominantly satisfied by augmented imports from abroad. The turnover of the organic food market grew by 30% from 1998 to 2005 and reached about 12,5 mio. Euros.

In the Czech Republic, organic farms differ from those typical for other EU states: typically, Czech organic farms are traditional family owned. The distribution of organic farms is unbalanced throughout the Czech Republic and most organic farms are located in the mountainous and submontane areas. Presently, two organic farming associations exist, the PRO-BIO association in Šumperk and the LIBERA association in Prague.

5.9.2.5 Conclusions

The overview of the bio market in the four selected Member States shows that all governments aim to increase the share of land cultivated organically. However, there are differences regarding the starting points, e.g. Spain started quite late with enforcement programs for organic cultivation and the measures to achieve this goal. In all countries, the share of organic food is quite low, especially in Spain were it is quite difficult for consumers even to find bio food in the supermarkets.

5.9.3 Green and non green versions

For the definition of green and non green versions it is necessary to analyse at the products' value chains to identify where the main environmental impacts derive from. Doing this, one can easily see that for all selected product types, as agricultural products, the main environmental impacts are produced during the cultivation or livestock husbandry (Salomone 2003, Rice and Ward 1996, Wiegmann et al. 2005). Several management systems address this with their standards (e.g. Ifoam standards,[87] EU standard,[88] Rainforest Alliance Certification Programme for Coffee[89]).

The green and non green versions are specified as follows:

- **Non green version:** Conventional products, which do not fulfil any standards. In case of chicken, the non green version is conventionally housed animals, where the livestock husbandry does not fulfil any standards.
- **Green version:** Organically grown crops or adequate animal housing, fulfilling the Ifoam or EU standards. A certificate for fulfilling the standards is needed. This can be proven by labels (e.g. the 'Bio-Siegel' in Germany) or by comparable certificates which indicate that the crops were cultivated or the chicken housing was in accordance with the mentioned standards.

In case of coffee not only the environmental aspects are important. Coffee as the world's most important agricultural commodity also has a great impact concerning social aspects. Therefore the **green coffee version** is organically grown and/or fair traded roasted ground coffee which fulfils the Ifoam or EU standards and/or the standards set by the Fair Trade

87 www.ifoam.org

88 For standards please refer to the annex to this section.

89 http://www.rainforest-alliance.org/programs/agriculture/certified-crops/coffee.html

Labelling Organisation International (FLO)88. Adequate certificates are e.g. the 'Bio-Siegel' in Germany and/or the 'Fair Trade' label or 'Max Havelaar' label or comparable certificates which indicate that the coffee cultivation took place in accordance with the mentioned standards.

5.9.4 Calculation and cost elements

Referring to the buying behaviour of public procurement, the calculation of life cycle costs will be based on the purchase price for the products (wholesale prices). For all product types, no differences are assumed in processing the products (e.g. energy and water costs, or costs for staff). Therefore, only the costs for purchasing are considered.

However, to give a picture of the share the ingredients have at the final product (cup of coffee, meal in a canteen), next to the price per kg purchased product also the price per cup or per serving respectively is given. To calculate the whole costs incurring for the preparation of a cup of coffee or a serving of tomatoes, potatoes, or chicken for the four selected Member States was not possible within the financial and time restrictions of the study at hand.

The prices shown base upon surveys carried out by the authors: By means of internet enquiry, requests by telephone or e-mail, public canteens, wholesalers, associations, etc. were contacted. The prices shown in the following sections are average prices. The variation between the prices within one product type was mostly small. Some prices had to be estimated on the basis of expert information, due to the fact that no information was available. All prices shown include the value-added tax (VAT).

The complete list of investigation contacts is shown in the annex.

5.9.5 Product type 9.1: Coffee

Coffee originates from the Ethiopian highland. The culture of drinking coffee came from the Arabian countries to Europe from the 16th century on. During the 20th century, coffee production reached considerable importance. Today, coffee is the most popular hot beverage. In Europe, 2 281 925 tonnes of coffee were consumed in 2003 (FAO 2006). This is equivalent to over 400 billion cups consumed every year. Worldwide, coffee is grown in over 50 countries and more than 60 million people depend on the production, marketing and processing of coffee for all or part of their income (ICO 2001). Thus, after oil, coffee is the highest-valued (legal) commodity traded from the developing world, and the world's most valuable agricultural commodity (Nestlé 2002, Oxfam 2002). The world coffee exports valued at 9,1 billion US$ in 2004 (FAO 2006).

As coffee cannot be cultivated in Europe itself, due to the climate conditions, coffee raw material is imported as green coffee beans (the so called 'green' coffee), roasted coffee or decaffeinated coffee.[90] The EU is the biggest coffee importer worldwide, followed by the USA that imported an amount of 1 239 080 tonnes in 2004 (FAO 2006).

Though there are several coffee species, in the coffee production mainly two species are used: *Coffea arabica* (Arabica coffee) and *Coffea canephora* (Robusta coffee). Among the four countries under survey the amount of imported Arabica and Robusta coffee varies, which roughly reflects different national preferences in coffee taste and flavour. Thus, in Spain Robusta coffee is preferred, whereas in Germany Arabica coffees are at the top of consumers preferences.

5.9.5.1 Functional unit and alternatives to be analysed

In the study at hand the costs of **one kilogram of roasted ground coffee**, typical for the countries' consumers' preferences[91], will be analysed (functional unit). Additionally, the costs will be calculated for one cup of coffee, which will be also defined country specific, concerning the amount of coffee necessary to prepare one cup[92].

In total, two versions of coffee have been analysed:

- **Non green version:** Conventionally grown roasted ground coffee, which does not have to fulfil any standards.
- **Green/fair version:** Organically grown and/or fair traded roasted ground coffee which fulfils the Ifoam or EU standards and/or the standards set by the Fair Trade Labelling Organisation International (FLO).

These mentioned versions are available on the market of the four countries, although organically grown coffee and fair traded coffee are still niches:

- In 2003, fair trade coffee accounted for a total of 13 789 tonnes of coffee in European countries (FLO 2004a). This amount represents 0,5% of the green coffee imports into the EU 25[93].
- According to International Coffee Organization (ICO) (2005b), who monitored the exports of organic coffee based on information received from the exporting members in

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90 Green coffee means all coffee in the naked bean form before roasting (ICO 2001). Roasted coffee means green coffee roasted to any degree and includes ground coffee. Decaffeinated coffee means green, roasted or soluble coffee from which caffeine has been extracted (ICO 2000). Roasted and decaffeinated coffee is imported only to a minor extent to the EU.

91 This means that the coffee analysed in the four countries under study differs concerning its mixture with respect to the used coffee species (Robusta or Arabica).

92 It has to been taken into account that consumer habits concerning the consumption of coffee differ in the four countries under study (see above). Thus, for each country the typical 'cup of coffee' will be defined (e.g. 'cortado' for Spain, 'Kaffee' for Germany, etc.)

93 The import of green coffee in 2003 accounted for 2 695 689 tons (FAO 2006).

the last years, in the season of 2004/2005, 45 496 tonnes of organic coffee were exported. Compared to the worldwide export of 5 667 101 tonnes of green coffee in 2004, organic coffee makes up 0,8% of the global coffee market.

5.9.5.2 System boundaries and data quality

The analysis took place in the capitals of the four selected countries: Prague (Czech Republic), Helsinki (Finland), Berlin (Germany), Madrid (Spain). The analysis refers only to the purchasing costs of coffee from the wholesaler, which is the main supplier in public food procurement.

Data quality requirements:

- **Time-related coverage:** Only current prices as gained in the market research are used.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states.

5.9.5.3 Results

The following table shows the wholesale prices for green / fair and non green coffee in the four selected countries.

Table 158 Wholesale prices of coffee in €/kg[94] (rounded figures)

Coffee	Price			Difference	
	non green	green/fair	fair	absolute	relative
Finland	5,18	13,80	-	8,62	166%
Germany	6,49	10,36	9,18	3,87	60%
Spain	5,64	9,36	-	3,72	66%
Czech Republic	3,37	4,72	-	1,35	40%

For Finland and the Czech Republic, the costs for green coffee had to be estimated on the basis of ZMP[95] analyses and Hoy (2004). This is due to the fact that the inquired wholesalers and canteens do not offer green or fair traded coffee; nevertheless, green/fair coffee is available in both countries.

The figures show that green/fair coffee is more expensive in all countries under survey. The cost differences vary from 40% (Czech Republic) to 166% (Finland).

[94] The prices given are not necessarily representative for the costs for all wholesaler markets in the country; prices for food can be different for different regions. The list in the annex shows the sources for the prices shown in the table.

[95] www.zmp.de

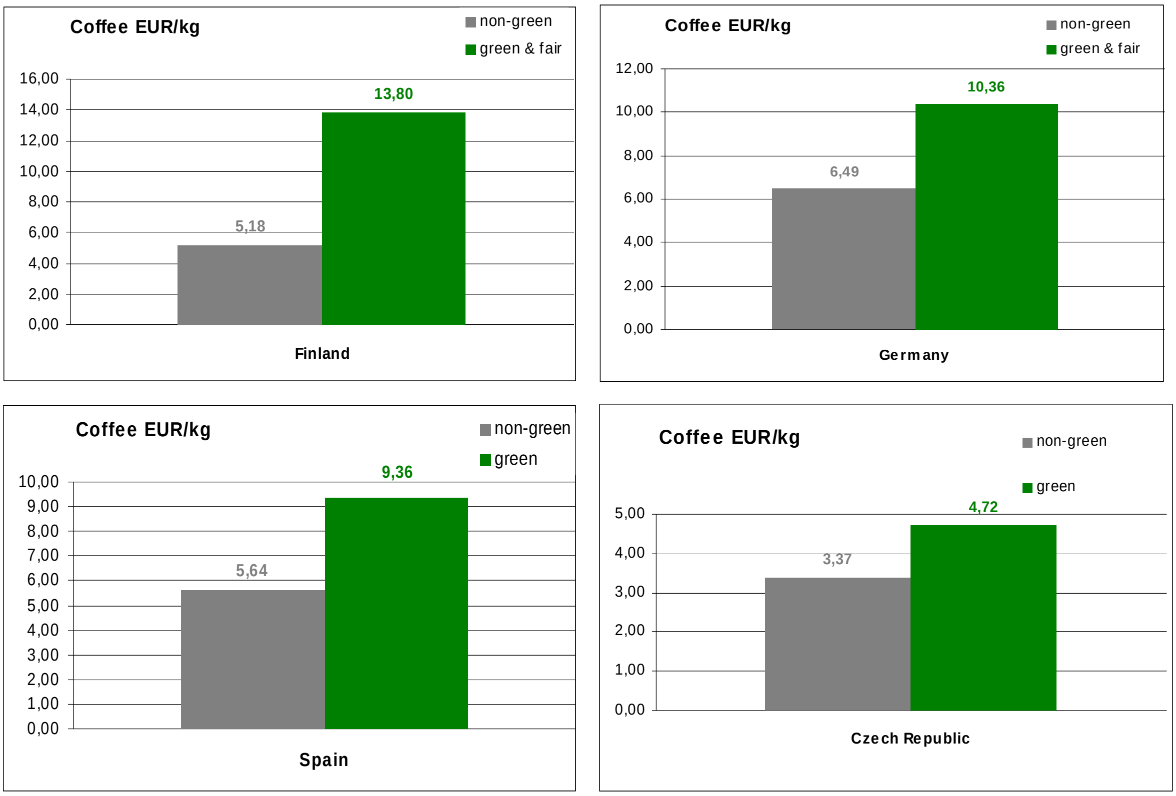

Figure 5 Wholesale prices of coffee in the countries under survey

For public purchasers, not only the cost differences for one kilogram of coffee are of interest, also the price per cup of coffee is interesting information. Thus, Table 159 shows the costs per cup of coffee. It is obvious that the absolute differences within those between the green and the non green version per cup are quite small: They vary from 1 ct/cup (Czech Republic) to 6 ct/cup (Finland). A comparison of the differences in the sales prices for green and conventional coffee in German canteens shows that the absolute price difference for the consumers is 15 ct/cup, although the real price difference, due to higher purchasing costs for organic coffee, is only 3 ct/cup.

Table 159 Wholesale prices of coffee/cup[96] in €/kg (rounded figures)

Coffee	Price		Difference		Sales Price/Cup	
	non green	fair/green	absolute	relative	non green	green
Finland	0,04	0,10	0,06	166%	-	-
Germany	0,05	0,07	0,03	60%	0,85	1,00
Spain	0,04	0,07	0,03	66%	-	-
Czech Republic	0,02	0,03	0,01	40%	-	-

The results show that – having a look on the absolute costs per cup of coffee – the differences between conventional and green coffee are quite small. If further cost factors, such as costs for personnel, energy and water costs, will be included in the calculation, the share of coffee purchasing costs will be far below 10% for both versions. Taking the sales price for one cup of coffee in a German canteen given in Table 159, the share of the coffee purchasing costs is 5% regarding the conventional version and 7% regarding the green version.

5.9.6 Product type 9.2: Tomatoes

Originally from Middle and South America, today, tomatoes are popular all over Europe. They have been introduced to Europe at the end of the 15th century by Christopher Columbus. In 2004, 17 mio. tonnes of tomatoes are cultivated in the EU on an acreage of 290 000 ha. Main producing countries in the EU are Italy (about 7 mio. tonnes), Spain, in particular the Canaries (about 4 mio. tonnes) and Greece (about 2 mio. tonnes) (EU 2006). Concerning tomatoes, a huge multitude of different varieties exist; and every year new varieties are created.

5.9.6.1 Functional unit and alternatives to be analysed

In the study at hand, the costs of **one kilogram of fresh tomatoes** have been analysed (functional unit). At first, peeled tomatoes were selected; however, it has not been possible to get data for peeled tomatoes, as organically grown peeled tomatoes are still too small niche products.

In total, two versions of tomatoes have been analysed:

- **Non green version:** Conventionally grown tomatoes which do not have to fulfil any standards.
- **Green version:** Organically grown tomatoes which fulfil the Ifoam or EU standards.

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[96] 1 cup = 7 g

5.9.6.2 System boundaries and data quality

The analysis took place in the capitals of the four selected countries: Prague (Czech Republic), Helsinki (Finland), Berlin (Germany), Madrid (Spain). The analysis only refers to the purchasing costs of tomatoes from the wholesaler which is the main supplier in public food procurement.

Data quality requirements:

- **Time-related coverage:** Only current prices as gained in the market research are used.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states.

5.9.6.3 Results

The following table shows the wholesale prices for one kilogram of fresh tomatoes. The overall high price level is due to the fact that the price survey took place out of season for tomatoes.

Table 160 Wholesale prices of tomatoes in €/kg (rounded figures)

Tomatoes	**Price**		**Difference**	
	non green	green	absolute	relative
Finland	1,36	2,45	1,09	80%
Germany	2,54	4,57	2,03	80%
Spain	0,55	3,54	2,99	544%
Czech Republic	0,35	0,88	0,53	151%

As already shown in the results for coffee, the price level in the Czech Republic is significant lower than in the other countries under survey. This is due to the fact that in general the cost of living and the wages in the Czech Republic are lower than in the other three countries under survey.

The figures show that green tomatoes are much more expensive in all countries under survey. The cost differences vary from 80% (Finland, Germany) to 544% (Spain). The absolute price differences vary between 0,53 € (Czech Republic) and 2,99 € (Spain). With attention to the fact that the survey took place out of season, the price differences should be considered carefully. It is assumed that the tomato prices decrease about 50% in season.

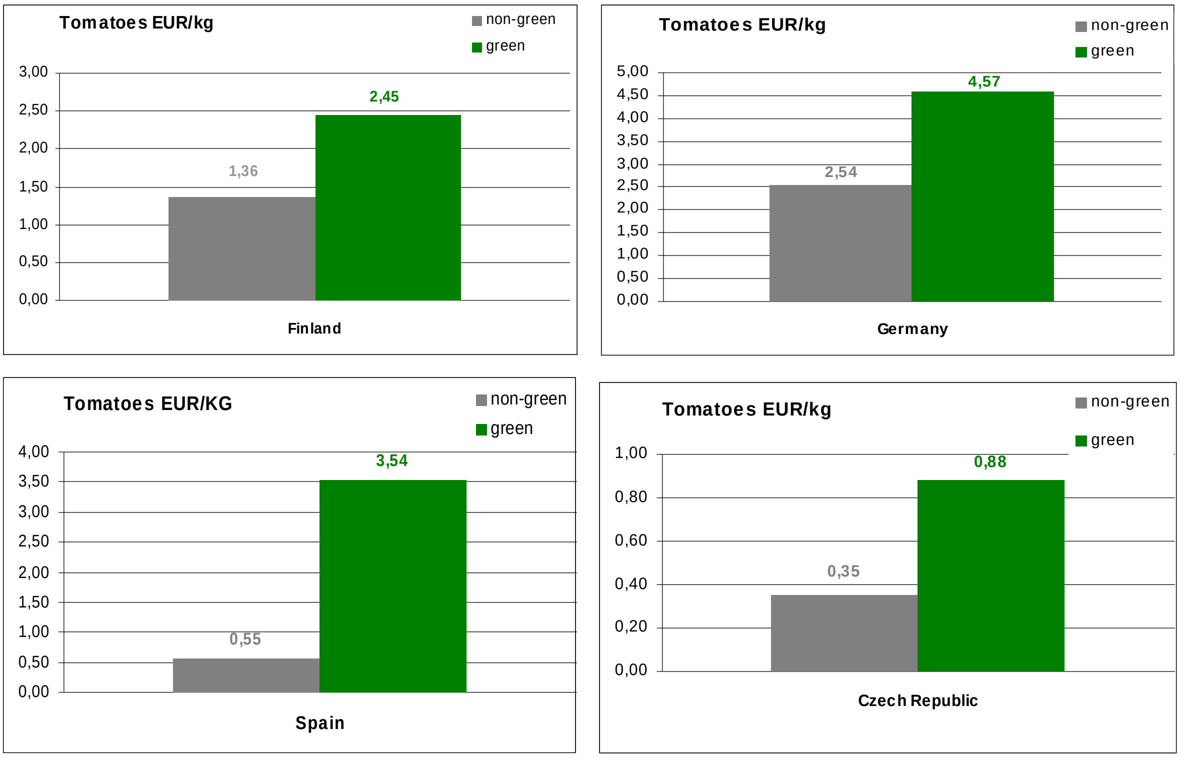

Figure 6 Wholesale prices of tomatoes in the different countries

The following shows the costs per serving of 200 g of tomatoes. The absolute price differences per serving varies between 0,11 € (Czech Republic) and 0,60 € (Spain). Even though the absolute price difference for one serving is higher than it is for one cup of coffee, the share of procurement costs for a tomato salad is 25% for the non green version and 46% for the green version, with a selling price of some 2 € in a German canteen.

Table 161 Wholesale prices of tomatoes per serving[97] in €/kg (rounded figures)

Tomatoes	Price		Difference	
	non green	green	absolute	relative
Finland	0,27	0,49	0,22	80%
Germany	0,51	0,91	0,41	80%
Spain	0,11	0,71	0,60	544%
Czech Republic	0,07	0,18	0,11	151%

97 1 serving = 200 g

5.9.7 Product type 9.3: Potatoes

Potatoes have their roots in the Andean Mountains of South America. Columbian farmers first cultivated the potato 7 000 years ago. In the 17th century the potato came to Europe. Today they are grown in almost any part of the world. Potatoes are perennial usually treated as an annually crop[98]. The potato is a staple food and omnipresent in European kitchens.

Generally, store-bought potatoes are sprayed with chemicals to inhibit sprouting. Alternatives are potatoes from organic farming.

5.9.7.1 Functional unit and alternatives to be analysed

In this study the costs of **one kilogram of potatoes** have been analysed (functional unit).

In total, two versions of French fries will be analysed:

- **Non green version:** French fries made of conventionally grown potatoes which do not fulfil any standards.
- **Green version:** French fries made of organically potatoes which fulfil the Ifoam or EU standards.

5.9.7.2 System boundaries and data quality

The analysis took place in the capitals of the four selected countries: Prague (Czech Republic), Helsinki (Finland), Berlin (Germany), Madrid (Spain). The analysis refers to the purchasing costs of potatoes from the wholesaler, which is the main supplier in public food procurement.

Data quality requirements:

- **Time-related coverage:** Only current prices as gained in the market research are used.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states.

5.9.7.3 Results

The following table shows the wholesale prices for potatoes for the four countries under survey.

98 www.erzeugermarkt.de

Table 162 Wholesale prices of potatoes in €/kg (rounded figures)

Potatoes	**Price**		**Difference**	
	non green	green	absolute	relative
Finland	0,24	0,51	0,27	113%
Germany	0,61	1,30	0,69	113%
Spain	0,41	1,45	1,04	254%
Czech Republic	0,41	0,60	0,19	46%

For potatoes, the green variant is more expensive than the non green variant. The absolute price difference between the green and the non green version is smaller in comparison with the other selected products, except for coffee: it varies between 0,19 € (Czech Republic) and 1,04 € (Spain). The relative price difference varies between 46% (Czech Republic) and 254% (Spain).

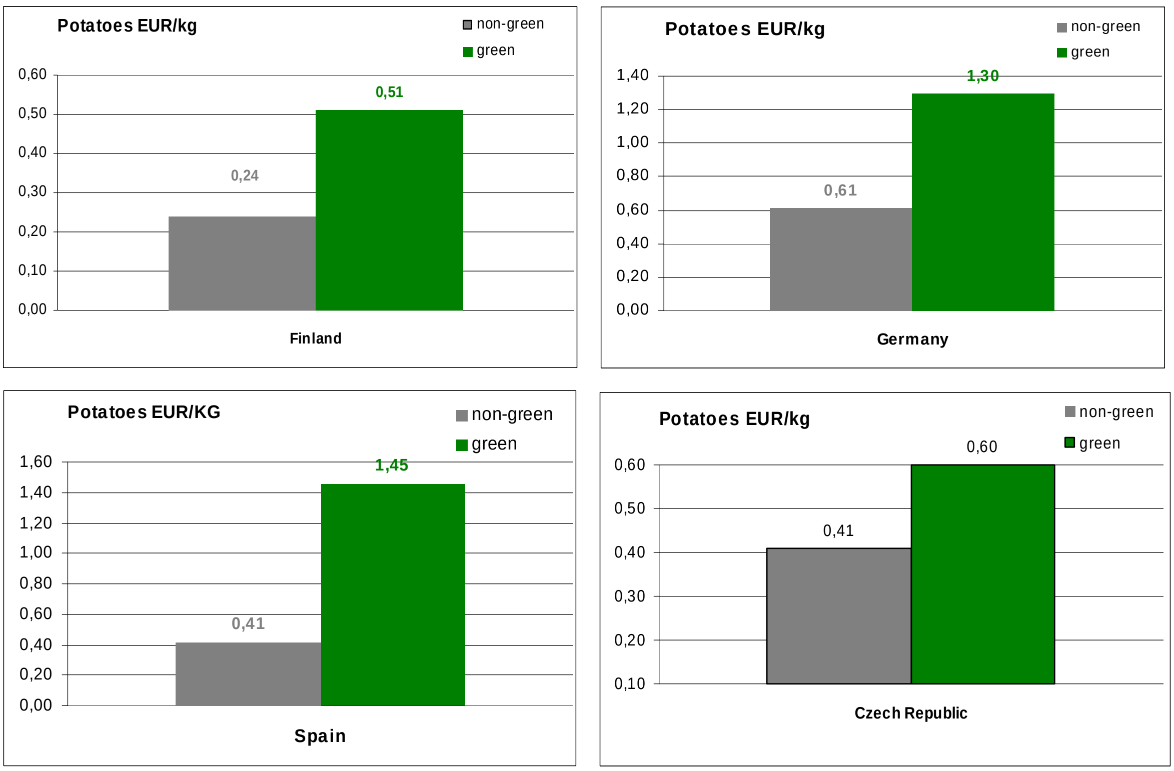

Figure 7 Wholesale prices of tomatoes in the different countries

The following table shows the costs per serving of 250 g potatoes. The prices for a serving of potatoes vary in the countries under survey between 0,06 € and 0,15 € for the non green version and 0,13 € and 0,36 € for the organically grown potatoes. Nevertheless, the absolute price differences per serving show a variation between 0,05 € (Czech Republic) and 0,26 €

(Spain). Especially for the Czech Republic, the price difference for organically grown and conventionally grown potatoes is not very high, and also in Finland the absolute price difference is quite small.

Table 163 Wholesale prices of potatoes per serving[99] in €/kg (rounded figures)

Potatoes	**Price**		**Difference**	
	non green	green	absolute	relative
Finland	0,06	0,13	0,07	113%
Germany	0,15	0,33	0,17	113%
Spain	0,10	0,36	0,26	254%
Czech Republic	0,10	0,15	0,05	46%

Potatoes as side order are always offered in public canteens. The results show that the absolute price differences are quite small between the green and the non green version, furthermore it is expected that without lower crop yields the price differences will be even lower.

5.9.8 Product type 9.4: Chicken

The increasing demand of chicken/poultry induced discussions in Europe about intensive or extensive poultry management. In the same way, the appearance of bird flu has been a bearing on consumer, producer and policy. Therefore, chicken meat has two interesting aspects for Europe: on the one hand the increasing demand by European consumers, and on the other hand production practises and dangerous diseases. In public canteens, various chicken meals are popular.

5.9.8.1 Functional unit and alternatives to be analysed

In this study the costs of **one kilogram of chicken meat** have been analysed (functional unit).

In total, two versions of chicken have been analysed:

- **Non green version**: Conventionally housed animals; livestock husbandry does not fulfil any standards.
- **Green version:** Adequate animal housing, fulfilling the Ifoam or EU standards.

These mentioned versions are available on the market of the four countries under study, although chicken wings fulfilling the Ifoam or EU standards are still niches.

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99 1 serving potatoes = 250 g

5.9.8.2 System boundaries and data quality

The analysis took place in the capitals of the four selected countries: Prague (Czech Republic), Helsinki (Finland), Berlin (Germany), Madrid (Spain). The analysis refers to the purchasing costs of chicken from the wholesaler, which is the main supplier in public food procurement.

Data quality requirements:

- **Time-related coverage:** Only current prices as gained in the market research are used.
- **Geographical coverage:** Cost data is used which is representative for purchasing authorities in the selected member states.

5.9.8.3 Results

Chicken meat is the most expensive product from the four products under survey. According to information of different wholesalers, bio-chicken does not exist on the wholesale market in the Czech Republic. The following table show the results for chicken meat.

Table 164 Wholesale prices of chicken in €/kg (rounded figures)

Chicken	**Price**		**Difference**	
	non green	green	absolute	relative
Finland	2,58	7,10	4,52	175%
Germany	2,23	5,34	3,11	139%
Spain	2,00	6,59	4,59	230%
Czech Republic	1,64	-	-	-

The absolute price differences of the green and the non green version vary between 3,11 € (Germany) and 4,59 € (Spain). The relative price differences vary from 139% (Germany) to 230% (Spain).

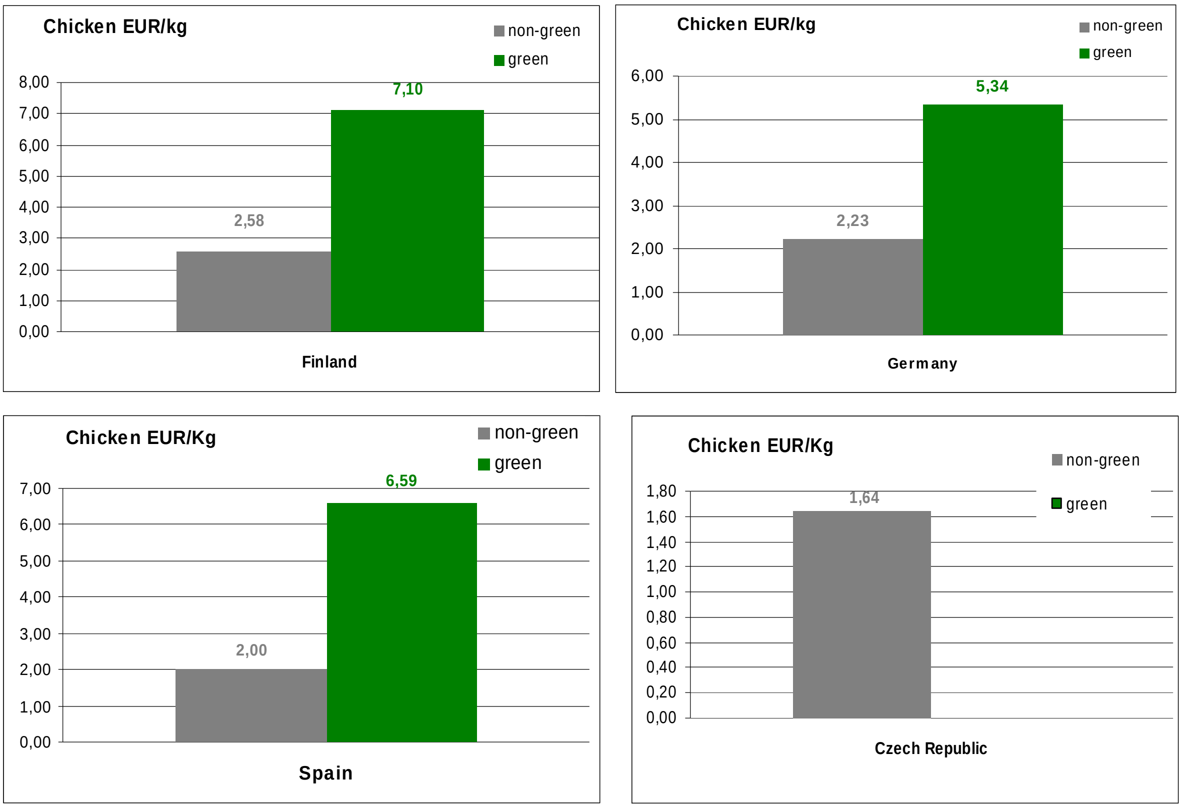

Figure 8 Wholesale prices of chicken in the different countries

The following table shows the costs for one serving of chicken meat (150g). The absolute price differences vary between 0,47 € (Germany) and 0,69 € (Spain).

Table 165 Wholesale price of chicken per serving[100] in €/kg (rounded figures)

Chicken	**Price**		**Difference**	
	non green	green	absolute	relative
Finland	0,39	1,07	0,68	175%
Germany	0,33	0,80	0,47	139%
Spain	0,30	0,99	0,69	230%
Czech Republic	0,25	-	-	-

[100] 1 serving chicken = 150 g

5.9.9 Conclusions

The results show that in general the green version is more expensive than the non green version. Nevertheless, for some products the absolute price differences per cup or per serving are quite low and the share of the purchasing costs of the raw product (e.g. coffee beans) at the total costs or selling prices of the end product (cup or serving) are far below 10% – for both the green and the non green versions. Furthermore, the sales prices in canteens do not only reproduce the real price difference resulting from higher purchasing costs for the raw product. In general, the price difference is much higher than that, even though the other cost elements, e.g. water and energy costs, personnel costs, remain the same. Such a high price difference, however, is counterproductive with regard to fostering the demand of products made from organic ingredients.

5.10 Product group 10: Paper

The product group 'Paper' shall comprise any product made out of paper using pulp, wood waste, virgin and recycled fibres or any similar raw material. This product group has traditionally been one of the first product groups where environmental criteria were introduced in green procurement practises. This section gives evidence about the price difference of 'green' and 'non green' paper products.

5.10.1 Selection of different product types

For this study three product types within the product group paper according to the following criteria were selected:

- Identification of the most commonly used product types, considering public procurement procedures and product requirements out of a procurers' view;
- Consideration of frequent user schemes;
- Inclusion of different applications and levels of processing of the product;
- Taking into account the impacts of the product type, especially environmental and social impacts;
- Availability of the product type in Member States, focussing especially on Sweden, Germany, Spain and the Czech Republic.

Consequently, the following three product types were selected:

Product type 1 – 1st level processing: **Copying paper** (A4, 80 g/m²)

Rationale: Copying paper in DIN A4 format is the most commonly used office paper. The production has a clear environmental impact on water, air, and soils. It is an everyday used paper product that has developed frequent user schemes. Furthermore, it has a broad availability in the selected Member States.

Product type 2 – 2nd level processing: **Envelopes** (DL with window)

Rationale: Even though the amount of electronic mail increases steadily, the classic mail is still used considerably. Out of the procurer's perspective, envelopes have a relevant percentage in the category 'finished products'. It also has a broad availability in the selected Member States.

Product type 3 – Hygienic: **Toilet paper** (2-layers, approximately 250 sheets per roll)

Rationale: In the category 'hygienic paper', toilet paper is the most commonly bought product, taken into account the procurer's perspective. It has a broad availability in the selected Member States.

All analysed products should fulfil common technical standards (see 5.10.4, 5.10.5, 5.10.6).

5.10.2 Green and non green versions

In order to have a clear separation of environment friendly products and conventional products, criteria for each identified product category were developed. The presented criteria must apply to the selected products to determine whether it is a green or a non green product.

The applied criteria represent recent studies and papers, taking into account country-specific legislation and eco-labelling programmes of the selected Member States (see FEA 2000, Bouwer et al. 2006, IFEU 2006). The criteria were derived from existing labels like the EU eco-label, the German 'Blauer Engel', the Forest Stewardship Council (FSC) label, the Swedisch Svan eco-label, or the Czech eco-label (Commission Decision 2001, Commission Decision 2002, Mžp 9-2006, Mžp 10-2006, Nordic Ecolabelling 2005, Nordic Ecolabelling 2006, RAL 2005, RAL 2006).

In order to be able to compare the results, the availability of certain products meeting these criteria for any public procurer has been taken into consideration.

The key difference is seen in the origin of the raw material for processing the paper products. The use of virgin fibre in comparison to recycled fibre[101] and the management schemes of the forest[102] from where the virgin fibre comes make a considerable difference between green and non green products.

The chemicals used e.g. for bleaching as well as the overall impacts on energy, water, soil, and air may be different, too. The following tables (see Table 166 and Table 163) explain the applied criteria.

For each product type, prices for green products, fulfilling the high environmental standard of 100% recycled quality as well as green products fulfilling the minimum standards as sustainable forest management schemes and environmentally friendly bleaching process have been assessed. Together with prices of normal products not fulfilling the standards, three categories give the base for the comparison of prices. Then, the two green versions are analysed together and compared to the non green version of the respective product type.

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[101] Due to the high performing eco-balance, recycled paper in comparison to fresh fibre based paper in general fulfils the criteria for limiting impacts on air, water, soils, energy, and waste (IFEU 2006). This results mostly from the reduced emissions for transport of the raw materials and less used process water (IFEU 2006: 2). Using recycled paper products fosters the idea of a circular flow economy and gives incentives to constantly improving the recollection rate for paper products, using the existing potentials in nearly every EU 25 country, especially in the Eastern European countries (comp. Commission Decision O.J.).
Although it is clear that the maintenance of the fibre cycle relies on the feed of a certain amount of primary fibres to ensure the strength and other properties of the paper to be produced, the overall European average utilisation rate of recovered paper of 43% still represents the enormous potential of recycled raw material for paper products in Europe (comp. Commission Decision O.J. 2001: p. 218). Besides, the input of virgin fibres into the production cycle is provided by other sources (e.g. gravure printing of magazines) so that copying and envelope paper must not be used for this purpose (www.papiernetz.de, last visited 26th February 2007).

[102] Paper with the label Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification schemes (PEFC) fulfils the criteria of sustainable managed forests and plantations (e.g. no over exploitation and no use of chemical pesticides). The FSC label can also be used when the paper is 100% recycled declaring: ‘Supporting responsible use of forest resources’. Paper with one of the following labels, also ensures a high degree of environmental protection: the flower (EU eco-label), Blauer Engel (German eco-label), Milieukeur (Dutch eco-label), Nordic Swan (Scandinavian eco-label), ekologicky šetrný výrobek (Czech eco-label). (comp. Bouwer et. al. 2006)

Table 166 Selected criteria for green and non green products, pt. 1

Criteria **Product Type**			**Fibres**		**Sustainable Forest Management (Certification)**	**Bleaching**		
			Recycled (%)	Primary pulp (%)	FSC PEFC or equivalent (%)	TCF	ECF	No EDTA / DTPA
Copying paper	Green	100% Recycled	100	0		x		x
		Certified	(1) – (2) min. 75 (3) less than 75	(1) 100 (2) max. 25 (3) min. 25	(1) 20 (2) – (3) 15-20	x	(x)	
	Non green		0	100	--			
Envelope	Green	100% Recycled	100	0		x		x
		Certified	(1) – (2) min. 75 (3) less than 75	(1) 100 (2) max. 25 (3) min. 25	(1) 20 (2) – (3) 15-20	x	(x)	
	Non green		0	100	--			
Toilet 'tissue' paper	Green	100% Recycled	100	0		x		x
		Certified	≥ 50	≤ 50	≥ 15	x	(x)	
	Non green		0	100	--			

Table 166 shows the key criteria to distinguish between green and non green versions. There are three options, (1), (2) and (3), concerning the criteria of different fibres used for the production of certified products. These adapted criteria derive from the Nordic Svan eco-label. The criteria for the green version, '100% recycled', go in line with criteria of the 'Blauer Engel' and the EU flower label. ECF bleaching – although not the environmentally friendliest bleaching – can be taken into account when the overall percentage of products used for the market research does not exceed 75%.

Table 167 Selected criteria for green and non green products, pt. 2

Criteria / Product Type			Environmental Management System (EMS) – or equivalent		Chemical Substances		Packaging	Re-cycable
			EMAS/ ISO 14001 or equivalent	Limits for fuel/ electricity (kWh/Adt) – depending on pulping process	No optical brightener; No colorants containing heavy metals	Limits for COD, S, NO_X, P, AO_X (kg/Adt) – depending on pulping process	Recycled cardboard boxes (film without PVC)	
Copying paper	Green	100% Recycled	x	Fuel: ≤ 2776 Electricity: ≤ 804	x		x	x
		Certified	x	Fuel: ≤ 5097 Electricity: ≤ 2500	(x)	COD ≤ 30, S ≤ 0,8 NO_X ≤ 2, P ≤ 0,05 AO_X ≤ 0,25	x	x
	Non green		(x)					x
Envelope	Green	100% Recycled	x	Fuel: ≤ 2776 Electricity: ≤ 804	X		x	x
		Certified	x	Fuel: ≤ 5097 Electricity: ≤ 2500	(x)	Used paper needs to meet a.m. standards	x	x
	Non green		(x)					x
Toilet 'tissue' paper	Green	100% Recycled	x	Fuel: ≤ 2776 Electricity: ≤ 804	x		x	x
		Certified	x	Fuel: ≤ 5097 Electricity: ≤ 2500	(x)	$P_{emissions,total} = P_{COD} + P_P + P_S + P_{NOX}$ ≤ 4.0 (each ≤ 1.5)	x	x
	Non green		(x)					x

Table 163 shows continued criteria to distinguish between green and non green versions. A working Environmental Management System (EMS) proves that the producer limits the use of harmful substances and pollution during the production process. In order to reach a comparable quality standard, at minimum 25% of the producers of non green paper products included in the market research should have an EMS, too. The adapted technical requirements for limits of fuel and electricity consumption and the use of chemical substances derive from the 'Blauer Engel', the Nordic Svan eco-label and the EU flower label. For the disposal the recyclable criteria is the most relevant. All analysed paper products shall meet the recyclable criteria.

For verification of the applied criteria to determine green and non green versions of the products, the technical product sheets provided by the producers were taken into consideration whenever assessable. Additionally, the suppliers were asked on the telephone for information on used fibres, sustainable forest management systems, (eco-)labels, and technical specifications.

5.10.3 Calculation and cost elements

Basically only purchase prices were considered in the cost calculation (see paragraphs below).

The market research on supplier level builds upon different information sources, like internet research, demanding offers from suppliers, information obtained by the survey on additional costs and benefits of GPP (see task 2 of the contract), and phone calls with procurers actually purchasing the selected product types. As far as possible, recent prices not older than one year have been included. The prices are drawn from suppliers and consider the typical size of the trading unit the supplier offer (e.g. one palette of copying paper, one palette of toilet paper). The prices have been calculated using specific volumes, that are linked to the demands, size, and consumption for a certain period of time of a typical local authority in Europe (125 000 inhabitants). Given prices are average prices in Euro, including VAT.[103]

The following table shows the scope of the market research by indicating the standard deviation and the sample size.

Table 168 Market research - standard deviation and sample size

Product type	Standard deviation (σ) in Euros	Sample size (n°. of products)
Copying paper	527	106
Envelopes	93	79
Toilet paper	0,13	71

Costs for purchase

The costs for purchasing are the relevant cost drivers out of a procurer's view. This refers to the price per selected functional unit (see sections on product types). The prices do not include special boni and award prices a local authority might be able to achieve.

Local authorities normally purchase their products using framework contracts. Due to data protection standards these sort of information on actually achieved prices could not be assessed in this market research. Nevertheless, whenever possible, suppliers were asked to indicate the rebate percentage that then entered the analysis.

103 For the calculation in Euro the following average exchange rates for 2006 apply: 1 Euro = 9,249 SEK, 1 Euro = 28,312 CZK, Source: Average interbank exchange rates in 2006; http://oanda.com/convert/fxhistory. For calculation the most recent VAT rates apply (Sweden 25%, Germany 19%, Spain 16%, Czech Republic 19%).

Costs for use

There is no specific difference between green or non green products during the use phase. Storage costs are the same and the mentioned technical requirements for all product types like the running characteristics (see technical requirements of the product types) build a sound basis to exclude the costs for toner and maintenance of copying and printing devices (as they are assumed to be identical for both versions).

Costs for disposal

There is no difference between green and non green products regarding the costs for disposal. Therefore, this cost element is excluded from the cost analysis.

5.10.4 Product type 10.1: Copying paper

5.10.4.1 Functional unit and alternatives to be analysed

The copying paper shall comprise sheets or reels of unprinted paper that are used for printing or copying. It should be applicable in the most common printing devices likes copying machines and laser printers. The analysed copying paper shall meet DIN A4 standard format with a given weight of 80 g/m^2.

Technical requirements for copying paper are specified in the DIN V ENV 12281 (running characteristics) and considering the ageing classification in DIN 6738 LDK 24-85. The whiteness of copying paper is described in DIN ISO 2469 and 2470. The analysed copying paper should accomplish with a degree of at least 70% whiteness. The green version fulfils the standards set in section 5.10.2.

The results are given for the functional unit of 1 tonne (400 reams, each 500 sheets) of copying paper.

5.10.4.2 System boundaries

As relevant cost elements, only the costs for purchase were considered. The prices have been calculated using specific volumes that are linked to the demands, size, and consumption for a certain period of time of a typical local authority in Europe (125 000 inhabitants). In this case the prices relate to the purchase of 1 tonne (= 400 reams) of copying paper. Given prices are average prices in Euro, including VAT. See also section 5.10.3. The market research for copying paper was based on the supplier scheme, strongly considering the availability of certain products in each specific country.

Data quality requirements:

- **Time-related coverage:** For this cost study only cost data is used which is not older than one year.
- **Geographical coverage:** For this cost study cost data is used which is representative for purchasing authorities in the selected member states (i.e. Sweden, Germany, Spain, Czech Republic)

5.10.4.3 Results

The following table shows the main differences between green and non green products. The green products have also been split up into recycled quality and certified quality in order to indicate the differences in prices for recycled and non-recycled products. This more comprehensive table and a list of brands, producers and suppliers included in the market research can be found in the annex.

Table 169 Costs of copying paper in the four selected Member States; in Euros per tonne (400 reams)

Copying paper (DIN A4, 80g/m²)	**Costs**		**Difference**	
	non green version	green version[104]	absolute	relative (%)
Sweden (SV)	2.835,-	2.935,-	100,-	3,5
Germany (DE)	2.402,-	1.844,-	-558,-	-23,2
Spain (ES)	1.578,-	1.642,-	64,-	4,0
Czech Republic (CS)	1.287,-	1.284,-	-3,-	-0,2

104 Including recycled and eco-certified copying paper. The price difference between recycled, certified, and non green qualities can be seen in the more comprehensive tables in the annex.

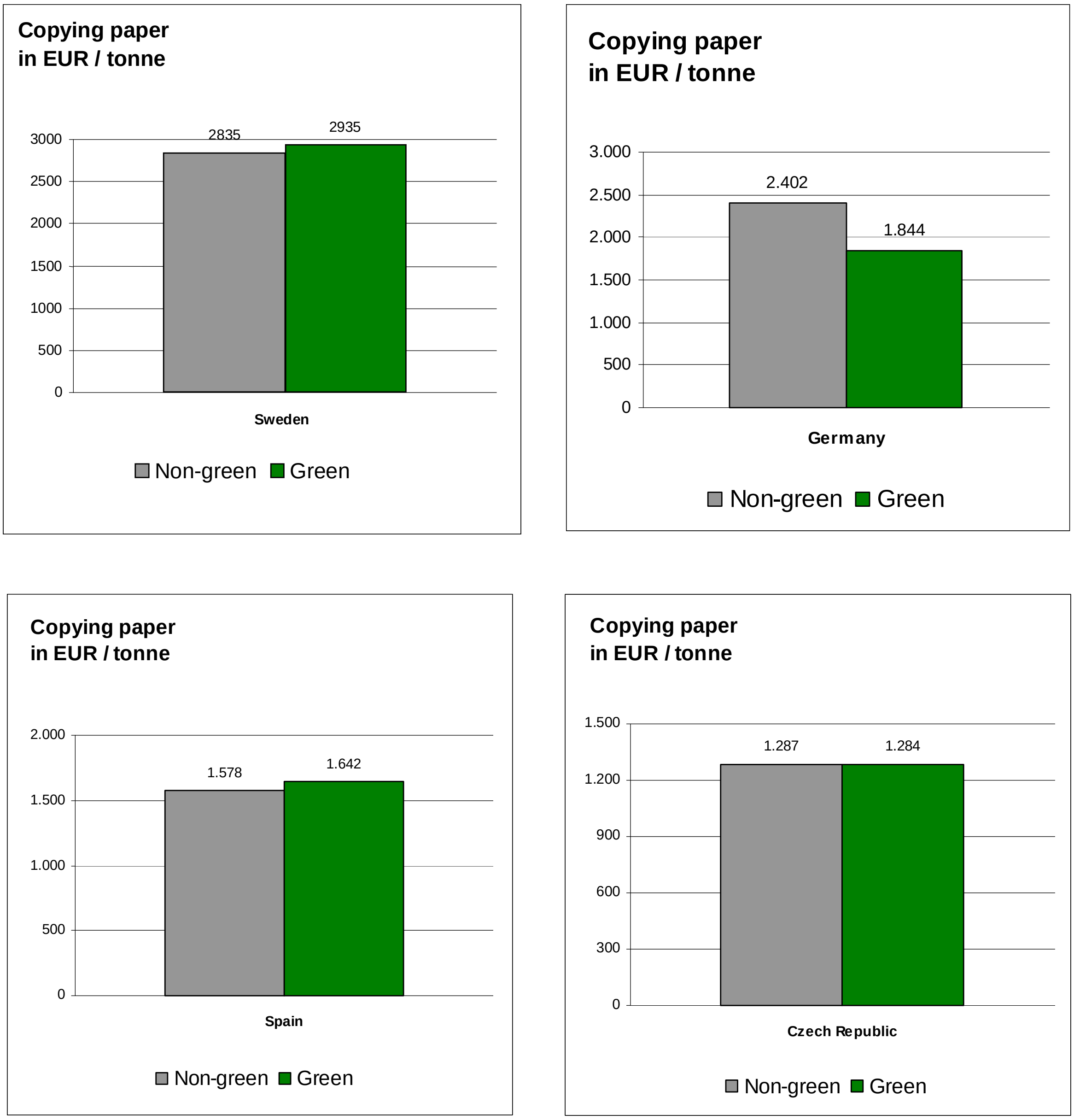

Figure 9: Price differences for 'green' and 'non green' copying paper

The purchasing costs of copying paper for public authorities are very similar in the selected Member States, although in Germany 'green' versions of copying paper are significantly cheaper (23%) than non green copying paper. In Spain and Sweden 'green' copying paper is slightly more expensive with a relative price difference of 3,5 to 4%. In the Czech Republic the average prices are nearly the same. (see Figure 9)

5.10.5 Product type 10.2: Envelopes

5.10.5.1 Functional unit and alternatives to be analysed

The envelopes shall comprise finished paper with the purpose to use them for delivery of mail (paper sheets). They should be usable for general mail with no specific security measures. The study focuses on the most commonly used envelopes focussing on DIN long format (110x220 mm), self-adhesive without paper stripe, and with window.

Envelopes should meet the general quality standards described in DIN 6733. The green version fulfils the standards set in section 5.10.2.

The results are given for the functional unit of 1 pack with 10.000 envelopes.

5.10.5.2 System boundaries

As relevant cost element only the costs for purchase were considered. The prices have been calculated using specific volumes, that are linked to the demands, size, and consumption for a certain period of time of a typical local authority in Europe (125 000 inhabitants). In this case the prices relate to the purchase of 10 000 envelopes. Given prices are average prices in Euro, including VAT. See also section 5.10.3. The market research for envelopes was based on the supplier scheme, strongly considering the availability of certain products in each specific country.

Data quality requirements:

- Time-related coverage: For this cost study only cost data is used, which is not older than one year.
- Geographical coverage: For this cost study cost data is used which is representative for purchasing authorities in the selected member states (i.e. Sweden, Germany, Spain, Czech Republic)

▪

5.10.5.3 Results

The following summary table (see Table 170) shows the main differences between green and non green products. The green products have also been split up into recycled quality and certified quality in order to indicate the differences in prices for recycled and non-recycled products. This more comprehensive table and a list of brands, producers, and suppliers included in the market research can be found in the annex.

Table 170 Costs of the green vs. non green version of envelopes in the four selected Member States; in Euros per 10.000 units

Envelopes	**Costs**		**Difference**	
(format DL, self-adhesive, with window)	non green version	green version[105]	absolute	relative (%)
Sweden (SV)	621,-	643,-	22,-	3,5
Germany (DE)	170,-	190,-	20,-	11,8
Spain (ES)	345,-	381,-	36,-	10,4
Czech Republic (CS)	162,-	156,-	-6,-	-3,7

[105] Including recycled and eco-certified envelopes. The price difference between recycled, certified, and non green qualities can be seen in the more comprehensive tables in the annex.

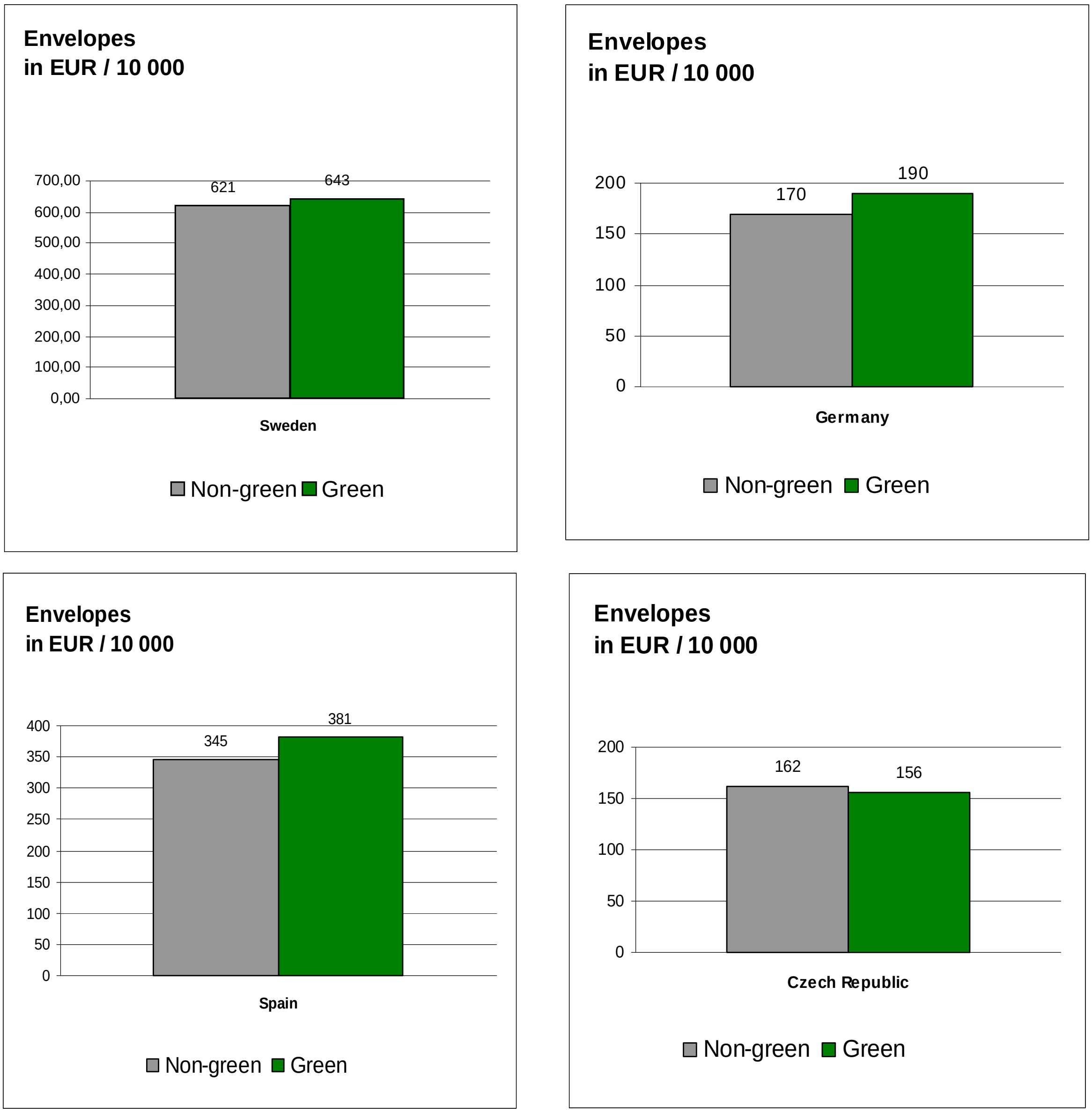

Figure 10 Price differences for green and non green envelopes

Green envelopes are between 10% (Spain) and 12% (Germany) more expensive than non green products, while green versions in Sweden are 3,5% more expensive. In the Czech Republic green envelopes achieve cheaper prices (relative difference 3,7%) (see Figure 10).

5.10.6 Product type 10.3: Toilet paper

5.10.6.1 Functional unit and alternatives to be analysed

The toilet paper shall comprise a perforated band of paper on a roll, which is used for toilet hygiene. The study focuses on standard rolls (2 layers, approximately 250 sheets per roll).

The EU solubility standard is the basic technical requirement to be met by the analysed product. The green version fulfils the standards set in section 5.10.2.

The results are given for the functional unit of 1 roll (~250 sheets) of toilet paper.

5.10.6.2 System boundaries

As relevant cost element only the costs for purchase were considered. The prices have been calculated using specific volumes, that are linked to the demands, size, and consumption for a certain period of time of a typical local authority in Europe (125 000 inhabitants). In this case, the prices relate to the purchase of one roll when purchasing more than 5 000 units. Given prices are average prices in Euro, including VAT. See also section 5.10.3. The market research for toilet paper was based on the supplier scheme, strongly considering the availability of certain products in each specific country.

Toilet tissue paper is mostly available in the qualities green 100% recycled and non green. There are hardly any eco-certified toilet paper products available in the selected countries[106].

Data quality requirements:

- Time-related coverage: For this cost study only cost data is used, which is not older than one year.
- Geographical coverage: For this cost study cost data is used which is representative for purchasing authorities in the selected member states (i.e. Sweden, Germany, Spain, Czech Republic)

5.10.6.3 Results

The following summary table (see Table 171) shows the main differences between ‘green’ and non green products. The ‘green’ products have also been split up into recycled quality and certified quality in order to indicate the differences in prices for recycled and non-recycled products. This more comprehensive table and a list of brands, producers, and suppliers included in the market research can be found in the annex.

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[106] In Switzerland a big supermarket chain recently introduced FSC-labelled toilet paper. They changed the whole assortment of toilet paper to FSC-labelled products.

Table 171 Costs of envelopes in the four selected Member States; in Euros per 1 roll (> 5.000 units)

Toilet paper (2-layers, 250 sheets per roll)	**Costs**		**Difference**	
	non green version	green version[107]	absolute	relative (%)
Sweden (SV)	0,63	0,63	0	0
Germany (DE)	0,27	0,21	-0,06	-22,2
Spain (ES)	0,23	0,23	0	0
Czech Republic (CS)	0,19	0,14	-0,05	-26,3

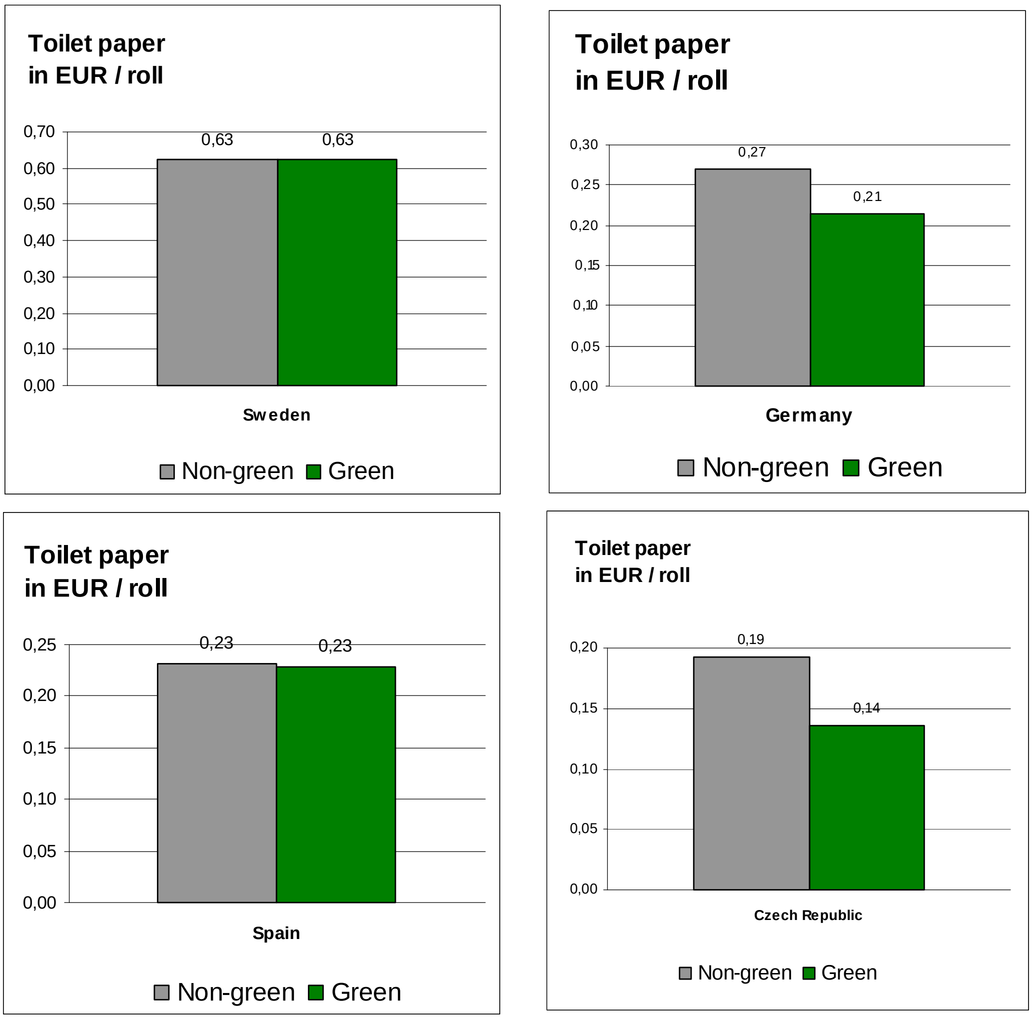

Figure 11 Price differences for green and non green toilet paper

107 Including recycled and eco-certified toilet paper. The price difference between recycled, certified, and non green qualities can be seen in the more comprehensive table in the annex.

For toilet paper the price advantages of green products are the most visible. While in Sweden and Spain one roll of toilet paper when buying more than 5 000 units costs the same, green toilet paper achieves significant savings in Germany (22%) and the Czech Republic (26%).

5.10.7 Conclusions

The given prices of the selected paper products ‘copying paper’, ‘envelopes’, and ‘toilet paper’ vary to a greater extend due to differences between the brands and the amounts within the given standards public authorities request, than due to the price differences of green and non green products. This is also proved by the relatively high standard deviations encountered during the market research (see section 5.10.3).

For the market research different suppliers with different market shares were approached. The included suppliers are medium to big companies, although for the product type ‘toilet paper’ the prices for the Czech Republic and Spain derive mostly from small and medium enterprises. The relatively high bandwidth of suppliers reflects the situation of this market segment well.

Due to a sufficient but small sample size, the shown prices can only be seen as indication, not being representative for the whole market segment in the respective market. A representative sample size of approximately 1 000 prices per product type would have exceeded the timeframe and financial means of this market research. Nevertheless, the prices suggest a general trend that price levels for the selected paper products for green and non green products are slightly more expensive in Sweden and Spain (2-5%) and significantly cheaper in Germany (11%) and the Czech Republic (11%).

In order to know whether the green products are long-term viable, both, production cost and price paid by the wholesaler to the supplier, would have to be compared. Some statements by SCA tissue confirm this: “Toilet paper is often sold under the price that the retailer is paying, in order to attract customers”, however “Forest certified pulp is generally sold without the customary rebates, so in the end it is more expensive“ (personal communication). This means that the market prices for paper products are strongly influenced by strategic or marketing considerations. For sure, the market offers environmentally friendly products that are cheaper than ‘conventional’ products. However, it might also be the other way around. The results gained in the study at hand therefore also reflect the negotiation skills of the purchaser and suppliers.

5.11 Product group 11: Furniture

5.11.1 Selection of different product types

In 2003, office furniture accounted for 10% (equivalent to 8,9 billion Euros) of the overall production volume of furniture in Europe (EU 15; by value).

The EU furniture industry is using a large variety of materials (see figure below). 45% of the total production value consists of the purchase of specific raw materials or semi-finished products by the furniture industry from other manufacturing industries.

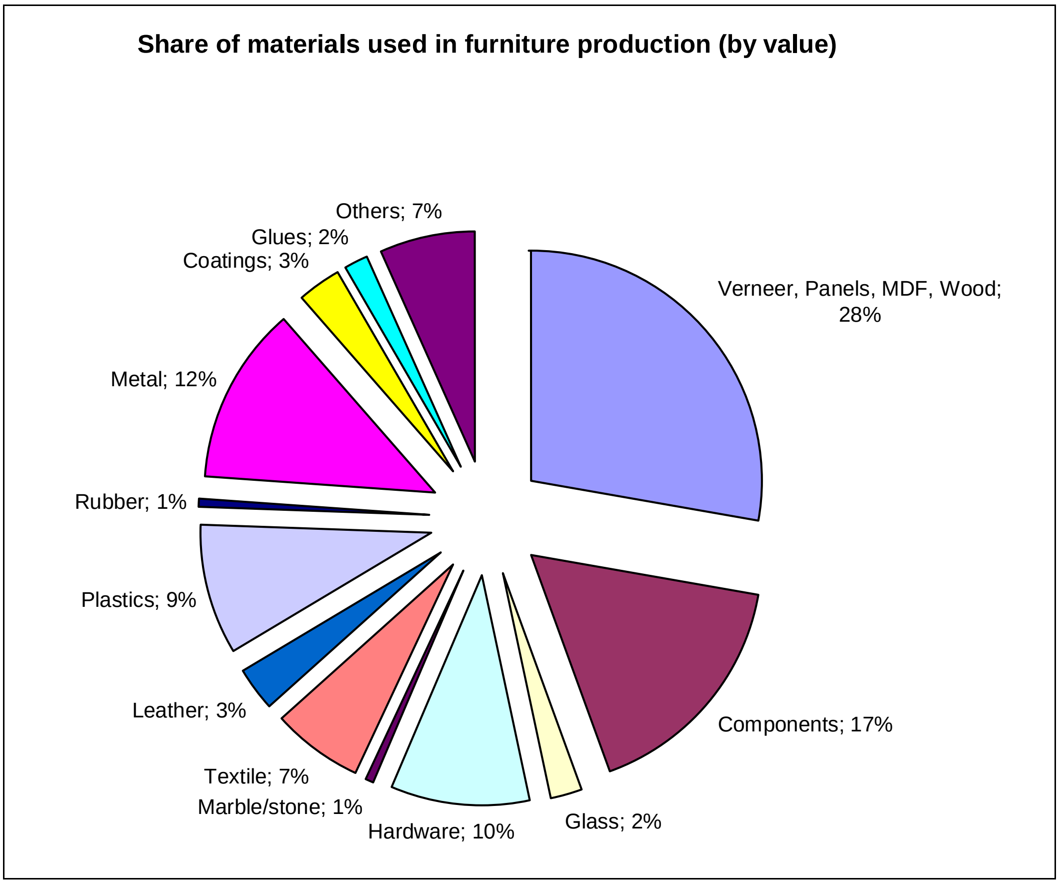

Figure 12 Share of materials used in EU furniture industry production (EU 15; by value)[108]

[108] European Furniture Manufacturers Federation (www.ueanet.com)

For this study, the 3 types of furniture were selected with regard to the following criteria:

- The process shall be relevant for most public authorities in the selected Member States;
- The furniture shall cover different operational areas;
- The furniture shall represent different levels of complexity (with regard to number and types of different materials).

Against this background the following product types were selected:

- Product type 11.1: Furniture mainly from solid wood: wooden school chairs;
- Product type 11.2: Furniture mainly from derived timber products: open storage units (shelves);
- Product type 11.3: Furniture mainly from metal, plastic or fabric: office chairs.

In order to get an idea of the dimension of procurement, the example of the City of Stuttgart (550 000 inhabitants) shall be cited:

- During the school term 2005/2006 the city of Stuttgart had about 80 450 pupils (general education and vocational schools). Without having exact numbers it can be expected that about the same number of school chairs is necessary. Assuming a product life time of 15 to 25 years, in average between 3 200 and 4 000 school chairs have to be purchased every year.
- In the case of storage units (shelves) the situation is different as the correlation between the number of users (employees) and the number of storage units in stock is expected to be less straight. Nevertheless, in order to outline the range, an approximation shall be done: If every employee needs half of one storage unit (defined as approximately 80 cm width, 44 cm depth, 2 m height) and its product life time is about 20 years, in average 450 storage units would have to be purchased every year.
- The public authority of Stuttgart has about 17 766 employees. Assuming one office chair for each employee and a product life time of 10 to 15 years, approx. between 1 200 and 1 800 office chairs would have to be purchased each year.

5.11.2 Green and non green versions

The main environmental impacts of furniture are connected with the necessary resource depletion (especially wood), the furniture production processes, emissions of substances from coatings (e.g. formaldehyde and VOC) and waste disposal or recycling processes (e.g. issues concerning product life time and disassembly).

As a consequence, European and national eco-labels on furniture considered at least some of the above mentioned aspects in their criteria.

The following table gives an overview of available eco-labels and the number of certified products in the four selected Member States analysed and on EU level. The term 'certified products' does not necessarily refer to furniture, but may also refer to components like panels.

Table 172 Overview of the national and the European eco-labels on furniture

	EU Eco-label (EU Flower)	**Blue Angel**	**Nordic Swan**	**CENIA**	**AENOR**
Country	EU	Germany	Sweden	Czech Republik	Spain
Furniture	Currently under revision	Products from wood and timber derived products with low emissions (RAL-UZ 38)	Swan labelling of Furniture and fitments, Version 3.3; 19 March 2003 – 31 March 2009	Flower – Květina - *Wood-based Agglomerated Materials and Products - "Aglomerované materiály na bázi dřeva a výrobky z nich" (Směrn. č. 12-2006)*	The Emblem of environmental quality (March 2007) Filing cabinets and classifiers (UNE 1180:1998)
Number of certified products (number of manufacturers)					
	0	9 (9)	126 (18)	29 (22)	0

Except for the Swedish Nordic Swan label, only wooden based furniture is included in current eco-labels of the 4 selected Member States. Against this background the Austrian Eco-label on office chairs ('*Richtlinie UZ 34 Büroarbeitsstühle und Bürostühle*') was taken as a basis for the product type office chairs.

Against this background the green and non-green versions are specified as follows:

- **Non green version**: conventional products which do not fulfil any standards.
- **Green version**: products which are certified with one of the following eco-labels:
  - Nordic Swan (SV)
  - Blue Angel (DE)
  - AENOR (ES)
  - Flower – Květina (CZ)
  - Austrian eco-label for office chairs (Richtlinie UZ 34) (only for product type 11.3 (office chairs))

5.11.3 Calculation and cost elements

Purchase costs

The purchase costs include the shipment of the storage units. Shipment costs differ by the volume of a product and by the overall amount a retailer has to transport in a certain region. For that reason it might be variable. Discount rates for larger purchase quantities were not considered, as they depend e.g. on negotiation skills of the procurer. It is assumed, however, that they do not differ between the green and the non green version. Statements from retailers make believe that discount rates up to 30% may be realistic.

Assembly

Depending on the producer and retailer, open storage units are some times sold disassembled. It can be expected that disassembled storage units are less expensive than assembled ones. Therefore it was paid attention only to compare assembled storage units with assembled ones, the same for disassembled storage units. Potential additional costs from assembly were neglected.

Repair

Over the lifetime of an open storage unit it might be necessary to repair it. There are no data available on how often a repair is necessary in average and what would be the average price for such a repair. In addition, it is assumed that there are no general differences between the green and the non green version. For that reason costs for wear and spare part as well as for labour were neglected.

Costs for disposal

Public authorities typically tender the take-back of old furniture in connection with the purchase of the new ones. Although it is clear that disposal costs flow into the costs for the whole tender, no separate prices can be given for the disposal of one storage unit.

The market research builds upon different information sources, such as internet research and inquiries at manufacturers, suppliers and procurers. As far as possible, recent prices not older than one year have been included. Given prices are average prices in Euro, including VAT.

5.11.4 Product type 11.1: Mobile cabinets

5.11.4.1 Functional unit and alternatives to be analysed

The LCCA was conducted for the purchase of one mobile cabinet, made from solid wood. The sizes of the mobile cabinets range from 54 cm height x 40 cm width and 60 cm depth to 62 cm height x 60 cm with and 80 cm depth. They have two to five drawers and four wheels. In the case of Czech Republic only products without weels were available for the non green version.

As described in section 5.11.2 the following green and non green versions are regarded:

- **Non green version**: non-labelled open storage units
- **Green version**: open storage units, labelled with one of the national eco-labels (Nordic Swan, Blue Angel, AENOR or Czech Flower – Květina) or only certified by FSC (Forest Stewardship Council).

5.11.4.2 System boundaries

In the cost analysis, purchase and shipment of the mobile cabinets were considered. Costs for spare and wear parts over the product life time were neglected. For details on the considered cost elements see section 5.11.3.

Data quality requirements:

- **Time-related coverage:** Data on purchase prices date from 2007.
- **Geographical coverage:** For this cost study cost data is used which is representative for purchasing authorities in the selected member states (i.e. Sweden, Germany, Spain, Czech Republic)

5.11.4.3 Results

The following table shows the results of the purchase costs for mobile cabinets in the four selected Member States.

Table 173 Costs of mobile cabinets in the four selected Member States; in Euros (incl. VAT)

	Costs		Differences	
	non green version	green version	absolute	Relative
SV	174	236	62	36%
DE	223	201	-22	-10%
ES	129	219	90	70%
CS	142	225	83	58%

The results show differences of the green and the non green version between -10 to +70 percent. Only in Germany the green version showed to be cheaper by 10 percent. In the other countries the green version was more expensive – the LCC being between 36 and 58 percent higher for the green then for the non green version.

The results are difficult to interpret for the following reason:

The assortment of office furniture in solid wood is very restricted. Almost all producers of office furniture use timber derived materials as well as plastic and metal to fabricate office furniture including mobile cabinets. For that reason only a restricted number of products could have been identified and included in the calculation; the number of products of the green version being even smaller. More products might be found asking cabinet makers or cabinet makers' workshops. However, it is to be expected that public purchasers would – not least for the expected higher costs – rather not tender craftsmen.

5.11.5 Product type 11.2: Open storage units

5.11.5.1 Functional unit and alternatives to be analysed

The LCCA was conducted for the purchase of an open storage unit from timber derived products with base or legs; height: ± 2060 mm (5 x DIN A4); width: ± 800 mm; depth: ± 435 mm. The sizes of the considered products might deviate slightly in case a congruent storage unit is not available.

As described in section 5.11.2 the following green and non green versions are regarded:

- **Non green version**: non-labelled open storage units
- **Green version**: open storage units, labelled with one of the national eco-labels (Nordic Swan, Blue Angel, AENOR or Czech Flower – Květina)

5.11.5.2 System boundaries

In the cost analysis, purchase and shipment of the open storage units were considered. Costs for spare and wear parts over the product life time were neglected. For details on the considered cost elements see section 5.11.3.

Data quality requirements:

- **Time-related coverage:** Data on purchase prices date from 2007.
- **Geographical coverage:** For this cost study cost data is used which is representative for purchasing authorities in the selected member states (i.e. Sweden, Germany, Spain, Czech Republic)

5.11.5.3 Results

The following table shows the purchase costs for green and non green open storage units in the four selected Member States.

Table 174 Costs of open storage units in the four selected Member States; in Euros (incl. VAT)

	Costs		Differences	
	non green version	green version	absolute	Relative
SV	433	437	4	1%
DE	226	462	236	104%
ES	223	451	228	102%
CS	143	162	19	13%

The results show differences of the green and the non green version between 1 and 104%, with the green version being more expensive then the non green version.

The results also show that – even for rather simple furniture like open storage units – a relatively broad range of solutions can be found on the market. Some of them can be clearly excluded from the analyses like archive shelves or shelves for libraries, being significantly more stable and more expensive then typical office shelves. Other differences are not so easy to be allocated but might also result in rather large price differences (e.g. different brands, different surface materials). The differences of the green and the non green versions in Germany and Spain shown above might result from the latter rather then from higher costs for 'green' material or the like.

5.11.6 Product type 11.3: Office chairs

5.11.6.1 Description of the product / service

Office chairs normally have adjustable seats, armrests, backs, back supports and heights to prevent repetitive stress injuries and back pain associated with sitting for long periods. For the investigation, a chair model was chosen with the following features:

- Controls that are easy to operate from sitting position;
- A seat that adjusts for both height and tilt;
- A backrest shaped to support the lower back;
- A stable five-point base;
- Wheels or casters suitable for the type of flooring;
- A swivel mechanism;
- Armrests that can be adjusted for height.

5.11.6.2 System boundaries

In the LCCA, purchase and shipment of one office chair was considered. Costs for spare and wear parts over the product life time were neglected. For details on the considered cost elements see section 5.11.3.

Data quality requirements:

- **Time-related coverage:** Data on purchase prices date from 2007.
- **Geographical coverage:** For this cost study cost data is used which is representative for purchasing authorities in the selected Member States (i.e. Sweden, Germany, Spain, Czech Republic)

5.11.6.3 Results

The following table shows the costs of the purchase of green and non green office chairs in the four selected Member States.

Table 175 Costs of office chairs in the four selected Member States; in Euros (incl. VAT)

	Costs		**Differences**	
	non green version	green version	absolute	relative
SV	335	398	62,5	19%
DE	295	355	59,5	20%
ES	311	369	58	19%
CS	319	378	59,5	19%

Currently only few office chairs are labelled with an eco-label. Products which only comply with part of the criteria of the Austrian eco-label were not considered in the investigation. This proceeding may be questioned, but statements from retailers encountered during the investigation implicate that the results shown above are somehow typical – green products (in a more general understanding) being more expensive then non green ones. The difference in purchase price typically seems to be between 10 and 20%. The most frequently mentioned aspects of green office chairs were the possibility to disassemble the chair for recycling purposes, the availability of wear and spare parts over the expected life time of the product and the take-back of old chairs.

The results have to be seen against the background of a broad assortment of different accomplishments of office chairs. As an example: Differences in purchase prices, caused by choosing a leather surface instead of a textile surface, might easily exceed the mentioned differences of green and non green. On one hand these differences represent different levels of product quality which are not directly comparable. On the other hand one might decide to buy a green version office chair with textile surface instead of a non green version with a leather surface for a similar price. As a consequence, one can conclude that in such cases there is some space for a ‘green decision’.

5.11.7 Conclusions

The LCC, which consist only of the costs for purchasing the products in the case of furniture, show for all product types and selected Member States that the green version is more expensive than the non green version (with the exception of mobile cabinets in Germany where the green version is about 10% cheaper than the non green version).

However in all cases a very big variety of different products exist, making it difficult to find two products which are identical except for the green criteria. The price differences therefore might also reflect differences in quality or fitting. To put it the other way: differences between fittings or brands seem to be higher compared to differences between the green and non green versions.

6 Overall Conclusions

Having the results of the LCC of the 11 product groups in mind, the following overall conclusion can be drawn:

- The focus on the *life cycle costs* reveal that in most cases the operating costs have a significant share of the purchasing authorities total costs. It therefore is highly recommendable to take operating costs in account to the evaluating process of a tender.
- The applied *function-based* approach reveals that in a lot of cases the costs for certain products, where cost differences due to 'green' criteria occur, only play a minor role in the life cycle costs of that function to be delivered. This approach should be applied more often to find out the best option to fulfil this function in both environmental and economic terms.

Further findings regarding life cycle costs of green and non green products and services are

- It cannot be generalised that green products always have higher purchase prices than non green product versions. In most product groups, the 'make' or brand of the product or other features have a much higher influence on the purchase price of a certain product than green criteria. It is therefore possible to have less expensive green products of one brand compared to non green products of another brand. For example, condensing boilers for gas fuel are much more expensive than low temperature boilers in all selected Member States. Cleaning products, however, vary very much, both within the green or non green versions and between the selected Member States. The resulting average purchase prices of the green versions are partly higher, partly lower than the prices of the corresponding non green version.
- In some cases (clothing, electricity, food, paper products) the purchase price is the only relevant cost element in the life cycle of a product. Of course, in cases of clothing, food or copying paper, the products are also processed during the use phase (e.g. washing and drying of clothes, preparing food and drinks, printing or copying), and therefore bring up further costs during the use phase. However, these processes belong to other product groups, as defined in this study[109], and the subsequent processes are not influenced by the purchase of a green or a non green product version.

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[109] Applying a function based approach would not focus on these products as such, but on the function to be delivered, e.g. printing of a certain number of pages. Therefore, in the study at hand, the influence of using different paper versions during a printing process were also investigated (see product group 8 on printers).

- In most cases, the operating costs (for energy, paper, or other operating media) cause a significant share of the total life cycle costs, for example in case of gas boilers, office lighting, buses or bus services, passenger cars, printers, and to a smaller extent also computers and computer displays. Therefore, in these cases the sole focus on the purchase price during the tender process is not justified. The mostly lower costs during the use phase of a green version compensate the sometimes higher purchase costs. This can be illustrated with the example of condensing boilers for gas fuel: They are about twice as expensive as the less efficient low temperature boilers. However, due to the much lower costs for gas fuel consumption, which account for 40 to 60% of the total LCC, the overall cost difference is reduced to only 16%. The green version is still more expensive than the non green version; however, the difference is significantly reduced. In case of single-function EP printers, the higher purchase price of the green version is even overcompensated for, mainly due to the lower costs for paper consumption resulting in lower LCC for the green than for the non green version. The case of passenger cars reveals that more environmental friendly cars usually also have a higher resale value than conventional cars.
- The focus on the function to be delivered puts the cost differences between some green and non green versions in relation to the overall costs to fulfil a certain function. This is most obvious for the product groups 1 (here: ‘painting’) and 4 (‘cleaning products and services’) where costs are highly dominated by labour costs. However, also for products like coffee, the share of the ‘greenable’ ingredient (coffee beans) only contributes to a minor degree to the overall costs of the end product. In these cases, the magnitude of the potential increase in costs through GPP would be highly overestimated when only looking at the cost differences of certain products or ingredients, but not at the full costs of the service or end product. In addition, it does not prove true that in the green version in general is more costly than the non green version.
- The cases of passenger cars or computer displays show that a main lever in reducing both environmental impacts and (life cycle) costs is the adequate definition of the function of the product to be purchased (e.g. the size or engine power). This important step is part of the definition of the subject matter of the contract. It is crucial that the procuring authority defines their actual demands very well, and does not oversize the products to be tendered for.
- Similar, other measures than the purchase of green products, like the user behaviour, might lead to the substantial lowering of environmental impacts and also costs: e.g. in case of cleaning, the use of dosage devices might lead to proper, mostly lower dosage of cleaning products, which reduces the amount of chemicals flushed in the sewage system as well as the demand of purchasing those products. Similar, an economical way of driving can significantly reduce the fuel consumption of buses and passenger

cars. And finally, the consequent use of duplex printing contributes highly to the lower paper demand and operating costs of printers with automatic duplex printing unit.

- In some cases the market for green products is only very small, which resulted in difficulties to get data for this study, but which also means that it is quite difficult for authorities to purchase green product versions without high additional effort (e.g. negociations with purchasers; this is the case e.g. for food or textiles). In these cases, however, it is essential that public authorities take this effort and start procuring 'green' products, in order to help these products towards a wider placement on the public *and* private market, and to generally serve as example. As public authorities usually procure high quantities, higher prices (for example known from 'green' clothing for private consumers) are levelled, as potential additional efforts during the production are allocated to a higher number of products reducing the price per unit.

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8 Annex

8.1 Documentation of market research

The tables in the following sections list the manufacturers and institutions that have been contacted or from which information could be gained from internet research.

8.1.1 Product group 1: Construction work

Table 176 Contact list of the market research – Construction work

Enquired manufacturers or suppliers	Answer?	Named products		
		gas boiler (product type 1)	**office lighting** (product type 2)	**painting** (product type 3)
SWEDEN				
Elco	n	x		
Brötje	n	x		
Vaillant	n	x		
Buderus	n	x		
Junkers	n	x		
Osram	n		x	
Philips	y		x	
GE Lighting	n		x	
AkzoNobelDecorativeCoatings-Sw	y			x
Caparol Sweden AB	y			x
TEKNOS AB	y			x
Beckers	y			x
ALCRO-BECKERS AB	n			x
LIWA FAERG AB	n			x
FLUGGER AB	n			x
GERMANY		**gas boiler**	**office lighting**	**painting**
Elco	n	x		
Brötje	n	x		
Vaillant	n	x		
Buderus	y	x		
Junkers	y	x		
Osram	n		x	
Philips	y		x	
GE Lighting	n		x	
Sto	y			x
Brillux	y			x
MEGA - Malereinkaufsgenossenschaft e.G.	y			x

Caparol	n			x
Keim	n			x
SPAIN		**gas boiler**	**office lighting**	**painting**
Elco	n	x		
Brötje	n	x		
Vaillant	n	x		
Buderus	n	x		
Junkers	n	x		
Osram	n		x	
Philips	y		x	
GE Lighting	n		x	
INDUSTRIAS PROA	n			x
INDUSTRIAS TITAN S.A.	y			x
PINTURAS LEPANTO SA	y			x
PINTURAS MONTO	y			x
Florma	y			x
PRODUCTOS RALPE SL	n			x
ALP-REVETON S.L.	n			x
AkzoNobelCoatingsSA Deco-Spain	y			x
CZECH REPUBLIC		**gas boiler**	**office lighting**	**painting**
Elco	n	x		
Brötje	n	x		
Vaillant	n	x		
Buderus	y	x		
Junkers	y	x		
Osram	n		x	
Philips	y		x	
GE Lighting	n		x	
Primalex	y			x
Mistral Paints	y			x

X = Information requested for.

8.1.2 Product group 2: Transport – Buses and bus services

Table 177 Contact list of the market research

Enquired manufacturers/ institutions	Answer?	subject of answer / cost element		
SWEDEN		**Tax**	**Insurance**	**Costs**
Swedish Insurance Association (Forsakringsforbundet)	n		Liability and comprehensive vehicle insurance	
KRAVAG	y		Liability and comprehensive vehicle insurance	
Allianz	n		Liability and comprehensive vehicle insurance	

Münchner Rück	y		Liability and comprehensive vehicle insurance	
Integer-Research, FindAdBlue.com	y			AdBlue
Greenchem	y			AdBlue
air1 (Yara, Brenntag)	n			AdBlue
BASF	n			AdBlue
OMV	n			AdBlue
SKW Priesteritz	n			AdBlue
AdBlue-Service	n			AdBlue
EuroStat	y			Personnel costs for maintenance
Scania	y			Fuel consumption of ethanol driven buses
Ethanol Bus Buyer's Consortium, www.ethanolbus.com	n	Registration tax, admission fee and motor vehicle tax	Liability and comprehensive vehicle insurance	
BEST project	y	Registration tax, admission fee and motor vehicle tax		Fuel consumption and promotion of ethanol driven buses
Ministry of Enterprise, Energy and Communication, Sweden	n	Registration tax, admission fee and motor vehicle tax		
GERMANY		**Tax**	**Insurance**	**Costs**
Federal Financial Supervisory Authority (BaFin)	y		Liability and comprehensive vehicle insurance	
DEKRA	y		Liability and comprehensive vehicle insurance	
Association of German Transport Undertakings (VDV)	y		Liability and comprehensive vehicle insurance	Vehicle prices in Europe, fuel consumption
Association of liability for public transport undertakings (HOEV)	y		Liability and comprehensive vehicle insurance	
Assocciation of Transport Undertakings in Berlin (BVG)	n		Liability and comprehensive vehicle insurance	
German Insurance Association (GDV)	n		Liability and comprehensive vehicle insurance	
KRAVAG	y		Liability and comprehensive vehicle insurance	
HUK	y		Liability and comprehensive vehicle insurance	
HDI	y		Liability and comprehensive vehicle insurance	
Allianz	n		Liability and comprehensive vehicle insurance	

Munich Re Group	y		Liability and comprehensive vehicle insurance	
Integer-Research, FindAdBlue.com	y			AdBlue
Greenchem	y			AdBlue
air1 (Yara, Brenntag)	n			AdBlue
BASF	n			AdBlue
OMV	n			AdBlue
SKW Priesteritz	n			AdBlue
AdBlue-Service	n			AdBlue
EuroStat	y			Personnel costs for maintenance
Evobus	y			Fuel consumption
Irisbus	y			Fuel consumption, costs for technical reduction and for maintenance
Audatex	y			Netto prices for buses
Public Transport Undertaking, Freiburg (Freiburger Verkehrs AG)	y			Fuel consumption, costs for technical reduction and for maintenance
SPAIN		**Tax**	**Insurance**	**Costs**
UNESPA	y		Liability and comprehensive vehicle insurance	
KRAVAG	y		Liability and comprehensive vehicle insurance	
Allianz	n		Liability and comprehensive vehicle insurance	
Munich Re Group	y		Liability and comprehensive vehicle insurance	
Integer-Research, FindAdBlue.com	y			AdBlue
Greenchem	y			AdBlue
air1 (Yara, Brenntag)	n			AdBlue
BASF	n			AdBlue
OMV	n			AdBlue
SKW Priesteritz	n			AdBlue
AdBlue-Service	n			AdBlue
EuroStat	y			Personnel costs for maintenance
Ministry of Transport, Spain (Ministerio de Fomento)	n	Registration tax, admission fee and motor vehicle tax		
Spanish Insurance Association (Consorcio de Compesación de Seguros)	n		Liability and comprehensive vehicle insurance	

CZECH REPUBLIC		Tax	Insurance	Costs
CAP	n		Liability and comprehensive vehicle insurance	
KRAVAG	y		Liability and comprehensive vehicle insurance	
Allianz	n		Liability and comprehensive vehicle insurance	
Munich Re Group	y		Liability and comprehensive vehicle insurance	
Integer-Research, FindAdBlue.com	y			AdBlue
Greenchem	y			AdBlue
air1 (Yara, Brenntag)	n			AdBlue
BASF	n			AdBlue
OMV	n			AdBlue
SKW Priesteritz	n			AdBlue
AdBlue-Service	n			AdBlue
EuroStat	y			Personnel costs for maintenance
Embassy of the Czech Republic	y	Registration tax, admission fee and motor vehicle tax		
German Embassy Prague	y	Registration tax, admission fee and motor vehicle tax		
German-Czechia Chamber of Commerce and Industry (AHK)	?	Registration tax, admission fee and motor vehicle tax		
Ministry of Transport, Czechia	y	Registration tax, admission fee and motor vehicle tax		
UAMK	n	Registration tax, admission fee and motor vehicle tax		
City of Krnov	y	Registration tax, admission fee and motor vehicle tax	Liability and comprehensive vehicle insurance	

8.1.3 Product group 3: Transport – Passenger cars

Table 178 Contact list of the market research – Passenger cars

Enquired manufacturers/ institutions	Answer?	Subject of answer/ cost element		
SWEDEN		**Tax**	**Insurance**	**Costs**
EuroStat	y			Personnel costs for maintenance
BEST project	y	Registration tax, admission fee and motor vehicle tax		
Ministry of Enterprise, Energy and Communication, Sweden	n	Registration tax, admission fee and motor vehicle tax		
GERMANY		**Tax**	**Insurance**	**Costs**
EuroStat	y			Personnel costs for maintenance
SPAIN		**Tax**	**Insurance**	**Costs**
EuroStat	y			Personnel costs for maintenance
Ministry of Transportation, Spain (Ministerio de Fomento)	n	Registration tax, admission fee and motor vehicle tax		
CZECH REPUBLIC		**Tax**	**Insurance**	**Costs**
EuroStat	y			Personnel costs for maintenance
Embassy of the Czech Republic	y	Registration tax, admission fee and motor vehicle tax		
German Embassy Prague	y	Registration tax, admission fee and motor vehicle tax		
German-Czechia Chamber of Commerce and Induystry (AHK)	n	Registration tax, admission fee and motor vehicle tax		
Ministry of Transport, Czechia	n	Registration tax, admission fee and motor vehicle tax		
UAMK	n	Registration tax, admission fee and motor vehicle tax		
City of Krnov	y	Registration tax, admission fee and motor vehicle tax	Liability and comprehensive vehicle insurance	

8.1.4 Product group 4: Cleaning products and services

Table 179 Contact list of the market research – Cleaning products and services (manufacturers)

Manufacturers	**Answer?**	**Named products[110]**		
SWEDEN	y/n	**all-purpose-cleaners**	**sanitary cleaners**	**window cleaners**
Calvatis GmbH	n			
Ecolab	y	X		X
Gipeco AB	n			
Havoline Kemi AB	y	X		X
Kemibolaget OCEAN AB	y	X	X	X
LDG Academy	y	X		
Macserien Servicecenter	y	X		X
Natures of Scandinavia	y	X		
Nilfisk-Advance	n	X		
PLS Produkter AB	n			
Tana Chemie	y	X	X	X
Taslis AB	y	X	X	
Tvättex	y	X		
GERMANY		**all-purpose-cleaners**	**sanitary cleaners**	**window cleaners**
Arnold Holste GmbH	y	X		
Asiral	n			
Bode Chemie	y			
Buzil	y	X	X	
cc Dr. Schutz GmbH	n			
Donau-Iller-Werkstätten	y	X		
Dr. Schnell Chemie	y	X	X	X
Dr. Weigert GmbH	n			
Dreiturm	y	X	X	
Ecolab	y			
Etol Werk Eberhard Tripp GmbH	n			
Fala Werk	n			
Finktec GmbH	n			
Goldschmidt GmbH	n			
Gruber Reinigungstechnik	n			
Johannes Kiehl KG	y	X	X	
Johnson Diversey	y		X	X
Karl Walter Reinigungsmittelwerk	n			

110 The product could not be named as the average prices given in the results section, in some cases are derived from only two different products. In such cases the confidentiality would be broken through naming of these products in this table.

Kleen Purgatis	y	X	X	X
Langguth	y		X	
Lysoform Dr. Hans Rosemann	n			
Mobiloclean	y	X		X
Novaprot GmbH	y	X		
Otto Oehme GmbH	n			
Procter&Gamble	y			X
Systemhandel	n			
Reinex GmbH	y			X
Tana Chemie GmbH	y	X	X	X
Unger	y			
SPAIN		**all-purpose-cleaners**	**sanitary cleaners**	**window cleaners**
A&B Laboratorios de Biotec.	n			
Berolkemi, S.L.	y	X		X
Caramba S.L.	n			
Cotalva	n			
E. Diaz Productos Químicos	n			
Euroquímica, S.A.	n			
Eurosanex S. L.	n			
Fadéin, S.L.	n			
Filer, S.L:	n			
Industria Jabonera Lina S.A.U.	n			
Industria Químicas Induquim, S.L.	n			
Industrias Vijusa, S.L.	y	X	X	X
KH Lloreda S.A.	y	X	X	
Laboratorios Bilper.S.A.	n			
Laboratorios Eurochem. S.A.	y	X		
Proder, S.A.	n			
Productos Calter S.L	n			
Productos Codina	n			
Proquideza, S.L.	n			
Químicas de Vianlopó S.L.	y	X	X	X
Quimicas Oro.S.A.	n			
Quimicas Quimxel S.L.	n			
Quimidex Professional, S.L.	n			
Tana-Chemie GmbH	y	X	X	X
CZECH REPUBLIC		**all-purpose-cleaners**	**sanitary cleaners**	**window cleaners**
Alfa Classic	y	X		
Golden Products	n			
Henkel	n			
Johnson Diversey GmbH	n			
Missiva	y	X		
MPD Plus Ltd., Rakovnik	n			
Procter & Gamble	n			

Reckitt Benckiser Ltd	n			
simple green	y	X		
Tana Chemie	y	X	X	X
Unilever	n			
Zenit S.R.O.	y	X	X	X

X = Information received and used for calculations.

For data on performance indices of cleaning processes, on average wages of cleaning staff and of the calculation of the hourly rate of building cleaners, the following institutions were contacted. For Spain additional information was gathered through internet research.

Table 180 Contact list of the market research – Cleaning products and services (other institutions)

Institution	Contact person
REFA Fachorganisation Gebäudereinigung	Klaus Schröder (director)
Almega, SV	Inger Jonasdotter
City of Göteborg, SV	Lars Parkbring
Pfiff Institut GmbH, DE	Dieter Hohmann (director)
City of Tübingen, DE	Peter Ruckdeschel
IP managering , CZ	Barbonova Balkova
City of Krnov, CZ	Rostislava Rollerova
European Federation of Cleaning Industries (EFCI)	Andreas Lill (director)
The Swedish Association of Industrial and Institutional Hygiene Products (IIH), SV	Internet research
Industrieverband Hygiene und Oberflächenschutz (IHO), DE	Dr. Walter Gekeler (director), internet research
Asociación de Empresas de Detergentes y de Productos de Limpieza, Mantenimiento y Afines (ADELMA); ES	Internet research
Czech Soap and Detergent Products Association (CSDPA), CZ	Internet research

8.1.5 Product group 5: Clothing

Table 181 Manufacturers offering flower labelled clothing

Manufacturer	Origin	Products	Further enquiry
SWEDEN			
Anne Linnonmaa Oy	Finland	ecological fashion (for private consumers)	No
Klopman International Srl	Italy	Advanced protective wear fabrics, casual apparel fabrics, image work wear fabrics	No
JOHA A/S	Denmark	baby wear and children's wear	No
F.Engel K/S	Denmark	Work wear	Yes
Krenholm Holding	Estonia	Bed linen, terry towels, diapers	No
Monkey Print AB	Sweden	event attention catchers	No
Texdot AB	Sweden	flag printing	No

Manufacturer	Origin	Products	Further enquiry
Kvadrat A/S	Denmark	furnishing designs	No
DIBB AB	Sweden	Hygiene products, bed linen, towels (for private consumers)	No
Industria Tessile Sanesi SPA	Italy	finished fabrics	No
J. Morup Stof APS	Denmark	knitted fabric	No
AB Utenos Trikotazas	Lithuania	knitwear	No
Väveriet i Uddebo	Sweden	upholstery fabric	No
Naturapura Iberica	Portugal	clothing (for private consumers)	No
Bogesunds Väveri AB	Sweden	textile fabrics	No
Bloch&Behrens Wool (NZ) Ltd	New Zealand	scoured New Zealand wool	No
Sanden Produktion AB	Sweden	upholstery fabrics and polyamide	No
AB Ludvig Svensson	Sweden	upholstery fabric made of wool	No
Gudbrandsdalen Uldvarefabrik	Norway	fabrics	No
View sustainable Design AB	Sweden	certified organic cotton yarn and fabrics	No
GERMANY			
Anne Linnonmaa Oy	Finland	ecological fashion (for private consumers)	No
Klopman International Srl	Italy	Advanced protective wear fabrics, casual apparel fabrics, image work wear fabrics	No
Hybler Textil SRO	Czech Republic	Bed and table linen, clothes	Yes
F.Engel K/S	Denmark	Work wear	Yes
Krenholm Holding	Estonia	Bed linen, terry towels, diapers	No
Texdot AB	Sweden	flag printing	No
Kvadrat A/S	Denmark	furnishing designs	No
Industria Tessile Sanesi SPA	Italy	finished fabrics	No
J. Morup Stof APS	Denmark	knitted fabric	No
Hch. Kettelhack GmbH&Co.KG	Germany	100% cotton fabrics	No
Leinefelder Textilwerke GmbH	Germany	yarn	No
Sea Cell GmbH	Germany	Lycocell	No
Bloch&Behrens Wool (NZ) Ltd	New Zealand	scoured new zealand wool	No
Södahl Design A/S	Denmark	bed linen	No
AB Ludvig Svensson	Sweden	upholstery fabric made of wool	No
Richter Kammgarn GmbH	Germany	woolen yarn	No
View sustainable Design AB	Sweden	certified organic cotton yarn and fabrics	No
SPAIN			
LA PREPARACION TEXTIL SA	Spain	100% cotton yarn	No
Klopman International Srl	Italy	Advanced protectivewear fabrics, casual apparel fabrics, image workwear fabrics	No
Hybler Textil SRO	Czech Republic	Bed and table linen, clothes	Yes
F.Engel K/S	Denmark	Workwear	Yes
Kvadrat A/S	Denmark	furnishing designs	No
DIBB AB	Sweden	Hygiene products, bed linen, towels (for private consumers)	No
Industria Tessile Sanesi SPA	Italy	finished fabrics	No

Manufacturer	Origin	Products	Further enquiry
Enrique Ballus SL-Enbasa Laval	Spain	Jacquard textiles	No
Bloch&Behrens Wool (NZ) Ltd	New Zealand	scoured new zealand wool	No
E. Cima SA	Spain	textiles de interior	No
AB Ludvig Svensson	Sweden	upholstery fabric made of wool	No
View sustainable Design AB	Sweden	certified organic cotton yarn and fabrics	No
CZECH REPUBLIC			
Hybler Textil SRO	Czech Republic	Bed and table linen, clothes	Yes
Bloch&Behrens Wool (NZ) Ltd	New Zealand	scoured New Zealand wool	No
Nova Mosilana	Czech Republic	fabric for Italian public sector	No

Table 182 Contact list of the market research – Clothing

Enquired manufacturers	Products	Contact person	Contacts
F. Engel K/S, Denmark	work wear with EU Flower	Kim Christiansen	telephone, 2 email requests
Hybler Textil SRO, Czech Republic	only bed linen with EU Flower, EU Flower Website also disclosed clothes		telephone
HTS, Germany	cotton towel rolls / textile service	Ulrich Ingelfinger	telephone
HTS, Switzerland	cotton towel rolls / textile service	Sandra Tenzi	telephone
Fa. Metzler, Switzerland	police shirts	Heidi Mastro-Metzler	telephone
Enquired procurers	**Products**	**Contact person**	**Contacts**
City Police of Zurich, Switzerland	police shirts	Samuel Mazan	telephone
Universitätsklinikum Freiburg, Germany	hospital clothing	Dr. Thomas Ebert	telephone
Universitätsklinikum Freiburg, Germany	hospital clothing	Prof. Dr. Markus Dettenkofer	telephone
LH Bundeswehr Bekleidungs-gesellschaft, Germany	military clothing	Martin Stehr	telephone

8.1.6 Product group 6: Electricity

Table 183 Contact list of the market research – Electricity

Suppliers	**Answer?**	**Products**		
		100% RES-E without additional requirements	**100% RES-E or CHP with additional requirements**	**100% RES-E with additional requirements**
SWEDEN		**GV #1**	**GV #2**	**GV #3**
Alingsås Energi AB	n			
Borås Elhandel AB	n			
Dala Kraft AB	n			
E.ON Försäljning Sverige AB	y	X		X
Eksjö Energi ELIT AB	n			
Elverket Vallentuna El AB	n			
Energibolaget i Sverige AB	n			
Eskilstuna Energi & Miljö Försäljning AB	y			X
Falkenberg Energihandel AB	n			
Fortum Markets AB	y			X
Fyrfasen Energi AB	n			
Gävle Energisystem AB	n			
Godel i Sverige AB	n			
Jämtkraft AB	n			
Karlshamn Energi Elförsäljning AB	n			
Kraft & Kultur i Sverige AB	n			
KREAB Försäljning	n			
Lunds Energi Försäljning	n			
Mälarenergi AB	n			
Mölndal Energi AB	n			
Nynäshamn Energi Försäljning AB	n			
O2 Energi AB	n			
Öresundskraft Marknad AB	n			
Östkraft AB	n			
Rauma Energi Kraft AS	n			
Ringsjö Energi Försäljning	n			
Skellefteå Kraft AB	n			
Smedjebacken Energi AB	n			
Svensk Kraftmäkling	y			X
Telge Energi Försäljning AB	n			
Trelleborgs Energiförsäljning AB	n			
Umeå Energi Elhandel AB	n			
Värnamo Energi AB	n			
Vattenfall AB	n			
Växjö Energi AB	n			

GERMANY		GV #1	GV #2	GV #3
Elektrizitätswerke Schönau GmbH	n			
Eprimo	y	X		
Greenpeace energy e.G.	n			
Lichtblick GmbH & Co. KG	y	X	X	X
NaturEnergie AG	y	X		
NaturPUR energie AG	n			
Naturstrom AG	y			X
Stadtwerke Hannover AG	y			X
SLOVENIA		**GV #1**	**GV #2**	**GV #3**
APT Power Trading	y			
Ekowatt	y	X		
Elektro Celje	n			
Elektro Gorenjska	n			
Elektro Ljubljana	y			X
Elektro Maribor	y			X
Elektro Primorska	y			X
HSE	y			X
CZECH REPUBLIC		**GV #1**	**GV #2**	**GV #3**
ČEZ	y			
Pražská energetika Group	y			X
News at Seven (article in journal)	n.a.			X

X = Information received.

8.1.7 Product group 7: IT devices – computers and monitors

Table 184 Contact list of the market research – Computers and monitors

Enquired manufacturers or suppliers	Answer?	Named products		
		desktop computer (product type 1)	**notebook computer** (product type 2)	**computer displays** (product type 3)
SWEDEN				
Dell	y	x	x	x
HP	y	x	x	x
Fujitsu Siemens	n	x	x	x
Sony	n	x	x	
Maxdata	n		x	
Samsung	y		x	
http://www.inwarehouse.se/	y	x	x	x
GERMANY		**desktop (1)**	**notebook (2)**	**display (3)**
T-Systems	n			
Dell	y	x	x	x
HP	y	x	x	x

Fujitsu Siemens	y	x	x	x
Sony	y	x	x	
Maxdata	y	x	x	x
Samsung	y		x	
https://shop.computacenter.de	y	x	x	x
SPAIN		**desktop (1)**	**notebook (2)**	**display (3)**
T-Systems	n			
Dell	y	x	x	x
HP	y	x	x	x
Fujitsu Siemens	n			
Sony	y	x	x	
Maxdata	n		x	
Samsung	n		x	
www.ciao.es	y	x	x	x
CZECH REPUBLIC		**desktop (1)**	**notebook (2)**	**display (3)**
T-Systems	n	x	x	x
Dell	y	x	x	x
HP	y	x	x	x
Fujitsu Siemens	y	x	x	x
Sony	y	x	x	
Maxdata	y	x	x	x
Samsung	n		x	
http://www.kalkulacky.cz/	y	x	x	x
http://www.pechcomp.cz	y	x	x	x

X = Information requested for.

8.1.8 Product group 8: IT devices – printers and copiers

Table 185 Market research sources – Printers and copiers

Enquired manufacturers	**Answer?**	**Analysed products**		
Sweden	y/n	**Inkjet printers**	**SFD electro photographic printers**	**MFD electro photographic printers**
Brother			x	
Canon		x	x	
Dell			x	
Epson		x	x	
HP		x	x	
Konica Minolta			x	
Kyocera Mita				
Lexmark	y		x	x
Oki			x	
Ricoh			x	
Samsung			x	

Xerox	y		x	x
Germany				
Brother			x	
Canon		x	x	
Dell			x	
Epson		x	x	
HP	y	x	x	
Konica Minolta			x	
Kyocera Mita			x	
Lexmark	y		x	x
Oki			x	
Ricoh	y		x	
Samsung			x	
Xerox	n/y		x	x
Spain				
Brother			x	
Canon		x	x	
Dell	y		x	
Epson		x	x	
HP	y	x	x	
Konica Minolta			x	
Kyocera Mita			x	
Lexmark	n		x	x
Oki			x	
Ricoh	n			
Samsung	y		x	
Xerox	n		x	x
Czech Republic				
Brother	y		x	
Canon	y	x	x	
Dell	y		x	
Epson	y	x		
HP	y	x	x	
Konica Minolta	y		x	
Kyocera Mita	n			
Lexmark	y/n		x	x
Oki	n			
Ricoh	n			
Samsung	y		x	
Xerox	n/y			x

X = Information requested for.

Enquired websites

Websites of manufacturers

- www.brother.se; www.brother.de; www.brother.es; www.brother.cz
- www.canon.se; www.canon.de; www.canon.es; www.canon.cz

- www.dell.se; www.dell.de; www.dell.es; www.dell.cz
- www.epson.se; www.epson.de; www.epson.es; www.epson.cz
- www.hp.se; www.hp.de; www.hp.es; www.hp.cz
- www.konicaminolta.se; www.konicaminolta.de; www.konicaminolta.es; www.konicaminolta.cz
- www.kyoceramita.se; www.kyoceramita.de; www.kyoceramita.es, www.kyoceramita.cz
- www.lexmark.se; www.lexmark.de; www.lexmark.es; www.lexmark.cz
- www.oki.se; www.oki.de; www.oki.es; www.oki.cz
- www.ricoh.se; www.ricoh.de; www.ricoh.es; www.ricoh.cz
- www.samsung.se; www.samsung.de; www.samsung.es; www.samsung.cz
- www.xerox.se; www.xerox.de; www.xerox.es; www.xerox.cz

Online shops:

- http://www.ciao.se
- http://www.inwarehouse.se
- http://www.misco.se
- http://www.pricerunner.se
- http://www.spray.se
- http://www.preisroboter.de
- http://www.areapc.com/listadoProductos.jsp
- http://www.ciao.es

8.1.9 Product group 9: Food

Table 186 Market research sources – Food

Enquired manufacturers / suppliers / purchasers	Ans-wer?	Products	
FINLAND		**Product type**	**Name**
http://www.kasvistieto.fi	y	Tomatoes - non green	n.s.
http://www.kasvistieto.fi	y	Potatoes - non green	n.s.
Economic Department Finland	y	Chicken - non green	n.s.
Economic Department Finland	y	Chicken - green	n.s.
ICO, Lidl	y	Coffee - non green	n.s.
http://www.bosoy.fi	y	Coffee - green	n.s.
Ministry of Agriculture and Forestry, Erja Mikkola	y	all products	n.s.
Puutarhaliitto	n	all products	
Statistical Office	y	all products	n.s.
City of Helsinki; Wholesale Food Market	n	all products	
kirsi-maaria.forssell@motiva.fi	n	all products	
http://www.meira.fi	n	all products	
heimo.valinen@k-supermarket.fi	n	all products	
plussa@kesko.fi	n	all products	
GERMANY		**Product type**	**Name**
Edeka, Metro	y	Tomatoes - non green	n.s.
Metro, Tollgrün	y	Tomatoes - green	n.s.
ZMP	y	Potatoes - non green	Linda
Metro, Tollgrün	y	Potatoes - green	n.s.

Edeka, Metro	y	Chicken - non green	n.s.
ZMP	y	Chicken - green	n.s.
ICO, Metro	y	Coffee - non green	n.s.
Metro	y	Coffee - green	Tempelmanns
Studentenwerk Berlin, Abt. Produktentwicklung/ Marketing	y	all products	n.s.
Casino Finanzamt Zehlendorf	y	all products	n.s.
KuK Kantine im Ernst-Reuter-Haus	y	all products	n.s.
Casino im Rathaus Kreuzberg	n	all products	
Charite Berlin	n	all products	
Studentenwerk Essen-Duisburg	y	all products	n.s.
Bundesverband Naturkost Naturwaren	n	all products	
SPAIN		**Product type**	**Name**
Mercasa	y	Tomatoes - non green	n.s.
Fundacio Futur	y	Tomatoes - green	n.s.
Can valls	y	Tomatoes - green	rojo
Can valls	y	Tomatoes - green	pera
Can valls	y	Tomatoes - green	rama
Can valls	y	Tomatoes - green	cherry-pera
Cistella Verda	y	Tomatoes - green	n.s.
Fundacio Futur	y	Potatoes - green	n.s.
Can valls	y	Potatoes - green	blanca
Can valls	y	Potatoes - green	blanca nova
Can valls	y	Potatoes - green	roja nova
Cistella Verda	y	Potatoes - green	n.s.
Merca Bilbao	y	Chicken - non green	n.s.
Merca Madrid	n	all products	
Xarxa Consum Solidari	n	all products - green version	
Fundacio Futur	y	Chicken - green	n.s.
Cistella Verda	y	Chicken - green	n.s.
Trevol	y	Coffee - fair trade	n.s. (crushed)
Alternativa 3	y	Coffee - fair trade	n.s. (crushed)
Alternativa 3	y	Coffee - fair trade	n.s. (crushed)
ICO, Mercadona	y	Coffee - non green	n.s.
CZECH REPUBLIC		**Product type**	**Name**
Green Marketing CZ, Tom Vaclavik	y	Tomatoes - non green	n.s.
Green Marketing CZ, Tom Vaclavik	y	Tomatoes - green	n.s.
Euromonitor, Billa	y	Potatoes - non green	n.s.
Czech Wholesaler, no Name	y	Potatoes - green	Linda
Czech Statistic Office	y	Chicken - non green	n.s.
Czech Statistic Office, Billa	y	Coffee - non green	n.s.
Czech Wholesaler, no Name	y	Coffee - green	n.s.
Ministry for Regional Development	y	all products	n.s.
Jakub_Kaspar@env.cz	y	all products	n.s.
Czech Statistical Office, tomas.chramecky@czso.cz	y	all products	n.s.

Wholesale Market:Velkotrznice-Lipence s.r.o	n	all products	
SEVEn, Juraj Krivosik	y	all products	n.s.
City of Krnov, Rostislava Rollerova	n	all products	

8.1.10 Product group 10: Paper

Table 187 Market research sources – Paper (Sweden)

Enquired suppliers	Answer	Products		
		Copying paper	Envelopes	Toilet paper
4office	y		Mailman (Bong)	Saga Toilet 260 (Katrin)
AB Helmer Nilsson	y	Briljant Copy (Papyrus)	Mailman (Bong)	Saga Toilet 260 (Katrin)
Killbergs	y	Multicopy (Stora Enso)		
Kontorab AB	y	Multicopy (Stora Enso)	Mailman (Bong)	Katrin Toilet 250 (Katrin)
Kontorab AB	y		Mailman H2 90g (Bong)	Saga Toilet 260 (Katrin)
Kontorsgiganten	y	N/Office Copy (Nordic Office)	E-65kuvert. Självhäftande ()	Universal T4 (Tork)
Kontorsspecial AB	y	Briljant Copy (Papyrus)	Mailman (Bong)	Saga Toilet 260 (Katrin)
KP Karlskrona	y	Briljant Copy (Papyrus)	Mailman (Bong)	Universal T4 (Tork)
Lyreco	y	IMPEGA	IMPEGA	Universal T4 (Tork)
Lyreco	y	Nautilus Super White Recy. (Mondi Business Paper)		
Map Sveridge	y	HP Office Paper (Hewlett Packard)	Mailman (Bong)	
Map Sveridge	y	HP Office Recycled (Hewlett Packard)		
Map Sveridge	y	HP Printing (Hewlett Packard)		
Map Sveridge	y	HP Recycled (HP)		
Michaelis	y	Maestro Supreme (igepa)		
Michaelis	y	Future Multitech (igepa)		
Svanströms	y	Element Air A4	E-65kuvert H2. Självhäftande	X
Svanströms	y	Nordic Office A4 (Nordic Office)	E-65kuvert V2. Självhäftande	
Svanströms	y	Copy paper Symbio Copy (M-real)	E-65kuvert V2. Självhäftande	
Svanströms	y	Data Copy (M-real)		
Swedoffice	y	HP Office (HP)	E-65kuvert H2. Självhäftande	Universal T4 (Tork)
Swedoffice	y	Element Air A4		
Swedoffice	y	Data Copy (M-real)		
Swedoffice	y	Nordic Office A4 (Nordic Office)		
Tigerstad AB	y	Xerox Premium (Xerox)	S65 H2 (Mayer)	? (SCA)

Tin AB	y	Briljant Copy (Papyrus)	Mailman (Bong)	Saga Toilet 260 (Katrin)
Turnex AB	y		Mailman (Bong)	
Xerox Sveridge AB	y	Xerox Recycled (Xerox)		
Xerox Sveridge AB	y	Xerox Premier (Xerox)		
vts kontor AB	y			Universal T4 (Tork)
	n	X	X	
Profili AB	y			Universal T2 (Tork)
Profili AB	y			Saga Toalett 360 (Saga)
Lilon	y			Katrin toilet 250 (Katrin)
Lilon	y			Saga Toilet 260 (Katrin)
Stora Enso Scandinavia	n	X	X	
SCA Hygiene Products AG	n			X
Kepa	n	X	X	X
Torget	n	X	X	X
Rimpac Emballage AB	n	X	X	X
Handduks Kompaniet	n	X	X	X
Kontorslandet	n	X	X	X
Materialgruppen AB	n			X
Rekal Svenska AB	n			X
Skövde Kontorscenter AB	n	X	X	X
Wettergrens AB	n	X	X	X

Table 188 Market research sources – Paper (Germany)

Enquired suppliers	Answer	Named products		
		Copying paper	Envelopes	Toilet paper
A & C Schneidewind GmbH & Co. KG Briefumschlagfabrik	n	X		
Ahlers-kuvert	y		Cygnus DL SK (Ahlers-kuvert)	
Antalis	y	Pure White (Steinbeiss Temming)		
Antalis	y	Trend White (Steinbeiss Temming)		
Ashton Feucht	y		Briefumschläge DL (Bong)	
AWA COUVERT GmbH	n	X		
B & S Ziriakus GmbH	y			Basic (Fripa)
B & S Ziriakus GmbH	y			Nuvola (Fripa)
Barock Herstellung und Vertrieb	n	X		
Becker Falken GmbH	n	X		

Berberich	y	Mundo 2000 (Blue Planet Universal)	2800 Laser (Clairefontaine)	
Berberich	y	Super Copy (BluePlanet)	Briefhülle holzfrei Offset (19530)	
Berberich	y	Copy Plus TCF (BluePlanet)	Recycling aus 100% Alt-papier mit Pergaminfenster	
Berberich	y	Pioneer (Portucel soporcel (PT))	Briefumschläge DL (Bong)	
Berberich	y	Berga Prestige (Storaenso)		
Berberich	y	Clairmail (Clairefontaine (FR))		
Berberich	y	1 Plus FSC (Stora Enso)		
Bong Deutschland GmbH	n	X		
Brause GmbH	n	X		
Brodinger	y			Basic (Fripa)
BSB Kuvert GmbH & Co.KG	n	X		
BSE-Briefumschläge GmbH & Co. KG	n	X		
Bundesverband des Deutschen Papiergroßhandels e.V.	n	X	X	X
BVS Bürosysteme (Kant)	y		Soennecken Briefhüllen DL (Soennecken)	
BVS Bürosysteme (Kant)	y		Soennecken Briefhüllen DL (Soennecken)	
BVS Bürosysteme (Kant)	y			Universal (Tork)
BVS Bürosysteme (Kant)	y			Extra (Probüro)
Calnova	y			Basic (Fripa)
Calnova	y			Scott 250 (Kimberley Clark)
Classen papier	y	Zoom (Stora Enso)		
Classen papier	y	Ballet (International paper)		
COMFOTEC Wolfgang Nies GmbH & Co. KG	n	X		
DEFAK GmbH Fabrik für Bürobedarf	n	X		
Deutsche Papier	y	IBM document pro (IBM)		
Direktrecycling	y		Direktrecycling DL (Direktrecycling)	
EBEMA Buerobedarf GmbH	n	X		
Ernst GmbH	y		Steinmetz Offset White (Steinmetz)	
Gecko Tec	y			Funny (weiß) (Atlas Handels)
Gecko Tec	y			Funny (55% weiß) (Atlas Handels)

Gecko Tec	y			Top 3 (Atlas Handels)
Handelsagentur Plock GmbH	n			X
Hetzel GmbH & Co. KG	n	X		
Hetzel GmbH & Co. KG	n	X		
Hyfagro	y			Select (Fripa)
Hyfagro	y			Nuvola (Fripa)
Hyfagro	y			Basic (Fripa)
hygi GbR (D-48291 Telgte)	y			Funny (Atlas Handels)
hygi GbR (D-48291 Telgte)	y			Funny (weiß) (Atlas Handels)
hygi GbR (D-48291 Telgte)	y			Funny (55% weiß) (Atlas Handels)
IBC-Aussenwirtschaft Magdy Essawy	n	X		
Industraga	y			Basic (Fripa)
Karl Heinz Geiger	y		No name	
Karl Heinz Geiger	y		No name	
Klaus Kühn & Co. GmbH &Co.Papierverarbeitu ng KG	n	X		
KPV Manfred Keilbach GmbH	n	X		
KPV Manfred Keilbach GmbH	n	X		
Kuvert und Druck	y		No name	
Kuvert und Druck	y		No name	
Leoma Bueroorganisation Mahler e.K.	n	X		
Mayer-Kuvert GmbH & Co.KG Briefhüllenfabrik	n	X		
medialogik	y	1 Plus FSC (Stora Enso)		
Medialogik	y		Versandhüllen, DL mit Fenster (Blessof)	
Memo	y	Recycling Pro (Memo)	Recycling Plus (Memo Print)	Recycling Tissue, 2-lagig (Memo)
Memo	y	Nautilus copy (Mondi Business Paper (Neusiedler AG- Austria))	Briefumschläge Naturweiß (Memo Print)	
Memo	y	Bright White (Steinbeiss Temming)		
Memo	y	Evolve Office (M-real)		
Memo	y	Bio Top 3 (Mondi Business Paper (Neusiedler AG- Austria))		

Niederleig GmbH	n			X
Obst GmbH	y			SAGA (Katrin)
Obst GmbH	y			Clou (Wepa)
Pohlscandia GmbH	y		Scandia Holzfrei Weiß (Pohlscandia GmbH)	
Pohlscandia GmbH	y		Scandia Recycling grau (Pohlscandia GmbH)	
Printus	y	JUMP (JUMP)		
Printus	y	IQ Economy (Mondi Business Paper (Neusiedler AG- Austria))		
Resin GmbH	n	X		
Rofa	y			Universal (Tork)
SCA Hygiene Products AG	n			X
Schneider & Söhne	y	Recyconomic 70 (Schneider & Söhne)	Plano Plus Briefumschläge RC grau	
Schneider & Söhne	y	PlanoDynamic (Schneider & Söhne)	Plano PlusBriefumschläge Offset weiß	
Schneider & Söhne	y	PlanoJet Office (Schneider & Söhne)	Plano Plus Briefumschläge Offset weiß	
Schneider & Söhne	y	PlanoFine TCF (Schneider & Söhne)		
Schneider & Söhne	y	PlanoBasic (Schneider & Söhne)		
Schneidewind Kuvert	y		Fensterumschläge DL weiß 80 g	
Schneidewind Kuvert	y		Fensterumschläge DL recycling grau	
SEB Weidlich	y		Briefumschläge DL (Bong)	
SEB Weidlich	y		Briefumschläge DL RC grau (Bong)	
Steinmetz Briefumschläge GmbH	n	X		
Storaenso	n	X		
Stypen Deutschland GmbH	n	X		
Wilke Hygienartikel	y			Samtweich (Clou)
Wilke Hygienartikel	y			Naturweich (Clou)

Table 189 Market research sources – Paper (Spain)

Enquired suppliers	Ans-wer	Products		
		Copying paper	Envelopes	Toilet paper
ANBO	y	Symbio Reciclado (Symbio)	Sobres Papel Ecologico (Kanguros)	
ANBO	y	Data Copy (M-real)	Galgo (Galgo)	
Antalis	y	Digital Natural (Kanguros)		
Antalis	y	Startext (Mondi Business Paper (Neusiedler AG- Austria))		
Antalis	y	Nautilus copy (Mondi Business Paper (Neusiedler AG- Austria))		
Antalis	y	Digital Star (Kanguros)		
Area PC	y			5 Stars (SAM)
Area PC	y			Premium (Tork)
bionatura	y			oko-purex (metsäe tissue)
Caprabo	y			Caprabo (?)
Caprabo	y			NoName (Colhogar)
Caprabo	y			Scottex (Scottex)
Carrefour	y			Carrefour (?)
Comercial Sieiro	y	Inacopia Office Multifonction (Portucel soporcel (PT))		Tork (Tork)
Comercial Sieiro	y	Tecno Star (Inapa Tecno)		5 Stars (SAM)
Comercial Sieiro	y	Tecno Green (Inapa Tecno)		
Comercial Sieiro	y	Multi Office (Portucel soporcel (PT))		
Comercial Sieiro	y			
Comercial Sieiro	y			
Drolim	y			Micro Derm (Marpel)
Drolim	y			Scottex (Scottex)
El Compass	y			Domesticus (Bugaroll)
ElCompas	y	Naturpapel (Unipapel)		
eroski	y			Mirasol (Perla Tisú)
eroski	y			Temaw (eroski)
Maprofar	y			Olimpic Verde (Olimpic)
Merca Empresa	y			Olimpic Verde (Olimpic)
Merca Empresa	y			Domestic (Bugaroll)
Mercadona	y			Bosque Verde (Bosque Verde)
Ofiline	y			Neutral (Tork)
Ofiline	y	X	5 Star (SAM)	Tork (Premium)
ofistore	y	Naturpapel recycled (Unipapel)	Publicidad (Autodex)	
ofistore	y	ULTRA ZOOM (Stora Enso)	Konstancia (S/D)	
ofistore	y	UNI-REPRO (Unipapel)	Naturpapel (Unipapel)	

ofistore	y		Open system (Autodex)	
optize.es			Naturpapel (Unipapel)	
optize.es	y		Konstancia (S/D)	
optize.es	y	XEROX PERFORMER (Xerox)	Publicidad (Autodex)	Personal Service Estandar (Colhogar)
Saving Office	y		5 Star (SAM)	
SB Formas EN Papel, S.L.	y		Sobres Recicl. 100% Ventana Dcha. (SB Formas EN Papel, S.L.)	
SB Formas EN Papel, S.L.	y		Offset Blanco Ventana Izquierda (Sobreplús, S.A.)	
Surpapel	y		no name (Inapa)	
Torras Papel	y	Berga Focus (Storaenso)	Cyclus sobres (Stora Dalum Papir)	
Torras Papel	y	Berga Prestige (Storaenso)		
Torras Papel	y	Berga Speed (Storaenso)		
Torras Papel	y	Explorer Premium (Portucel soporcel (PT))		
Torras Papel	y	HP Printing (HP)		
Torras Papel	y	HP Office (HP)		
Torras Papel	y	Pioneer (Portucel soporcel (PT))		
Torras Papel	y	Multioffice (Portucel soporcel (PT))		
Torras Papel	y	Logic 500 (M-real)		
Torras Papel	y	Vision Bright White (Steinbeiss)		
Torras Papel	y	Nautilus copy (Mondi Business Paper (Neusiedler AG- Austria))		
Torras Papel	y	HP recycled (HP)		
Torras Papel	y	Vergaspit ()		
Torras Papel	y	Logic 300 (M-real)		
Txartel	y		5 Star (SAM)	
Txartel	y		Navigator Tira Silicona 120 G. (ref. NAVIGATOR 110) (SAM)	
Vikingdirect	y	Viking Recycled Paper (Viking)		
Vikingdirect	y	IQ Triotec Unique (Mondi Business Paper)		
Vikingdirect	y	HP Office (HP)		
Vikingdirect	y	Viking copy Paper (Viking)		
Vikingdirect	y	Stress Free Paper (Multioffice)		
Vikingdirect	y	Data Copy (M-real)		
Zoomici	y			Lotus (Lotus)
Stora Enso Espana	n	X	X	
SCA Hygiene Products AG	n			X
Papelera de Besaya	n	X		
Góma-Camps, S.A.	n	X	X	X
Maserite S.L.	n	X	X	
Inapa	n	X	X	
Papeleria Firmas	n	X	X	X
Cronus Demosite	n	X	X	X

Table 190 Market research sources – Paper (Czech Republic)

Enquired suppliers	Ans-wer?	Products		
		Copying paper	Envelopes	Toilet paper
	y/n			
ARBO	y	Motif	Umschlag DL mit Fenster (KRPA, CZ)	
ARBO	y	Real copy		
BALUN	y		Umschlag DL mit Fenster (Slovakei; KRPA CZ)	
BALUN	y		Umschlag DL mit Fenster (Slovakei; KRPA CZ)	
barvymarek	y			Grato (Rollpap s.r.o.)
Bokk-net Bohemia s.r.o.	y			Mimax (Spektrum a.s.)
Brassica-pap spol. S.r.o.	y			Flowers de luxe2 (Brassica-pap spol. S.r.o.)
Brassica-pap spol. S.r.o.	y			
Buroprofi	y		obálka DL	
centrála IT	y		obálka DL	
Cerepa a.s.	y			Frotto maxi (Cerepa a.s.)
Droppp	y	Steinbeis Vision (Steinbeis)	obálka DL certified (KRPA)	
Drostra	y			Zewa (SCA)
ELFI	y	Dailitop (Mondi scp)	Envelope DL with window (KRPA, CZ)	
ELFI	y	Polspeed (XEROX)		
ENV	y	XEROX recycled plus (Xerox)		
Fetko spol. S.r.o.	y			Majesta (irwing tissue Canada)
Hel&P vse pro kancelar	y	Symbio (Symbio)		
helap	y		obálka ELCO DL	
kancelarskepotreby	y		obálka DL	
KRPA, CZ	y		Envelope (recycled paper) (KRPA, CZ)	
KRPA, CZ	y		Envelope (white paper) (KRPA, CZ)	
KRPA, CZ	y		Envelope (recycled paper) (Krkonosske papirny)	
KRPA, CZ	n			X
LAW	y	Multicopy (Stora Enso)		
LAW	y	IBM office pro (International Paper)		
mefisto	y	Steinbeis Vision Trend White (Steinbeiss Temming)	obálka DL certified	
mefisto	y	IQ triotec white (Stora Enso)	obálka DL certified	
mefisto	y	Communiqué		
mefisto	y	Lettura recycled		
nejlepsiceny	y			Grato (Rollpap s.r.o.)
Olsanske papirny	y	Prima Copy (Olsanske papirny as)		

OSPAP	y	Motif recycled (Stora Enso, Finnland)		
OSPAP	y	IBM (Kwidzyn)		
Papirondrak	y			Quality (Q-pap s.r.o.)
PAS s.r.o.	y	Recycled plus (Vanguard)		
PAS s.r.o.	y	Motif Basic (Stora Enso, Finnland)		
Praktik Papir	y		obálky DL Recykl	
Praktik Papir	y		obálky DL SAMOL	
PVM	y			TIMI plus (TIMI)
PVM	y			TIMI duo (TIMI)
rollpap spol. s.r.o.	y			Grato recycled (rollpap spol. s.r.o.)
SCA Hygiene Products AG	n			X
sklenicka	y			Plus (KrSC)
Stilus Trade spol s.r.o.	y	Volumax	Envelope DL with window (KRPA)	
Stora Enso Praha	n	X	X	
TECOM paper s.r.o.	y	Motif recycled (Stora Enso, Finnland)		
UPM Kymmene s.r.o.	n	X	X	X

Enquired websites

http://www.papier.info, last visited 15th February 2007
http://papir.arnika.org, last visited 17th February 2007
http://www.stp.de, last visited 19th February 2007
http://www.ecodes.org/, last visited 20th February 2007
http://www.papiernetz.de, last visited 18th February 2007
http://www.urgewald.de/index.php?page=9, last visited 14th February 2007
http://www.eco-label.com/default.htm, last visited 13th February 2007
http://www.cenia.cz/web/www/web-pub2.nsf/$pid/MZPMSFHMV9DV, last visited 13th February 2007
http://www.leap-gpp-toolkit.org, last visited 20th February 2007

8.1.11 Product group 11: Furniture

Table 191 Market research sources – Furniture

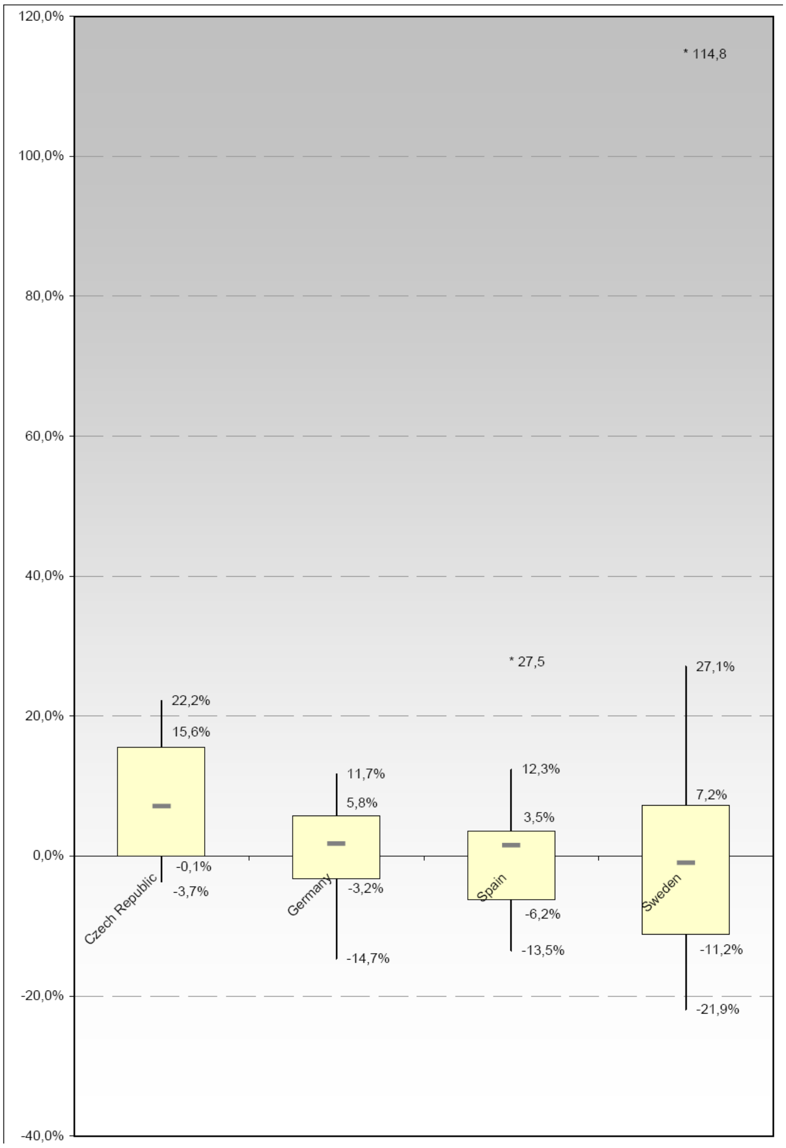
Enquired manufacturers or suppliers	**Answer?**	**mobile cabinets** (product type 1)	**open storage units** (product type 2)	**office chairs** (product type 3)
SWEDEN		**cabinets (1)**	**storage (2)**	**chairs (3)**
AB Edsbyverken	y		x	
Chairholder	y		x	x
memo	y	x		

IKEA	y	x		
Kinnarps	y	x	x	
Woodlands	y	x	x	
http://www.ikm.kinnarps.se	y	x		
Horreds Möbel AB	n	x	x	
S-Line Office AB	n	x	x	
Gerdmans	y		x	
GERMANY		**cabinets (1)**	**storage (2)**	**chairs (3)**
AB Edsbyverken	y		x	
moll Funktionsmöbel GmbH	n		x	
Assmann	n		x	
memo	y	x		x
Chairholder	y		x	x
Schäfer Shop	y		x	x
http://www.buero-shop24.de				
MTB	y		x	
IKEA	y	x		
Otto Office	y		x	
möbelum	y	x		
moizi	y	x		
SPAIN		**cabinets (1)**	**storage (2)**	**chairs (3)**
AB Edsbyverken	y		x	
Chairholder	y		x	x
IKEA	y	x		
Groupo Polanco	n	x	x	
memo	y	x		
http://mobiofi.com/	y	x	x	
www.montteonline.com	y	x	x	
CZECH REPUBLIC		**cabinets (1)**	**storage (2)**	**chairs (3)**
HON – NÁBYTEK s.r.o.	y		x	
JOSEF ŠEBEK - INTEBO	n		x	
TECHO a.s.	n		x	
SAMAS Česká republika spol. s r.o.	n		x	
INTERIOR PFD spol. s r.o.	n		x	
Truhlářství Eva Mikešová	n		x	
EXBYDO s.r.o.	n		x	
ALAX spol. s r.o.	n		x	
KOŘAN NÁBYTEK s. r.o.	n		x	
ARTIK II s. r.o.	y		x	
STARKON Nová Říše spol. s r.o.	n		x	
VLABO, s.r.o.	n		x	
Nábytek EXNER, spol. s r.o.	n		x	
Chairholder	y		x	x
http://www.nabytekvalmo.cz	y	x	x	

http://www.zarizeni-kancelari.cz	y	x	x	
http://www.ceskynabytek.cz	y	x	x	
IKEA	y	x		
http://nabytek.perfektni-nabytek.cz	y	x		
memo	y	x		

8.2 Further information

8.2.1 Statistical analysis development of electricity prices



8.2.2 Consumption figures of the selected products in product group 9 (Food)

The following tables show the development of the consumption of coffee, tomatoes, potatoes and chicken in the four selected Member States between 1995 and 2004 (in 1 000 tonnes per year and in kilogram per capita and year).

Table 192 Food consumption of selected products (in 1 000 t/a)

GERMANY	1995	2000	2004
Coffee	580	533	591
tomatoes	968	1,120	1,514
potatoes	6 866	6 723	6 223
chicken	602	634	627
FINLAND	**1995**	**2000**	**2004**
coffee	40	55	61
tomatoes	65	79	103
potatoes	337	358	355
chicken	43	65	82
SPAIN	**1995**	**2000**	**2004**
coffee	150	163	149
tomatoes	1 535	2 045	1 824
potatoes	3 387	3 278	3 117
chicken	937	974	1 332
CZECH REPUBLIC	**1995**	**2000**	**2004**
coffee	31	36	30
tomatoes	88	111	132
potatoes	941	874	652
chicken	133	204	231

Source: FAO 2006

Table 193 Food consumption of selected products (in kg/capita/year)

GERMANY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
coffee (green)	7.1	7.0	7.0	6.9	7.5	6.5	7.0	6.5	6.4	7.2
tomatoes	11.9	13.1	13.3	13.0	13.1	13.6	14.3	15.1	14.9	18.4
potatoes	84.1	88.2	84.5	80.1	81.0	81.7	78.4	76.6	75.2	75.4
chicken	7.4	8.9	8.4	8.6	7.6	7.7	8.7	7.9	8.1	7.6
FINLAND	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
coffee (green)	7.8	11.0	10.9	11.3	12.0	10.7	11.1	11.0	11.4	11.8
tomatoes	12.9	15.4	14.0	12.8	15.2	15.2	15.9	16.5	15.9	19.8
potatoes	43.1	67.9	68.4	67.9	69.7	69.2	70.5	69.7	71.8	68.2
chicken	8.5	10.1	10.3	12.1	12.8	12.6	14.4	15.3	15.9	15.8
SPAIN	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
coffee (green)	3.8	4.0	4.1	4.0	4.2	4.0	3.4	3.8	3.5	3.6
tomatoes	38.4	45.6	43.9	45.8	48.1	50.2	50.6	48.4	42.7	44.4
potatoes	84.8	87.1	86.0	80.6	80.2	80.4	80.6	80.4	78.7	75.8

chicken	23.5	22.3	22.5	26.0	24.5	23.9	25.1	29.7	29.5	32.4
CZECH REPUBLIC	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
coffee (green)	3.0	3.4	3.8	3.1	3.7	3.5	3.9	3.9	3.3	2.9
tomatoes	8.5	7.1	7.4	8.8	10.3	10.8	11.4	11.9	11.8	12.9
potatoes	91.1	94.1	87.0	83.6	83.4	85.1	86.8	88.7	73.3	63.8
chicken	12.9	12.9	16.2	18.1	18.6	19.9	21.8	20.6	21.0	22.6

Source: FAO 2006

8.2.3 Standards and regulation in product group 9 (Food)

8.2.3.1 Fair Trade-Standards by FLO[111]

Fairtrade standards are enforced by the Fairtrade Labelling Organisation (FLO), an independent worldwide umbrella organisation set up to ensure fairer international trade in mainstream commercial markets.

Fairtrade goods must be produced in accordance with specified environmental, health and safety standards:

For small farmers' co-operatives:

- A democratic structure that allows all members to participate in the co-operative's decision making processes.

For plantations and factories:

- Decent wages - at least the legal minimum;
- Good housing;
- Minimum health and safety standards;
- The right to join trade unions.

For all types of production:

- No child or forced labour;
- Programmes for environmental sustainability.

Fairtrade trading terms must include:

- A price that covers the cost of production;
- A social 'premium' to improve living and working conditions ;
- Partial payment in advance to prevent small producer organisations falling into debt;
- Contracts that allow long term production planning.

111 Fairtrade Labelling Organisation International: Fairtrade Standards for Coffee, Version June 2004

8.2.3.2 Ifoam Standards

The Goal of the International Federation of Organic Agriculture Movements (IFOAM) is the worldwide adoption of ecologically, socially and economically sound systems that are based on the principles of Organic Agriculture. The IFOAM Norms consist of the IFOAM Basic Standards and the IFOAM Accreditation Criteria. The IFOAM Basic Standards (IBS) are a keystone of the organic movement. Democratically and internationally adopted, they reflect the current state of organic production and processing methods. They are structured as ‘standards for standards.’ They provide a framework for certification bodies and standard-setting organisations worldwide to develop their own more detailed certification standards which take into account specific local conditions. The IFOAM Accreditation Criteria (IAC) establish requirements for conduct of organic certification by certification bodies. The IAC are based on the International ISO norm for the operation of certifying bodies.

- Principles of Health: Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.
- Principles of Ecology: Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.
- Principles of Fairness: Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.
- Principles of Care: Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

8.2.3.3 EU regulation on organic food

The Regulation on organic farming was adopted in 1991. The intention was to clarify the concept of organic farming. The Regulation-Guidelines lay down rules for the production of organic products. The rules refer to plant production, livestock production and processing organic agricultural products into foodstuffs. The definition of organic farming is adopted from the Codex Alimentarius. According to the Codex, organic farming involves production management systems.

In some European countries, e.g. Germany, the standards set in the EU regulation on organic food form the basis of national ‘Labels’, which for example can be easily used by the supplier for proving the compliance with the set standards.

8.2.4 More detailed results of product group 10 (Paper)

The following more comprehensive tables give an overview of the prices as well as the absolute and relative difference taking into account different levels of green versions.

Table 194 Total costs of the green version '100% recycled', the green version 'certified', and the non green version of copying paper in the four selected Member States; in Euros per tonne

Copying Paper (DIN A4, 80g/m²)	Costs				Difference					
	non green version	green version	100% recycled	certified green	absolute/ relative for 100% recycled vs. non green		absolute/ relative for certified vs. non green		absolute/ relative for green vs. non green	
Sweden (SV)	2.835,-	2.935,-	3.233,-	2.638,-	398,-	14%	-197,-	-7%	100,-	3,5%
Germany (DE)	2.402,-	1.844,-	1.433,-	2.254,	-969,-	-40%	-148,-	-6,2%	-558,-	-23,2%
Spain (ES)	1.578,-	1.642,-	1.723,-	1.562,-	145,-	9,2%	-16,-	-0,01%	64,-	4,1%
Czech Republic (CS)	1.287,-	1.284,-	1.284,-	n/a	-3,-	-0,2%	n/a	n/a	-3,-	-0,2%

Table 195 Total costs of the green version '100% recycled', the green version 'certified', and the non green version of envelopes in the four selected Member States; in Euros per 10 000 units

Envelopes (dl, self-adhesive, with window)	Costs				Difference					
	non green version	green version	100% recycled	certified green	absolute/ relative for 100% recycled vs. non green		absolute/ relative for certified vs. non green		absolute/ relative for green vs. non green	
Sweden (SV)	621,-	643,-	n/a	514,-	n/a	n/a	22,-	3,5%	22,-	3,5%
Germany (DE)	170,-	190,-	177,-	203,-	7,-	4,1%	33,-	19,4%	20,-	11,8%
Spain (ES)	345,-	381,-	343,-	419,-	-2,-	0,6%	74,-	21,5%	36,-	10,4%
Czech Republic (CS)	162,-	156,-	156,-	n/a	-6,-	3,7%	n/a	n/a	-6,-	3,7%

Table 196 Total costs of the green version '100% recycled', the green version 'certified', and the non green version of toilet paper in the four selected Member States; in Euros per roll

Toilet paper (2-layers, ~250 sheets/roll)	Costs				Difference					
	non green version	green version	100% recycled	certified green	absolute/ relative (%) for 100% recycled vs. non green		absolute/ relative (%) for certified vs. non green		absolute/ relative (%) for green vs. non green	
Sweden (SV)	0,63	0,63	0,69	0,56	0,06	9,5%	-0,07	-11%	0	0%
Germany (DE)	0,27	0,21	0,20	0,23	-0,07	-25,9%	-0,04	14,8%	-0,06	-22,2%
Spain (ES)	0,23	0,23	0,20	0,25	-0,03	-13%	0,02	10%	0	0%
Czech Republic (CS)	0,19	0,14	0,14	n/a	-0,05	-26,3%	n/a	n/a	-0,05	-26,3%

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ICLEI
Local Governments for Sustainability

Costs and Benefits of Green Public Procurement in Europe

Service contract number: DG ENV.G.2/SER/2006/0097r

Part 2: Additional Costs for Individual Purchasing Authorities of Buying Green Products (Administrative and Product Costs)

Freiburg, 26 July 2007

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Abbreviations

add.	Additional
Arpa Piemonte	Regional Agency for the Protection of the Environment
EC	European Commission
EMS	Environmental Management System
GPP	Green Public Procurement
IHOBE	Basque Environment Agency
SP	Sustainable Procurement
TCF	Totally Chloride Free
WS	Workshop

1 Executive Summary

This section analyses the additional costs and benefits of implementing Green Public Procurement (GPP) into individual purchasing authorities. There is evidence that GPP creates slight additional administrative costs mainly referring to the implementation of environmental criteria into tender documents as well as for specific in-house training to raise awareness and give practical advice on how to implement GPP. The additional costs referring to the setting up of a GPP policy and strategy are negligible. The overall average administrative costs are 223 Euro per 1000 inhabitants of the city or region.

There are numerous ways to reduce these costs. Examples from this survey (e.g. Barcelona, Ravensburg, Feldkirch) indicate that using existing guidance for developing, for instance, green criteria reduces the costs significantly. This reflects the efforts undertaken by the European Commission to further develop tools and instruments to give clear and easy-to-use guidance to the procurement officers.

Additionally these costs have to be seen alongside great benefits and cost savings, mainly for the product groups IT and office equipment and transport.

2 Introduction

The objective of this task is to build a body of qualitative and quantitative evidence of the costs for individual purchasing authorities to set up and run the green public purchasing strategy within the organisation. This includes administrative costs as well as additional costs or benefits of buying 'green' products.

The methodological approach is based on the assessment of qualitative and quantitative data by using a questionnaire, telephone interviews and supporting visits.

3 Selection of a representative sample group

A representative sample group was selected from across Europe. This includes both local government and public authorities that are well advanced in the field of Green Public Procurement (GPP). The organisations selected for this task were chosen for their leading role in participation in different projects, taking part in ICLEI's Procura+ Campaign, and through case studies showing good practise in GPP.

ICLEI developed a set of criteria upon which to choose a representative sample to be surveyed.

These criteria include:

- Relevance to the Member States;
- A mix of small, medium and large organisations;
- Organisation at local, regional and national level;
- Duration and extent of experience in integrating GPP criteria into procurement activity.
- Likely ability to source data and information, and the consequent scope and quality of evidence that can be gathered;
- Extent of environmental and economic impacts; and
- A selection across Northern, Southern, Western, Central and Eastern Europe.

In order to obtain data from 20 authorities, more than 40 suitable authorities have been contacted by ICLEI. The following table shows the authorities that were contacted.

Table 1 List of local/ regional authorities

Country	Individual purchasing authorities	Organisation/ Department	Data received Yes = y, No = n
Austria	City of Vienna	Ökokauf Wien	n
Austria	State of Vorarlberg - Feldkirch		y
Austria	Association of Viennese Hospitals	Director Environmental Protection	n
Austria	BBG Bundesbeschaffung GmbH		n
Bulgaria	Bourgas	European Integration Unit	n
Czech Republic	Krnov		n
Denmark	City of Kolding		n
Denmark	City of Copenhagen	Purchasing Unit	y
Denmark	Danish Ministry of Environment	Centre for Corporate Management	n
England	Environment Agency		n
England	Leicester City Council	Procurement Unit	n
England	DEFRA	Procurement & Contracts Division	n
England	Bromley	Procurement Unit	y
England	Sutton	Corporate Procurement	n
England	Camden	Sustainable Procurement	n
England	Sandwell	Procurement department	n
England	NHS	Sustainable procurement	n
England	University of Durham	Sustainable procurement	n
England	University of Southampton or Edinburgh		n
Finland	City of Pori	Environmental Protection Office	y

Finland	City of Helsinki	Purchasing centre	n
France	Saint Denis	Public Procurement	n
France	Mulhouse	Sustainable Procurement Unit	y
France	Lille	Sustainable Procurement Unit	n
Germany	Heidelberg		y
Germany	German National Government – Federal Ministry of Environment	Sustainable Procurement Unit, Purchasing Unit, Policy Unit	n
Germany	Federal Environmental Agency (UBA)	Purchasing centre, GPP policy unit	y
Germany	Ravensburg	Purchasing Unit	y
Germany	Tübingen	Building management unit	y
Germany	Darmstadt		n
Germany	Freiburg	Department for School and Education	n
Hungary	Budapest	Environmental Office	y
Hungary	Miskolc	Urban Development Unit	y
Ireland	Cork City Council	Fleets and energy manager, construction division	y
Italy	Ferrara		n
Italy	Cremona	Agenda 21 Office	n
Italy	Arpa Piemonte (Regional Agency for the Protection of the Environment)	Director	y
Netherlands	City of Tilburg	Finance Department	n
Netherlands	National Government	GPP Unit	n
Portugal	Metro Porto	Engineering Department	n
Scotland	Uni Edinburgh	Sustainable procurement	n
Spain	Barcelona City	Ecoinstitut	y
Spain	The Basque Country	The Basque Environment Agency IHOBE	y
Sweden	Göteborg	Purchasing Unit	y
Sweden	Municipality of Örebro	Environmental Coordination Office	y
Sweden	Växjöhem AB		n
Sweden	Stockholm	Purchasing Centre	y

20 organisations' procurement costs and benefits were analysed. They represent a mixture of small, medium and big individual public purchasing authorities. The following table gives an overview of the number of inhabitants of the cities and regions as well as the number of public employees.

Table 2 Local/ regional authorities, including represented inhabitants

Country	Organisation	Number of public employees[1]	Number of represented inhabitants
Italy	Arpa Piemonte (Regional Environment Agency)	not known	4 291 000
Spain	Barcelona	12 859	1 600 000
England	Bromley	3 500	299 100
Hungary	Budapest	1 200	1 650 000
Ireland	Cork	1 600	119 143
Netherlands	Dutch Central Government	120 000	16 491 460
Austria	Feldkirch	369	31 965
Germany	Freiburg	2 000	215 966
Germany	German Federal Environment Agency UBA	1 200	82 459 178
Sweden	Göteborg	45 000	500 000
Germany	Heidelberg	2 500	140 000
Denmark	Kopenhagen	42 000	1 230 607
Hungary	Miskolc	552	181 565
France	Mulhouse	2 200	110 359
Sweden	Örebro	11 000	98 237
Finland	Pori	6 750	235 000
Germany	Ravensburg	430	48 000
Sweden	Stockholm	45 000	700 000
Spain	The Basque Environment Agency IHOBE	68 000	2 124 846
Germany	Tübingen	1104	87 000

4 Methodology

The authorities taking part in the survey reflect a certain bandwidth of organisations like small, medium and big cities, regional authorities responsible for a whole geographic region, and individual purchasing authorities like hospitals and environmental agencies.

The aim of the study was to get a snap shot of costs rather than providing in-depth scientific research. The given figures are generally based on estimations provided by the respondents. Only a few local authorities (mainly Procura+ participants) have running analysis tools available that partly give concrete figures about the requested costs.

1 The number of employees correlates to the cities' and regional administrations. (Source: Combined Internet and telephone survey)

4.1 Design of the survey

The main instrument for this task is a specially developed questionnaire. It contains questions about:

- The costs of a GPP policy. Individual purchasing authorities may relate the GPP activities to overall sustainability policies as well as developing political back-up documents and legal decrees for the implementation of GPP into the purchasing authority's bodies;
- The costs of a GPP strategy. Setting up activities and relating them to strategic aims and policies is a necessity when fostering GPP in an individual purchasing authority;
- The costs for implementation of GPP measures. GPP policies and strategies influence the day-to-day work of procurers. This section focuses on costs when implementing these requirements into tendering processes, for instance developing green criteria;
- The costs for training, monitoring and evaluation. In order to develop the necessary capacity to implement GPP, the organisations have to secure effective training using in-house resources and external consultancy knowledge.

Additionally, the respondents were asked to include product- and service-specific costs, relating to their recent tenders and offers. This should enable a cross-calculation to be made by authority about additional costs and benefits for GPP. The authorities also had the possibility to indicate their share of GPP for different products and services.

The questionnaire has been designed professionally using a word formulary that could be filled in electronically. Six language versions of the questionnaire (English, German, French, Spanish, Italian, and Hungarian) are available. It was piloted by the city of Tübingen (Germany) and after some minor adaptations to the questions it was ready to be disseminated. A copy of the questionnaire in English can be found in the annex.

First, the participants were contacted via telephone, asking for their availability and interest in the survey. The questionnaires were then sent out electronically, with a cover letter explaining the purpose and use of the requested data. The respondents always had the opportunity to direct any queries to ICLEI.

The key calculation unit is the person hour costs[2]. Specific person hours for the relevant tasks are not easy to assess, because the purchasing units are mostly decentralised within the organisations. Due to this complexity the respondents were encouraged to collect a lot of information from different departments, and where necessary estimate the person hours

[2] Person hour costs are costs generated by staff working on specific tasks. For this study the following calculation method was used: Gross monthly salary (full-time position) / daily working time (8 hours) / monthly working days (17,5), resulting in the costs per staff and hour (person hour costs).

spent on each task and activity related to the above mentioned categories. Assisting telephone calls ensured that the information assessed was of a high quality.

Having received the completed questionnaire, the next stage was to scan and input the responses. A check was made on the returns for accuracy as well as whether all the questions had been answered. If this was not the case, follow up telephone interviews were undertaken to clarify responses, reveal contradictions and ensure that gaps in the questionnaire were completed.

In one case ICLEI team members visited the organisation (City of Mulhouse) and discussed open questions directly.

ICLEI will make sure that the results are fed back to the participating organisations. This will include the results of the questionnaire as well as to inform about further dissemination of the results. Feeding back the results to the participating authorities is scheduled for August 2007, following feedback from the EC.

4.2 Analysis of the data

The data was initially analysed, starting off by describing the basic features of the data in the study, such as costs per specific task groups. The next stage identified trends and patterns in the data of these basic statistics.

4.2.1 Quality control of the data

The returned data was transferred into an Excel-based calculation sheet. The given information on the history and the procedure of implementing GPP into the respective authority was used to cross-check the leading role of the authority as well as to triangulate[3] with, if any, missing information not described in the respective sections of the questionnaire. Therefore, triangulation was not used to verify or generalise the findings, but to expand the data source availability by using different methodologies.

The costs were calculated separately for the sections ‘policy and strategy’, ‘implementation’, ‘miscellaneous’, ‘training’, ‘product-/ service-specific costs by product groups’, and ‘GPP share’. The costs presented refer to the calculated person hours costs and do not include overhead costs (e.g. office equipment).

Only clearly indicated additional costs were taken into consideration. For example, the testing of cleaning products is a measure a procurer has to do with either ‘green’ or ‘non

[3] In social-economic research the term ‘triangulation’ meens taking at minimum two points of view on the object of research, using different methodological approaches (Flick 2003, p. 309).

green' products. In this case additional costs do not appear when purchasing green products. However, e.g. specific training for GPP creates additional costs.

4.2.2 Differentiating between one-time and annual costs

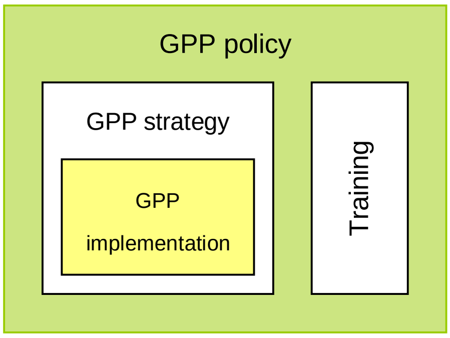
Both one-time and annual costs have been taken into consideration. This means that continuous costs such as the regular update of green criteria are described separately from costs relating to e.g. developing a mayors' decree to address the political will for green procurement.

Different sizes of cities and regions of the implemented GPP measures influence the study. The main results of the analysis are clustered in sections with reference to their population size. The additional costs are described in total Euro spend for GPP per 1000 inhabitants of the respective city or region as well as total Euro spend for GPP per employees of the respective city or region.

4.3 Limitations

The given figures give a clear indication of additional costs. Nevertheless, the information on the products and services does not reflect the whole purchasing of GPP in the local authorities and the calculation can only be used to give examples. In some local authorities, like the Federal Agency for Environment (UBA) in Germany, there are very few additional costs because of the general green political orientation of the organisation. To summarise, it depends on the level of GPP already implemented in the organisation to assess real additional costs.

5 Results



This section shows:

- The procurement systems of the organisations;
- The share of GPP of the whole procurement;
- A general overview of additional costs of GPP;
- The outcomes of the categories:
  - 'costs for policy and strategy',
  - 'costs for implementation',
  - 'miscellaneous costs' (relating to policy, strategy and implementation, including monitoring and evaluation) and
  - 'costs for training';
- Product-specific costs (examples).

5.1 Organisation's procurement system

The majority of authorities use a centralised or mixed procurement/ purchasing system (see Figure 1). The mixed approach mainly uses some centralised components (e.g. proof-reading of tender documents, legal adaptation of documents, developing procurement strategies) combined with decentralised tendering (e.g. organisational units).

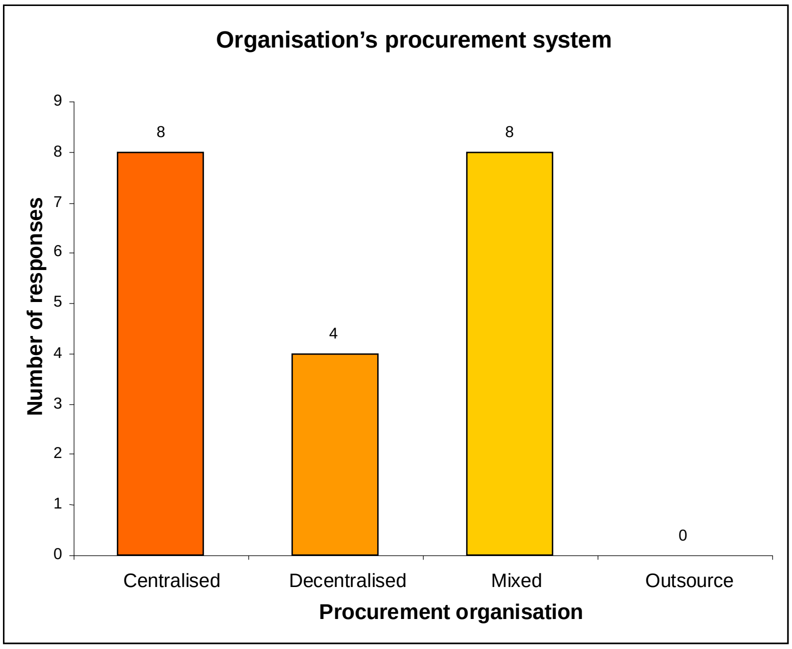


Figure 1 Organisation's procurement system

5.2 Percentage spent on GPP

The following table shows an indication of how much of the whole organisation's procurement budget is spent on GPP. These figures derive from self-statements of the authorities and therefore are not comparable.

Table 3 Percentage spent on GPP of overall budget

Organisation	GPP (%)
Arpa Piemonte – Regional Agency for the Protection of the Environment	47
Barcelona	28
Bromley	not known
Budapest	not known
Cork	not known
Dutch Central Government	not known
Feldkirch	not known
Freiburg	15(5)
German Federal Agency for Environment (UBA)	60(4)
Göteborg	not known
Heidelberg	80
Kopenhagen	not known
Miskolc	not known
Mulhouse	not known
Örebro	15(2)
Pori	20-25(3)
Ravensburg	10
Stockholm	84
The Basque Environment Agency (IHOBE)	5
Tübingen	90(1)

(1) = only for cleaning
(2) = only for organic food
(3) = 20% of products, 25% of services
(4) = the rest (40%) is used for laboratory procurement, where it is hard to include green criteria
(5) = only for IT equipment and paper

5.3 Total additional costs of GPP

The following table provides data on the overall additional costs of GPP. In this summary table all received and analysed cost drivers are included (comp. section 4.1).

Table 4 Total additional costs of GPP

Organisation	Mentioned additional costs of GPP (in EUR)	Total additional costs of GPP per 1000 inhabitants (in EUR)
Arpa Piemonte – Regional Agency for the Protection of the Environment	10.693	2
Barcelona	585.951	366
Bromley	7.361	25
Budapest	41.339	25
Cork	1.931	16
Dutch Central Government	1.444.034	88
Feldkirch	17.437	546
Freiburg	9.064	42
German Federal Agency for Environment (UBA)	2.218	<1
Göteborg	16.073	32
Heidelberg	5.220	37
Kopenhagen	166.205	135
Miskolc	5.474	30
Mulhouse	4.363	40
Örebro	13.671	139
Pori	223.572	951
Ravensburg	2.454	51
Stockholm	67.406	96
The Basque Environment Agency (IHOBE)	72.240	34
Tübingen	164.060	1.886
Average add. costs of GPP per 1 000 inhabitants		**227**
Average add. costs of GPP (<50 000 inhabitants), n=2	**9.946**	
Average add. costs of GPP (50 000–100 000 inhabitants), n=2	**88.866**	
Average add. costs of GPP (100 000–250 000 inhabitants), n=6	**41.604**	
Average add. costs of GPP (250 000–1 000 000 inhabitants), n=3	**30.280**	
Average add. costs of GPP (>1 000 000 inhabitants), n=6	**386.744**	

The overall additional costs for GPP range from 1.931 Euro (Cork) to 1.444.034 Euro (Dutch Central Government). Depending on the number of inhabitants in the city/region average total costs for GPP vary from 9.946 Euro to 386.744 Euro. Average costs per 1000 inhabitants are 227 Euro; all figures include one-time (32%) and annual (68%) costs.

5.4 Costs for setting up a GPP policy and strategy

Many organisations use their environmental policy for 'greening' their purchasing processes. Specific costs for setting up political support and taking strategic approaches occur in two-thirds of the responding authorities. Nevertheless, it is hard to identify real additional costs, if the authority does not have a specific GPP policy and strategy, due to the high impact range of environmental policies in a lot of administrative tasks. In these cases the overall environmental policies (e.g. climate change and adaptation policy) influence strongly on GPP activities, but the additional costs are not measurable because of the linkages of the different activities.

A GPP policy within the local authority is aimed at setting up a supporting framework e.g. by addressing high level political commitment for GPP (e.g. mayors' decree). A GPP policy will generally be accompanied by a GPP strategy that provides a detailed outline of actual implementation activities, which will be put in place to achieve the goals of the policy. A GPP strategy is generally far more comprehensive than a GPP policy.

The additional costs for both categories have been combined to express their interrelation. Topics and tasks measured were, for example, the planning of the adapted organisational structure or the drafting, editing and dissemination of the strategy.

The following table shows one-time and annual costs for introducing a GPP policy and GPP strategy.

Table 5 Costs for policy and strategy of GPP in EUR

Organisation	**Costs for policy and strategy (in EUR)**			
	one-time	annually	per 100 employees	per 1000 inhabitants
Arpa Piemonte – Regional Agency for the Protection of the Environment		5.259	not known	1
Bromley		781	1.096	3
Budapest	29.491		22	18
Barcelona	140.916		2.458	88
Ravensburg			not known	not known
Cork			25	not known
Dutch Central Government	25.210	5.042	1.708	2
Feldkirch	6.303		112	197
Freiburg		2.241	154	10
German Federal Agency for Environment (UBA)	1.849		36	not known
Göteborg	16.073		17	32
Heidelberg	425		241	3
Kopenhagen	101.029		not known	82
Miskolc			not known	not known

Mulhouse			13	not known
Örebro	1.378		2.145	14
Pori	144.784		not known	616
Stockholm	3.529		8	5
The Basque Environment Agency (IHOBE)	48.784		72	23
Tübingen	175		16	2
Average costs	**39.996**	**3.331**	**541**	**69**

Setting up a GPP policy and GPP strategy needs a one-time investment of some 40.000 Euro on average. Only 4 out of 20 respondents have annual costs related to political backup and strategic issues, with an average of 3.331 Euros. Average total costs per 100 employees of the organisation are 541 Euro. Regarding the additional costs per 1000 inhabitants of the respective city or region, on average 69 additional Euro were spent.

The additional costs vary significantly depending on the level of experience of the local/ regional authority. In case of the Federal Agency of Environment in Germany (UBA) the general focus of the organisation (i.e. giving environmental expert knowledge to the Ministry for Environment) means there are no additional costs for a GPP policy. Other authorities like Budapest or Barcelona had to build up organisational units for GPP within their administrative structure, adapting internal procedures, regulations and guidelines. The costs related to these activities are split into 'one-time' and 'annual' costs and vary in the selected authorities between 170 Euro and 13.900 Euro (one-time costs) and between 120 Euro and 1.000 Euro (annual costs).

The different costs result from activities like information management, developing legal requirements and instructions to the departments, public relation activities, formulating a strategic plan, developing action plans, and setting up and re-organisation of working groups.

The following figures show exemplary additional costs for GPP for the city/ region showing the specific tasks and activities. These examples from the cities Barcelona, Pori and Budapest, and Arpa Piemonte (Regional Agency for the Protection of the Environment) have been selected, because of the existent clear and visible cost drivers and because they reflect the scope of possible activities and costs within the category 'GPP policy and strategy'.

5.4.1 Barcelona: Costs for GPP policy and strategy

Barcelona's additional one-time and annual costs for setting up a GPP policy and GPP strategy are 140.916 Euro (88 Euro per 1000 inhabitants). In the case of a GPP strategy, the main cost drivers can be found in the setting up and on-going work of the strategic units (co-ordination and monitoring groups) and the development of new activities (75 % of the costs).

The city of Barcelona has been active in green procurement since 1999.

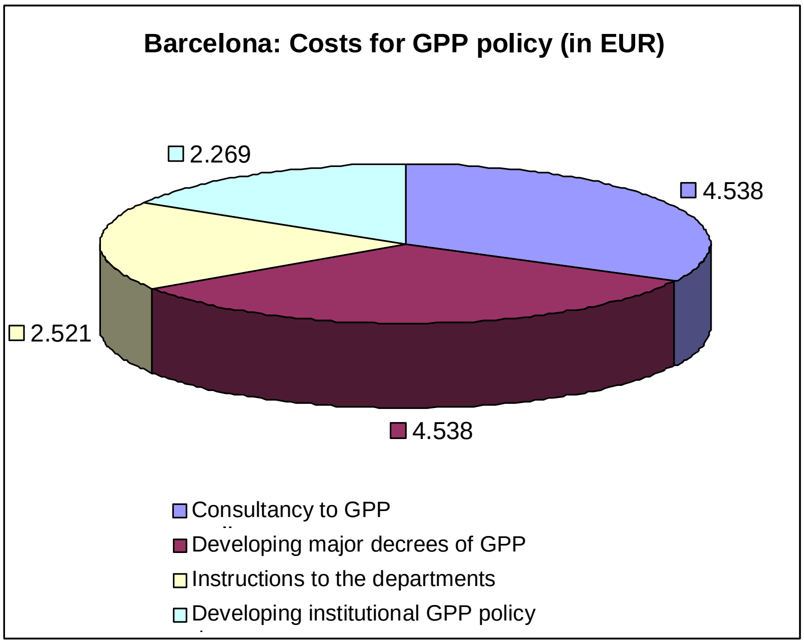


Figure 2 Barcelona: Costs for GPP policy

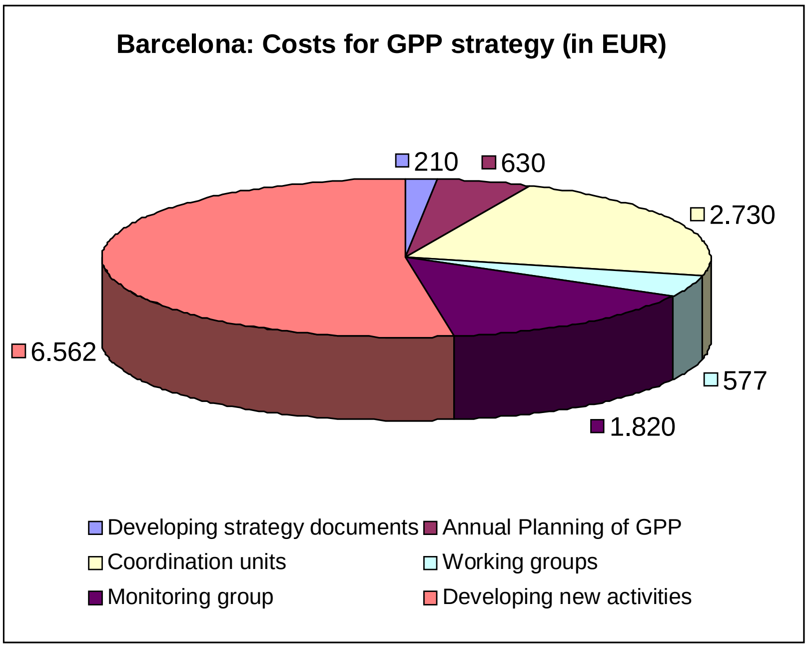


Figure 3 Barcelona: Costs for GPP strategy

5.4.2 Arpa Piemonte: Costs for GPP policy and strategy

Figure 4 shows annual costs, where the main costs refer to the preparation of GPP guidelines as part of the strategic approach.

Apart from these internal activities additional costs incur by external GPP activities, financed within the project for the promotion of GPP (APE), promoted by the Province of Turin and ARPA Piemonte and in which 24 local organisations are involved. In addition to the costs detailed in the graph over the page, annual costs of the APE project are approximately 15.000 Euro. This is the most important expenditure item with regards to GPP, mainly attributable to staff costs. The working hours can approximately be split in the following way: 20% for ARPA Piemonte, 20% for Province of Turin and 60% for activities supporting the remaining organisations participating in the APE project. The expenses of ARPA Piemonte out of this project are therefore equal to approximately 3.000 Euro per year.

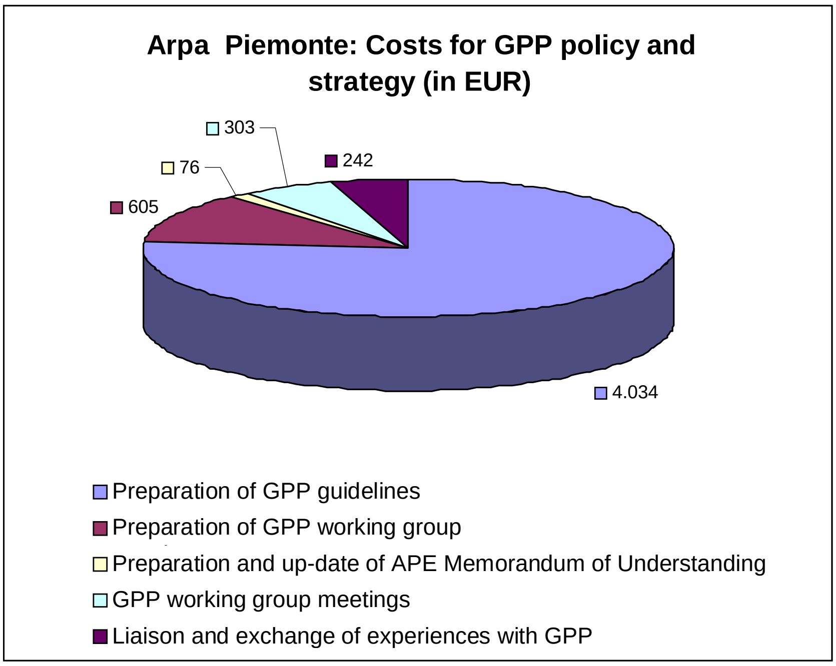


Figure 4 Arpa Piemonte: Costs for GPP policy and strategy

5.4.3 Pori: Costs for GPP policy and strategy

The city of Pori (Finland) has spent approximately 144.784 Euro (616 Euro per 1000 inhabitants) in total for GPP policy and strategy since the establishment of GPP practises in 1992. Main costs derive from the initial phase, because of the project ‘Environmental Friendly Procurement in Pori’ (see Figure 5). During the years 1992-2005 eco-advisors had been working in the procurement office. The city had received consultancy advice for purchasing cars and vehicle services, for cleaning services, catering services, office work and office equipment, health care and construction services.

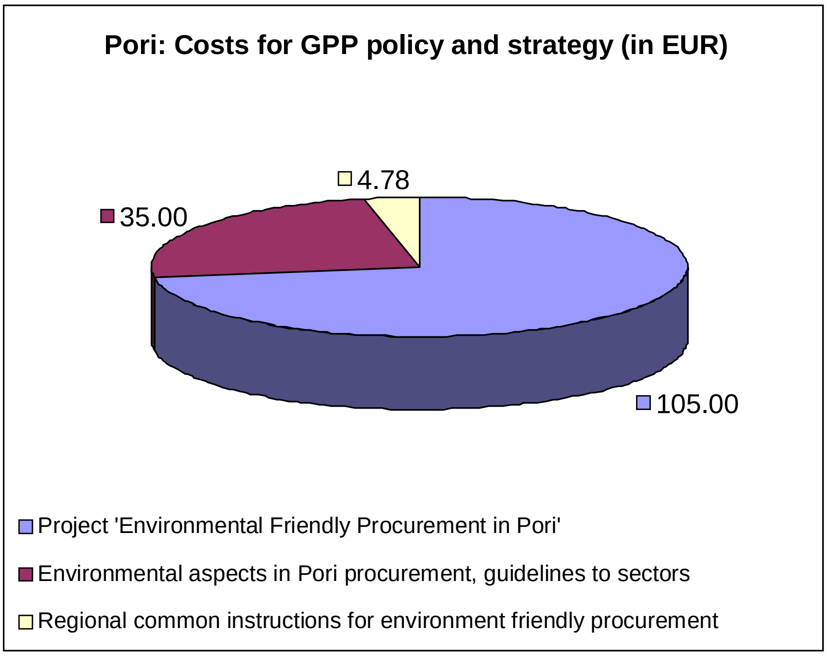


Figure 5 Pori: Costs for GPP policy and strategy

5.4.4 Budapest: Costs for GPP policy and strategy

Budapest recently started to undertake GPP within a new institutional framework. The Budapest Municipality and its bodies have applied GPP regulations since July 2006. Therefore, the main additional costs come from drawing up and adapting GPP regulations (see Figure 6).

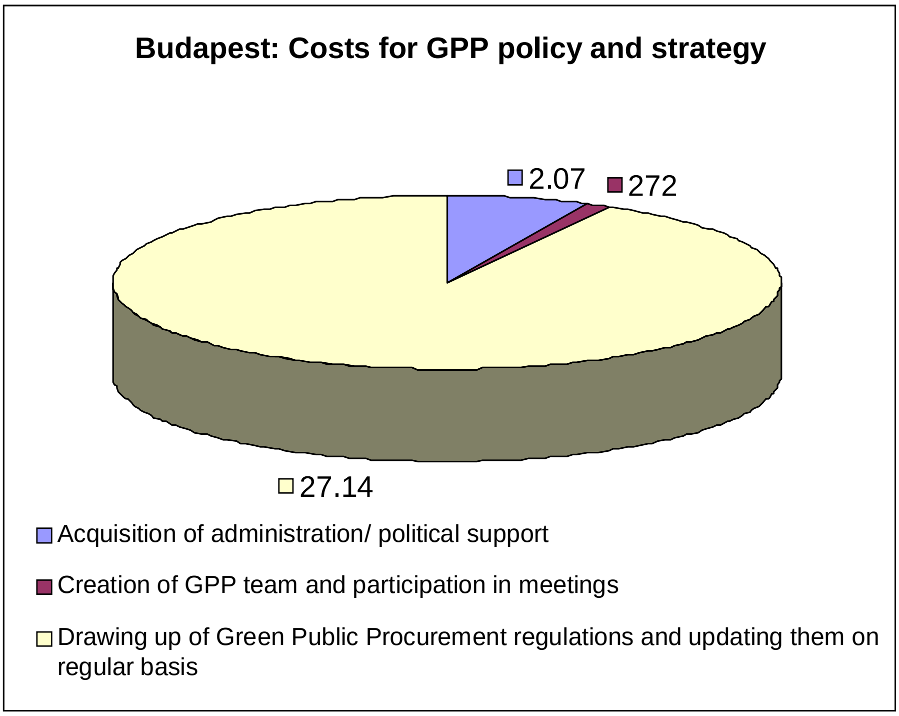


Figure 6 Budapest: Costs for GPP policy and strategy

5.5 Costs for implementation of GPP

Table 6 below shows details of the additional costs for implementing GPP, such as researching environmental criteria, writing specifications, and verifying compliance.

Table 6 Costs for implementation of GPP

Organisation	Costs for implementation (in EUR)			
	one-time	annually	per 100 employees	per 1000 inhabitants
Arpa Piemonte - Regional Agency for the Protection of the Environment		4.538	not known	1
Barcelona		87.675	682	55
Bromley		2.231	64	7
Budapest	6.489		541	4
Cork	672		42	6
Dutch Central Government		1.058.824	882	64
Feldkirch	4.202	1.681	1.594	184
Freiburg		6.824	341	32
German Federal Agency for Environment (UBA)			not known	not known
Göteborg			not known	not known
Heidelberg			not known	not known
Kopenhagen	33.150		79	27
Miskolc		2.571	466	14
Mulhouse	3.427		156	31
Örebro			not known	not known
Pori	23.294	6.353	439	126
Ravensburg		840	195	18
Stockholm			not known	not known
The Basque Environment Agency (IHOBE)		8.269	12	4
Tübingen	2.731	983	336	43
Average costs	**10.567**	**107.344**	**416**	**41**

The implementation of GPP into the procedures of the respective authorities needs an average one-time investment of 10.567 Euro. Annual costs generate an average of 107.344 Euro, ranging from 983 Euro (Tübingen) to 1.058.824 Euro (Dutch Central Government). Mean total costs per 100 employees are 416 Euro. Regarding the additional costs per 1000 inhabitants an average 41 Euro is used for the implementation of GPP.

The different costs are based on typical activities like assessment of procurement practises, adapting tenders, developing criteria, analysing environmental impacts of products, verifying bids, participation in working groups and managing audits.

The following figures show a selection of additional costs for implementation of GPP for:

- A regional environment agency - IHOBE, Spain
- A big city – Barcelona, Spain
- A small city – Ravensburg, Germany

5.5.1 IHOBE: Costs for implementation of GPP

The Basque Environment Agency (IHOBE) started some internal pilot activities on GPP in 2003. After an assessment of the current purchasing practises of products and services, IHOBE decided to 'green' the tenders for five product groups. The process was based on the existing ISO 14 001 certification system. The above mentioned additional costs are calculated for one year (total costs for implementation: 8.269 Euro, 12 Euro per 100 employees, 4 Euro per 1000 inhabitants).

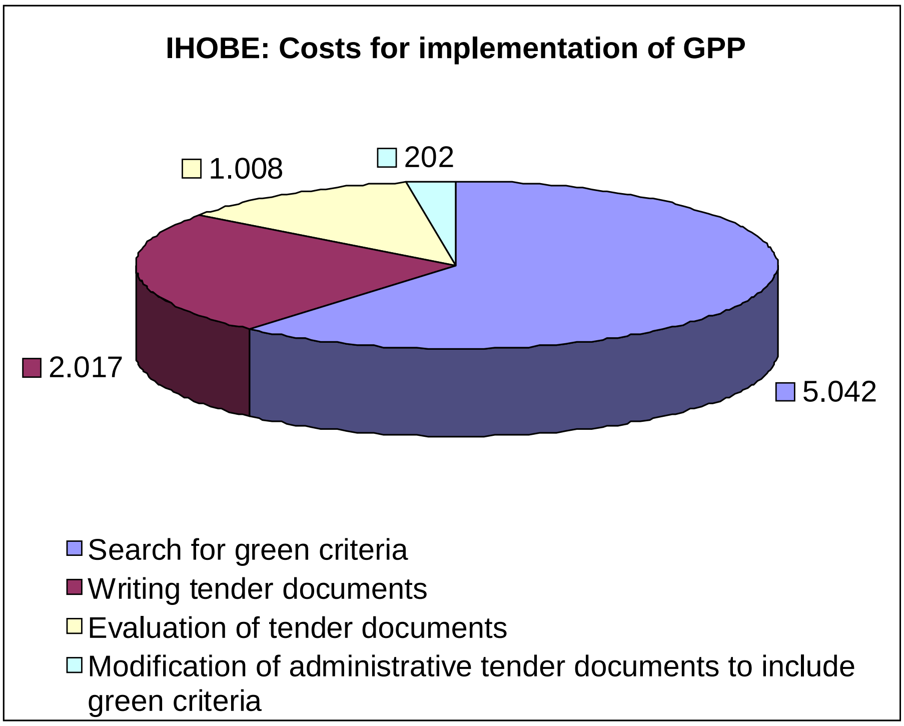


Figure 7 IHOBE: Costs for implementation of GPP

5.5.2 Barcelona: Costs for implementation of GPP

The overall costs for implementing GPP into the cities administrative bodies are 87.675 Euro (55 Euro per 1000 inhabitants). The major costs are the 'greening' of contracts and the implementation of new activities (e.g. new product and service groups to include in GPP). Barcelona mainly works with external consultants to develop and implement green criteria. These costs decreased continuously over the years. In 2005 the annual costs for external consultations reached approximately 73.000 Euro and included tasks like developing green criteria, reorganising administrative systems, developing strategic documents, editorial work and assistance in the 'greening' of events.

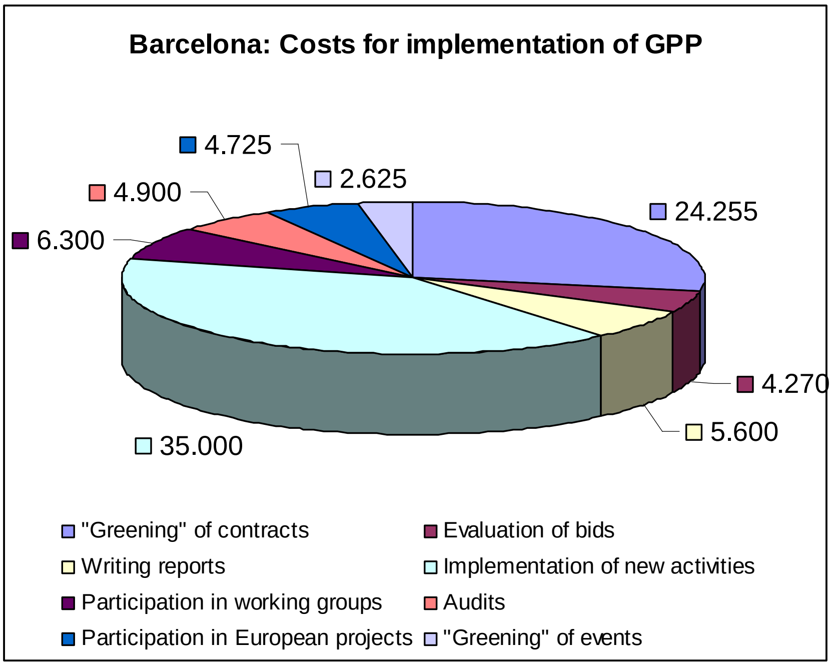


Figure 8 Barcelona: Costs for implementation of GPP

5.5.3 Ravensburg: Costs for implementation of GPP

The city of Ravensburg (48 000 inhabitants) is active in GPP for more than 5 years. The procurement office uses and adapts green criteria of the Association for the Environment Vorarlberg (Austria) and ICLEI's Procura+ Campaign. This reduces the costs significantly as shown in the following figure and Table 6 (much lower costs compared to average costs).

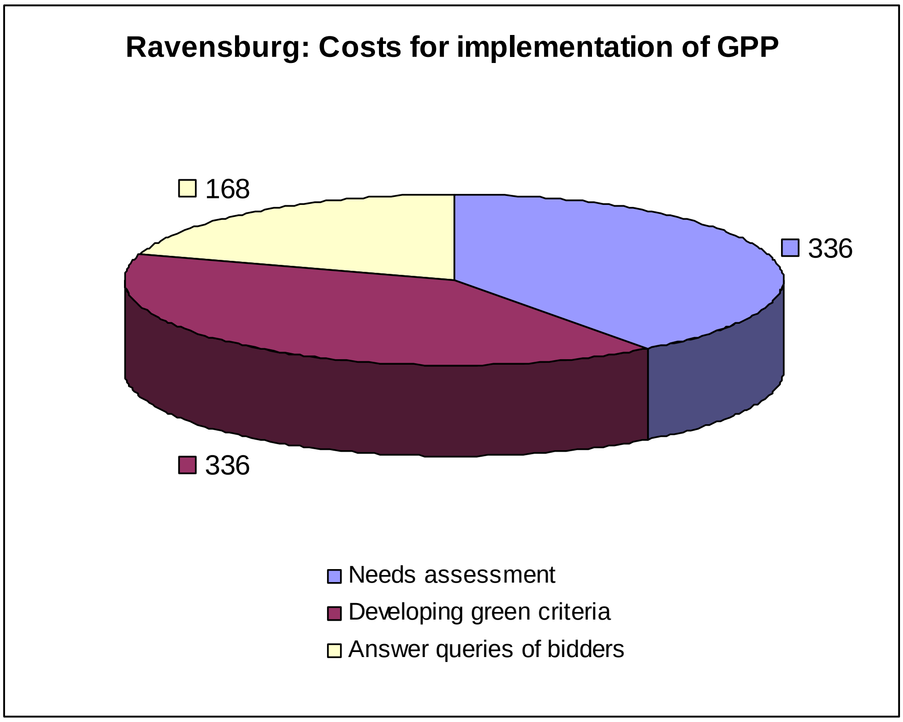


Figure 9 Ravensburg: Costs for implementation of GPP

5.6 Miscellaneous costs of GPP

Several miscellaneous costs are incurred when applying GPP in an organisation. For example, it is important to get the acceptance for GPP within the respective departments. Another task is to monitor and evaluate the proceedings regularly.

The following table indicates one-time and annual costs for executing these miscellaneous tasks in the 20 authorities taking part in the survey.

Table 7 Miscellaneous costs of GPP

Organisation	Miscellaneous costs (in EUR)			
	one-time	annually	per 100 employees	per 1000 inhabitants
Arpa Piemonte – Regional Agency for the Protection of the Environment	645		not known	<1
Barcelona	83.370		648	52
Bromley		2.231	64	7
Budapest	1.441		120	1
Cork			not known	not known
Dutch Central Government		254.118	212	15
Feldkirch		5.252	1.423	164
Freiburg			not known	not known
German Federal Agency for Environment (UBA)		370	31	<1
Göteborg			not known	not known
Heidelberg		4.794	192	34
Kopenhagen	26.836		64	22
Miskolc	2.171		393	12
Mulhouse	129		6	1
Örebro	588		5	6
Pori	5.259	18.000	345	99
Ravensburg			not known	not known
Stockholm			not known	not known
The Basque Environment Agency (IHOBE)	11.067		16	5
Tübingen	655		59	8
Average costs	**13.216**	**47.461**	**239**	**28**

The overall miscellaneous one-time costs of GPP amounted on average to 13.216 Euro. The overall annual costs to 47.461 Euro. This refers to mean 28 Euro per 1000 inhabitants.

Miscellaneous tasks and activities were conducted in the working fields:

- Materials for dissemination,
- Internal news-feeds and raising awareness among the employees,
- Raising suppliers awareness,
- Monitoring and evaluation,
- Auditing procurements.

The following figures show some detailed examples of miscellaneous costs of GPP.

5.6.1 Barcelona: Miscellaneous costs of GPP

Barcelona's miscellaneous costs mainly consist of the production and dissemination of information. In total 83.370 Euro were spent in previous years, costing 52 Euro per 1000 inhabitants.

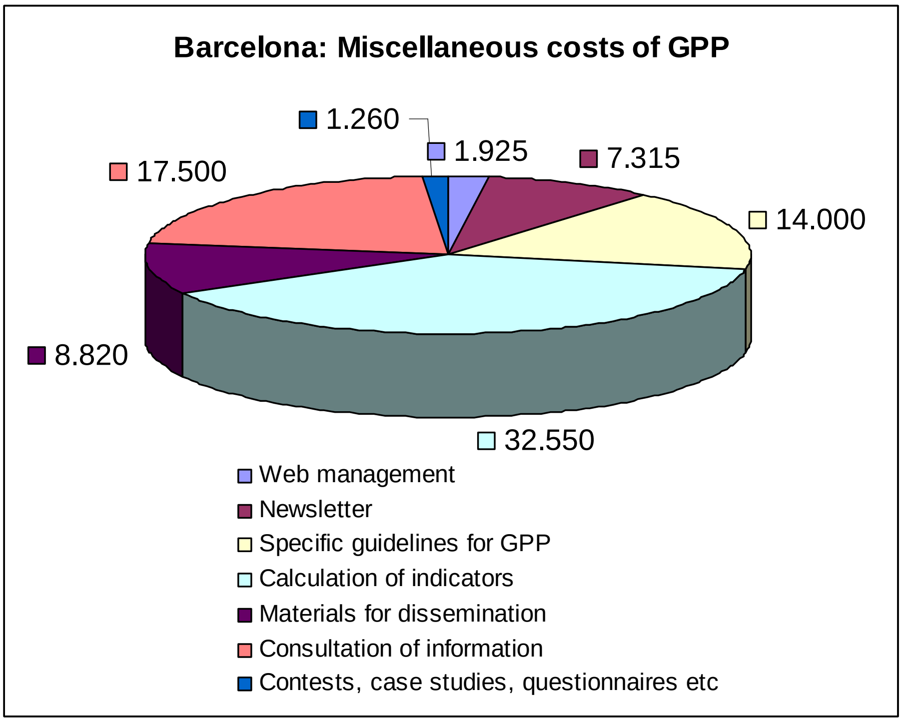


Figure 10 Barcelona: Miscellaneous costs of GPP

5.6.2 Miskolc: Miscellaneous costs of GPP

The miscellaneous costs of GPP for the city of Miskolc (Hungary) split up into the acquisition of information and the production of guidelines. Since July 2005 2.171 Euros have been spent, i.e. 12 Euros per 1000 inhabitants.

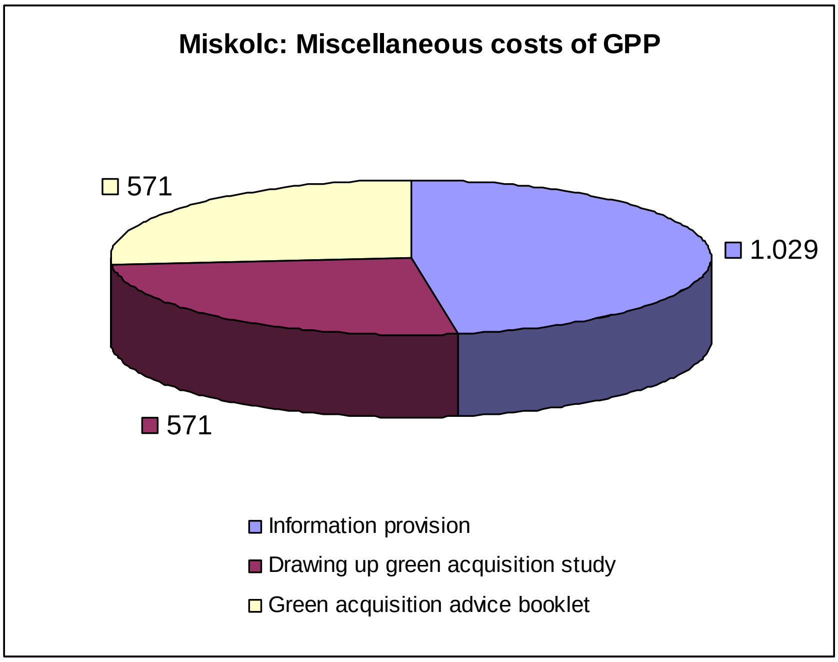


Figure 11 Miskolc: Miscellaneous costs of GPP

5.7 Costs for Training

Training and raising awareness play a key role when undertaking GPP in an organisation. For the survey the main costs were assessed for in-house training using internal and external trainers as well as the costs for staff attending GPP events like conferences, workshops or seminars. The following table summarises training costs.

Table 8 Costs for training for GPP

Organisation	Overall costs for training[4] (in EUR)	Costs for training (in EUR per 100 employees)	Costs for training (in EUR per 1000 inhabitants)
Arpa Piemonte – Regional Agency for the Protection of the Environment	251	not known	<1
Barcelona	200.990	1.563	126
Bromley	2.117	60	7
Budapest	3.918	327	2
Cork	1.258	79	11
Dutch Central Government	100.840	84	6
Feldkirch		not known	not known
Freiburg		not known	not known
German Federal Agency for Environment (UBA)		not known	not known
Göteborg		not known	not known
Heidelberg		not known	not known
Kopenhagen	5.191	12	4
Miskolc	731	132	4
Mulhouse	807	37	7
Örebro	11.705	106	119
Pori	25.882	383	110
Ravensburg	1.613	375	34
Stockholm	63.876	142	91
The Basque Environment Agency (IHOBE)	4.120	6	2
Tübingen	159.515	14.449	1.834
Average costs	**38.854**	**1.459**	**157**

Most of the costs for training and events (95%) derive from in-house staff training with people attending different training in GPP. Person hours of attending staff are included into the calculations. On average local and regional authorities spend 38.854 Euro for training and events (equivalent to an average of 157 Euro per 1000 inhabitants). Nevertheless, there are big differences in the participating authorities' expenditures, ranging from 251 Euro (Arpa Piemonte) to 200.990 Euro (Barcelona). The high costs in Barcelona result from several internal training sessions with more than 5100 participants in total.

4 Training is an on-going activity within an organisation. In this table costs are described that have a timeframe between 2 (Miskolc), 5 (Tübingen) and over 10 years (Stockholm). All costs for training in the respective timeframes are considered.

The following table gives a detailed overview of the costs (fees and person hours) of GPP events attended by the selected authorities.

Table 9 Costs of participation in GPP events

Organisation	Event	Fees	Person hours	Total costs of GPP events
The Basque Regional Environment Agency IHOBE	GPP conference in Graz	1.295	25	1.925
	Ecoprocura 2006	985	48	2.195
			Sum of costs (Euro)	**4120**
Barcelona	Ecoprocura 2006; Barcelona	0	254	8.890
	Green Public Procurement (ICLEI); Graz	500	36	1.760
	Greening Events; Vienna	0	18	630
	Procura+; Torino	100	18	730
	Eurocities Working Responsible Consumption; Brussels	150	18	780
	Mercado Responsable de Productos Forestales (España-Africa); Madrid	100	18	730
	Jornada Beneficios Compra Pública Etica; Madrid	0	14	490
	Jornadas Compra Pública Verde de la Diputación de Barcelona	0	28	980
			Sum of costs (Euro)	**14.990**
Ravensburg	Procurement workshop Mainz	0	10	336
	Environmental Academy ICLEI Freiburg	0	20	672
	Association for the Environment Vorarlberg - Seminar in Ravensburg	0	8	268
	Conference agenda-transfer/ ICLEI Berlin – Sustainable Procurement	0	10	336
			Sum of costs (Euro)	**1.613**
Arpa Piemonte – Regional Agency for the Protection of the Environment	6-7 events per year	100	8	181
			Sum of costs (Euro)	**181**
Mulhouse	Meetings of Green Public Buyers (acheteurs éco responsables d'Alsace)	0	32	807
			Sum of costs (Euro)	**807**

Bromley	Office of Government Commerce - WS	865	30	1.534
	London Centre of Excellence - WS	360	10	583
			Sum of costs (Euro)	**2.117**
Budapest	GPP conference 2006 - Graz	640	69	1.208
	GPP conference ECOPROCURA 2006 Barcelona	2.265	54	2.709
			Sum of costs (Euro)	**3.917**
Cork	Green Public Procurement Seminar Dublin	250	24	1.258
			Sum of costs (Euro)	**1.258**
Heidelberg				**not known**
Tübingen	Several seminars	250	25	796
	Several Workshops	250	30	905
			Sum of costs (Euro)	**1.701**
Örebro	Eco Procura Barcelona	640	32	1.227
	Seminar SP	90	24	530
	Seminar organic food	27	8	173
	Workshop SP	0	32	587
			Sum of costs (Euro)	**2.517**
Miskolc	Participation in the RELIEF project	520	4	543
			Sum of costs (Euro)	**543**
Kopenhagen	Dogme-Life	455	100	3.612
			Sum of costs (Euro)	**3.612**
Dutch Central Gov.				**not known**
Feldkirch				**not known**
Pori				**not known**
Göteborg				**not known**
German Federal Agency for Environment UBA				**not known**
Stockholm	GPP conference Graz, Austria	2.200	64	4.082
	Conference in Barcelona	2.500	144	6.735
			Sum of costs (Euro)	**10.817**
Freiburg				**not known**
Average costs for GPP events (EUR)				**2.038**

Events play a major role in keeping up to date with GPP. The average costs are 2.038 Euro per authority for the 13 local and regional authorities involved in training and events of GPP. The costs refer to the last 1-2 years.

5.8 Product-specific costs and benefits

This section refers to product-specific costs and benefits that authorities achieved with their GPP strategies. Some examples give an indication of the relation of costs of green and non green procurement. The calculations include life-cycle-costing aspects. A more detailed analysis of product related costs and benefits, based on a market research, was conducted in Part 1 of this study.

Table 10 Product-specific costs and benefits for key product groups

Organisation	Product(1)	Costs (in EUR, incl. VAT, incl. LCC, per year), comparison of bids Non green version	Costs (in EUR, incl. VAT, incl. LCC, per year), comparison of bids Green version	Applied green criteria	Absolute difference[5] (in EUR)	Relative difference
Arpa Piemonte – Regional Agency for the Protection of the Environment	Paper A4	20.851	20.477	The EU flower eco-label, min. 75% recycled, TCF	-374	-2%
	Envelopes(2)	11.040	4.680	min. 75% recycled, TCF	-6.360	-58%
	PC**	2.254	1.242	Energy Star	-1.012	-45%
	TFT-displays(2)	540	744	Energy Star, TCO '03	204	38%
Barcelona	Café(3)	0,35	0,35	EU bio label	0	0%
	Processed wood	117.000	195.000	FSC label	78.000	67%
Bromley	Office supplies (several products)	240.000	231.000	refillable, materials etc	-9.000	-4%
Freiburg	All-in-one copier(8)	243.950	291.100	Blue Angel, Energy Star 4.0, RohS-Directive	47.150	19%
	Paper A4(2)	205.980	171.650	Blue Angel	-34.330	-17%
	PC(2)	64.545	65.433	Energy Star 4.0, Blue Angel	888	1%
	TFT-displays(2)	9.020	7.177	Energy Star 4.0	-1.843	-20%
Heidelberg	Paper A4(2)	100.000	88.000	Blue Angel	-12.000	-12%
	Toilet paper(2)	20.250	15.000	Blue Angel	-5.250	-26%
Miskolc	Paper A3	9.335	10.865	Recycling	1.530	16%
	Envelopes	1.408	1.279	Recycling	-129	-9%
	Toilet paper	1.455	1.300	Recycling	-155	-11%
	Cleaning agent (Domestos)	1.755	1.620	Green ingredients	-135	-8%
	Window cleaning agent	303	283	Green ingredients	-20	-7%

5 Negative values mean that the green version is cheaper than the non green version. Positive values the opposite.

Örebro	Paper A4[2]	283.500	220.000	Svan eco label	-63.500	-22%
	Coffee[6]	3,5	4,6	National eco label	1,1	31%
	Fried diced meat[6]	1,7	2,2	National eco label	0,5	29%
	Eggs[6]	1,6	2,3	National eco label	0,7	44%
	Milk[6]	0,6	0,7	National eco label	0,1	17%
Ravensburg	Paper A4[4]	5,1	3,64		-1,46	-29%
	Pencils[5]	0,57	0,46	Without paint	-0,11	-19%
	Note pads[6]	0,41	0,24		-0,17	-41%
	Markers	10,8	6,78		-4,02	-37%
	Steno note pad	0,41	0,24	Recycling	-0,17	-41%
The Basque Environment Agency (IHOBE)	Paper A4 (not recycled)	892	545	Nordic Svan label, TCF	-347	-39%
	PC[2]	2.550	2.365	No clon, Energy Star, No Pb, Cd, Hg, Cr (VI), PBB, PBDE, packaging	-185	-7%
	TFT-displays[2]	653	488	TCO '99, Energy Star, packaging, waste disposal management	-165	-25%
Tübingen	Outsourced cleaning of buildings	1.100.000	1.100.000	requirements include a list of to use green products	0	0%
	Toilet paper	5.031	2.911	100% recycled without bleaching	-2.120	-42%
	Sortiment of cleaning products[7]	21.661	9.626		-12.035	-56%
Sum		**2.463.998**	**2.442.807**		**-21.192**	**-1%**

(1) = The comparison is based on the same amount purchased for both green and non green products.
(2) = Non green prices are extracted from part 1
(3) = Price per one cup, vending machine (128 without green, 102 with green)
(4) = Price per 1000 sheets
(5) = Price per 12 units
(6) = Price per unit
(7) = The high price difference refers mainly to the use of high concentrated product types
(8) = LCC not included

In sum GPP achieves savings of about 1% compared to non green purchasing, but it has to be stressed that most savings apply to IT computer devices and office materials as well as to cleaning products. Green products are more expensive when purchasing for example food or wood products.

6 Discussion of the Methodology

The information asked for was hard to receive, because of the difficulty for the organisation to monitor and measure costs spent for setting up and implementing GPP in the different authorities across Europe. In many cases the respondent had to estimate the number of hours spent on an activity e.g. developing green criteria or getting political support within the organisation.

The use of person hour costs indicates clear costs, but in the majority of cases these had to be estimated. The analysis also had to use a simplified salary structure, asking only for the estimated average costs of people in charge for GPP.

A strong asset for handling the survey was the already established contacts to different local and regional authorities. The direct phone calls and visits also brought good results. Nevertheless, the findings are just an indication and cannot be used as in-depth statistical data.

7 Conclusions

The specific administrative costs for setting-up and implementing GPP in a local authority in Europe are higher than for standard procurement. The biggest cost driver is the continuos training, raising awareness and supporting procurers in the public authority on a continuos basis to ensure they are purchasing green products and services. Other additional costs are administrative costs for setting up the policy and strategy but these are low compared to the overall procurement budgets.

The additional costs for those organisations that have developed advanced GPP procurement systems over a medium period of time (5-10 years) time are negligible. This is due to the savings in specific product categories such as office machinery, see for example the results for Freiburg, Barcelona and Heidelberg.

The study shows that the individual purchasing authorities setting up and implementing GPP spend on average 223 Euro per 1 000 inhabitants (this takes into account both initial one-time costs and average annual costs).

Furthermore, the results show that after the initial period of starting and developing a GPP strategy and after the administrative tasks have been integrated into the procurement process, there is evidence that GPP does generate monetary savings. On the administrative side once a GPP system is set up, there is little need to further invest in adapting the standard procurement process – “it becomes integrated and normal” (Rolf Huber, Heidelberg). This means, that the additional administrative costs decrease with time. Thus potential savings through lower (life cycle) costs for green products and services might outweigh the additional administrative costs.

Furthermore, these additional costs have to be related to the environmental benefits over a longer period of time which could have been shown by many other studies and reports. Two-thirds of the authorities of this study have incorporated GPP into the organisation over a period of time, achieving good political outcomes and also visible results to promote. The value of this is of course hard to define.

Additional costs always depend on the local authority's policy goals and how comprehensive GPP is incorporated into the organisation. Depending on the local circumstances it is not always necessary to undertake all steps[6] for implementation of GPP.

In many local authorities GPP is an inherent part of the daily activities. Leading cities like Barcelona, Stockholm or Heidelberg purchase a great number of products and services using green criteria. GPP helps them to achieve their sustainable policy goals. Many authorities invested in energy efficient office equipment and directly contributed to reduce the CO_2 emissions. Other individual purchasing authorities have also developed comprehensive environmental management systems (e.g. Barcelona). Now, this system builds the basis to expand GPP activities to a series of product and service groups, fostering future cost savings and at the same time triggering the market supply of eco-solutions in technology and R&D (see part 3 of the study at hand). Therefore, the low additional administrative costs are to be seen alongside annual benefits over a long period of time.

8 Recommendations

One of the future possibilities that needs to be considered is to include a simple and easy-to-use European-wide monitoring system, including benchmarking possibilities and tools to measure the outcomes, e.g. by cost-benefit-analysis and impact analysis tools. Local authorities often – like in this survey too – lack the availability of statistical data on their activities.

Environmental management systems (EMS) like EMAS give a good basis to develop straightforward and practical GPP implementation and monitoring tools. It would therefore be beneficial to promote and highlight the links between EMS and GPP and how they support each other's goals.

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[6] A comprehensive approach mostly integrates a baseline assessment, a set up of an implementation strategy including piloting activities, until incorporating the GPP policy and strategy. Then GPP works out on a broad scale and is flanked by effective monitoring and evaluation systems.

More information on implementation guidelines can be obtained from the EC website (http://ec.europa.eu/environment/gpp/index_en.htm) and on the ICLEI Procura+ website (www.procuraplus.org).

The ICLEI scorecard used in the Procura+ Milestone approach is one tool to consider or further adapt. The tool currently measures the share / amount of green products and services procured by the organisations.

A GPP toolkit currently produced and available in the beginning of 2008 will give clear advice on how to overcome key barriers to foster cost-effective implementation of GPP. The tool will contain information and good practice to show that green products do not necessarily cost more, particularly when incorporating Life Cycle Costs (LCC). Therefore, this guidance will be complementary to the results of this study.

Being part of a network to support, share and show costs and benefits of GPP is a valuable asset that many local authorities use. On the one hand GPP strongly depends on the political support and on the other hand on the individual commitment from the different departments of the respective organisation. Both requirements do not necessary require high investments. For the daily work of the purchasing authorities GPP should be practical and easy-to-use. For securing political backing, dissemination work should always highlight the benefits to be achieved for the implementation of sustainability policies. Besides financial savings GPP drives innovation, achieves global and especially local environment and health goals, improves the public image and increases the legitimacy of political representatives.

9 Sources

Flick 2003	Flick, Uwe (2003): Triangulation in der qualitativen Forschung. In: Flick, Uwe; von Kardorff, Ernst & Ines Steinke (Hg.): Qualitative Forschung. Ein Handbuch. 2. Aufl. Reinbek bei Hamburg, p. 309-318
ICLEI 2007a	ICLEI – Local Governments for Sustainability (2007): Qualitative and quantitative survey on additional administrative, product- and service-specific costs of Green Public Procurement (GPP). Freiburg.
ICLEI 2007b	ICLEI – Local Governments for Sustainability (2007): The Procura+ Manual (2nd edition). A Guide to Cost-Effective Sustainable Public Procurement. Freiburg.

10 Annex

Analysing the costs for setting up and undertaking Green Public Procurement (GPP)

Questionnaire 2007

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecolog

I.C.L.E.I
Local Governments for Sustainability

This questionnaire aims to calculate the ADDITIONAL costs, if any, for setting up and undertaking green public procurement (GPP) within purchasing authorities. The questionnaire focuses on the extra administrative costs as well as additional costs of buying 'green' products and services.
If you have any questions about completing the questionnaire contact**:**

Philipp Tepper, Project Officer, ICLEI
E-Mail: philipp.tepper@iclei-europe.org
Telefon: +49-761/368 92-47

Please complete and send the questionnaire **no later than Friday 20 April 2007** to Philipp.

Confidentiality

The data published will only refer to the organisation and not the person.

Definition of green public procurement (GPP)

For the purpose of this questionnaire we define GPP as the purchasing process for goods, services, works and utilities by public and semi-public bodies where they choose outcomes and solutions that have a reduced impact on the environment throughout their whole life-cycle, as compared to comparable products/solutions.

A. About your organisation

Name of respondent	
Organisation	
Position (job title)	
Department	
Telephone	
Email	

European Commission,
Directorate General
for Environment

A1. What is the total number of staff (including full-time and part-time) your whole organisation employs?

A2. What is the average gross salary (i.e. including taxes) per month for the main person working on GPP in your organisation? *The information is necessary to calculate the costs by person hours. It will not be published nor connected to the respondent's name.*

Monthly gross salary
(please specify the currency):

Salary	Currency

A3. Is your organisation's procurement: (Please tick.)

Centralised (e.g. the majority of purchasing is the responsibility of a single unit or designated units purchase particular products or services) ☐

Decentralised (i.e. responsibility for procurement is shared between departments) ☐

Outsourced (i.e. a private company carries out procurement on behalf of your National/Federal government) ☐

Mixed (Please specify): ☐

A4. Please describe how the process of 'greening' tenders is organised in your organisation.

B. Administrative costs for establishing a GPP policy

B1. Please list the tasks your organisation has undertaken to establish a GPP policy, the estimated costs (expressed in person/hours per task) and the number of times the task is undertaken. **Please note ONLY list tasks related to GPP**.

Example: raising management/political support setting up and meetings of a GPP working group, preparing a policy, consulting etc.

Task	Person hours spent on the task	Number of times task has been undertaken

B2. Please list the tasks your organisation has undertaken to establish a GPP strategy, the estimated costs (expressed in person/hours per task) and the number of times the task is undertaken. **Please note ONLY list tasks related to GPP.**

Example: researching, writing, consulting, printing the strategy.

Task	Person hours spent on the task	Number of times task has been undertaken

C. Extra administrative costs, if any, of implementing GPP compared with standard procurement.

C1. Please estimate the amount of person hours your organisation spends (from all departments) on implementing GPP. **Please note ONLY list tasks related to GPP.**

Example: searching for environmental criteria, writing specifications and verifying compliance with green criteria.

Task	Person hours spent on task	Number of times task is undertaken

C2. Please estimate the amount of person hours your organisation spends (from all departments) on other aspects of GPP. Please note ONLY list tasks related to GPP.

Example: raising awareness amongst employees and suppliers of the organisation's commitment, monitoring and auditing compliance with the GPP strategy and policy

Tasks	Person hours spent on implementing GPP	Number of times task is undertaken

GPP Training and events

Please note only include events which were attended because it was on GPP not on general public procurement

C3. Please indicate the person hours your organisation has spent on GPP training for staff in the past 5 year (2001 – 2006)? (E.g. to write specifications for green goods and services, carry out green audits). Please include hours for all staff attending.

Trainer(s) if internal	Staff attending training

C4. If you have used an external trainer(s), please give the costs for the past 5 years?

Total costs of using an external trainer(s) in 5 years		

C5. Please indicate the costs for staff attending a GPP event (e.g. workshop, conference, seminar), including working time, travel and accommodation for 2006?

Name of event	Attendance fee, travel and accommodation costs	Total person hours spent travelling and attending the event

D. Additional costs, if any, of buying green products or services

D1. Calculating the additional costs, if any, of buying green products and services can be difficult to calculate therefore two options are given below. Please use the method where you have figures available for A or B. Please also include any life cycle cost calculations where available.

A. For recent tenders list the price for both non green and green offers by companies bidding to supply a product / service.

	NON green offer			Green offer			
Product / Service	**Total units**	**Price per unit (€)**	**Life cycle costs where known (€ and unit)**	**Total units**	**Price per unit (€)**	**Life cycle costs where known (€ and unit)**	**Green criteria used**

B. In the table below list the costs of purchasing a product / service for a recent green tender compared with a previous non green tender for the same product / service?

	Most recent NON green tender			Most recent green tender			
Product / Service	**Total units**	**Price per unit (€)**	**Life cycle costs where information is available (€ and unit)**	**Total units**	**Price per unit (€)**	**Life cycle costs where information is available (€ and unit)**	**Most important green criteria used**

D2. What is the annual procurement budget for 2005 (or the most recent year data is available) for your organisation and if possible please estimate the % that is spent on purchasing green products and services?

Year	Annual procurement budget		% spent on purchasing green products and services

Please use the space below for any additional comments or elements you feel we may have missed regarding costs for setting up and undertaking GPP in your organisation

Please return the completed survey to Philipp Tepper, e-mail: philipp.tepper@iclei-europe.org **no later than Friday 20 April 2007**.

Thank you for taking the time to complete the questionnaire. The information will be used to help guide the further work of the European Commission Directorate General Environment on GPP.

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

I.C.L.E.I
Local Governments for Sustainability

Costs and Benefits of Green Public Procurement in Europe

Service contract number: DG ENV.G.2/SER/2006/0097r

Part 3: The Potential of GPP for the Spreading of New/Recently Developed Environmental Technologies – Case Studies

Freiburg, 26 July 2007

ICLEI – Local Governments for Sustainability

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Abbreviations

ADEME	Agence de l'Environnement et de la Maîtrise de l'Energie
CRT	Continuously Regenerating Technology
CNG	Compressed Natural Gas
CRT	Continuously Regenerating Technology
EDF	Electricité de France
EMS	Environmental Management System
Fahma	Fahrzeugmanagement Region Frankfurt RheinMain GmbH
GPP	Green Public Procurement
HLB	HLB Bahnen GmbH (railway company)
I +D	Investigation and Development
LCA	Life Cycle Analysis
LcA	Lifecycle Assessment
LPG	Liquefied Petroleum Gas
MDT®	Micro Downlight Technology®
MTU	Engine producer MTU
MUPI	Mobilier Urbain pour Publicité et Information
OPI	Optical Point of Information
PIU	Urban Information Panel
PM	Particulate matters
Ppm	parts per million
R&D	Research and Development
RMV	Rhein-Main Transport Network
SPP	Sustainable Public Procurement
GPP	Green Public Procurement
RES-E	Electricity from Renewable Energy Sources
SEPI	Société Européenne de Promotion et d'Investissements
SEV	Société d'Electricité Vendeville
SMDR	Société matériaux de démolition et de recyclage

1 Introduction

The objective of this task was to build a body of qualitative and quantitative evidence to show how tender documents have been established in such a way as to trigger the offer of products based on a new or recently developed eco-technology. This report describes in detail at least 5 procurement procedures including the methodology and different theoretical and practical steps undertaken by a procuring authority.

The case studies

1) Rhein-Main Transport Network, GERMANY – 'particle filters' for train
2) Barcelona, SPAIN – bus shelters
3) Zurich, SWITZERLAND – floorlamps
4) Lille, FRANCE – lighting system
5) Göteborg, SWEDEN – buses

There is strong evidence that green public procurement (GPP) can have an impact on the market, and in particular on the design and production of new 'eco-technologies' or better 'eco-solutions'. However, in light of the difficulty in identifying suitable good practice examples, it has to be pointed out that a single public authority may be rarely in the position to claim that its tender was the sole cause for triggering the offer on the market.

2 Selection of good practice examples

Following an extensive period of literature review, internet research and contacting key organisations, several potential good practice cases were identified across Europe that eventually led to the selection of five best practice examples. With the exception of fahma, a 100% associated company of the regional Rhein-Main Transport Network (see 'Taunusbahn' case), all contracting parties were relatively major cities with experience with GPP. Key selection criteria included the existence of a green tender that had a market impact on new or recently developed 'eco-technology'. Furthermore, the examples were chosen on the basis of the following criteria:

- Legality of the tender that was used;
- Relevance to the EU;
- Likely ability to source data and information, and the consequent scope and quality of evidence that can be gathered;
- Extent of environmental and economic impacts; and
- Replicability in other purchasing organisations.

In order to identify five good practice examples more than 80 suitable authorities, relevant associations, private companies and other experts have been directly contacted by ICLEI.

3 Methodology

3.1 Literature review

The literature was undertaken to analyse the available evidence for tender documents to trigger the offer of products based on a new or recently developed eco-technology.

The following documents were identified:

- OECD review of the environmental performance of public procurement (2003).
- The Green Alliance study on sustainable procurement for DEFRA (2005). The Green Alliance report cites good examples of initiatives in Denmark as well as the UK.
- The results of the Downstream Impacts of Sustainable Public Procurement project undertaken by ERM with ICLEI for DEFRA (2006).
- Cost Benefit Analysis of Sustainable Public Procurement, a research report completed for the Department for Environment, Food and Rural Affairs by SQW Ltd.
- Driving innovation through public procurement, February 2007, Policy Briefing, Nesta
- Guide On Dealing with Innovative Solutions in Public Procurement - 10 elements of good practice, PRO INNO Europe.

To assist in the search for examples a message was sent to ICLEI's Buy-It-Green Network (BIG-Net), which contains over 200 sustainable procurement professionals and ICLEI's Cities for Climate Protection (CCP) mailing list which contains over 225 participants.

3.2 Selecting examples

Based on the research, a list and short summary of examples gathered was sent to the EC to decide with the project team which 5 examples would be most suitable to carry out further research. The selection of examples chosen was based on:

- Legality of the tender that was used;
- Relevance to the EU;
- Likely ability to source data and information, and the consequent scope and quality of evidence that can be gathered;
- Extent of environmental and economic impacts; and
- Replicability in other purchasing organisations.

Following the selection procedure, research was undertaken to identify how, why and what was undertaken to trigger the offer of products based on a new or recently developed eco-technology. Parts of the tender were translated into English and analysed to extract the important information.

3.3 Design of the questionnaire

The main instrument for the research was a questionnaire for both the public procurers and the suppliers. They were asked to provide information on:

Public authority:

- Background information
  - Total procurement budget / green procurement budget
  - Further experience with GPP
- Information on the product
  - Quantity of products purchased
  - Availability on the market
  - Comparative figures between ‘standard’ and ‘green’ product (incl. LCC)
- Drivers responsible for procurement
  - Main reasons, including political support, policy, specific targets and / or implementation strategy
- Tendering process
  - Developing the green procurement criteria (internal and external involvement)
  - The green procurement criteria (from selection to specification; verification)
  - Assessing the tender (number of bidders; timetable of tendering process)
  - Contract management
- Potential of triggering the market
  - Impact on the market; supply chain;
  - Cost analysis
- Barriers and difficulties
- Lessons learned

Private supplier:

- Background information
  - Sales percentage
  - GPP experience with GPP
- Information on the product
  - Cost analysis ‘standard’ versus ‘green’ (LCC)

  - Sub-suppliers involved
  - Availability on the market
- Drivers responsible for procurement
  - Main reasons, including policy, specific targets
- Tendering process
  - Compliance with criteria
- Potential of triggering the market
  - Impact on market; market supply, other sectors
  - Duration and sustainability of changes
  - Impact throughout the supply chain
  - Impact on other sectors (sub-suppliers)
  - Impact
- Eco-Technology / Eco-solution used
- Barriers and difficulties

Additionally, the respondents were asked to provide tender and contract documents as well as other relevant information on the product concerned. The questionnaire has been designed professionally using a word formulary that could be filled in electronically. Four language versions of the questionnaire (English, German, French, and Catalan) were available.

3.4 Follow up interviews

Additional to the questionnaire methodology proposed to the EC, ICLEI undertook follow up interviews with both the purchaser and suppliers. The reason for this was that, due to the lengthy selection process to identify suitable good practice examples, short timescales were given to the respondents to reply, and most importantly to obtain more detailed information.

All interviews were undertaken in the native language (Swedish, German, French, and Catalan) to ensure that accurate information was obtained.

A strong asset for handling the survey was the already established contacts to different local and regional authorities, in particular with the cities of Zurich, Barcelona and Lille that are all part of ICLEI's Procura^{+} Campaign on sustainable procurement in Europe[1]. Despite the limited timeframe, the respondents were keen to get involved in the project.

[1] See online at: www.procuraplus.org

The dates the interviews took place were:

	Purchaser interview	Supplier interview
Case study 1: Taunusbahn - Germany	21 May 2007 Joachim Michels & Gerolf Wogatzki	4 June 2007 Wolfgang Späth & Björn Vitt
Case study 2: Barcelona, Spain	31 May 2007 Adolf Creus & Helena Barracó	31 May 2007 Luís Sánchez Olavarría
Case study 3: Zurich, Switzerland	25 May 2007 Stefan Hösli	25 May 2007 Markus Binda & Markus Simon
Case study 4: Lille, France	30 May 2007 Richard Jullian, Danielle Poliautre, Eric Decaillon	30 May 2007 Christophe Montelimard
Case study 5: Göteborg, Sweden	10 January 2006 and 24 May 2007 Lennart Löfberg 12 January 2006 Pierre Modini	20 January 2006 Peter Danielsson

3.5 The Case studies

The following 5 case studies describe in detail the methodology and different steps undertaken by the procuring authority where tender documents had an impact on the market or developed an eco-solution. The case studies describe the process from the start of the procedure such as the initial policy and idea right through to the development of the criteria and the call for tender as well as the results.

The case studies present the following:

- Background information on the organisation
- Information on the product
- What was the new Eco-Technology
- The drivers responsible for procurement
- The tendering process
- Development of the green procurement criteria
- The green procurement criteria
- Contract management
- Results of the tendering process and the key factors that triggered the market for the Eco-Technology including impacts on the supply chain, impacts on market supply and impacts on the wider market demand
- Barriers and difficulties
- Lessons learned
- Outlook
- Contacts

4 Case study 1: Sustainable Procurement of Public Railcars with the Eco-Technology 'particle filters' for the Taunusbahn, GERMANY

Figure 1 Photo Alstom/ B. Rosenthal

Prepared by ICLEI – Local Governments for Sustainability

With support from:

Joachim Michels, Gerolf Wogatzki – fahma Fahrzeugmanagement GmbH, Sabine Groß, Wolfgang Späth, Björn Vitt, Rdiger Wendt – Alstom LHB GmbH, Mr. Käsberger – Hug Engineering AG

4.1 Background information

The Rhein-Main Transport Network (RMV) covers 14 000 km², serving a population of over 5 Million people. The Taunusbahn is a line that is part of the RMV, operated by the HLB Bahnen GmbH (HLB) railway company supplying regional transport links from Frankfurt main station to cities and communities in the higher Taunus Mountains such as Königstein, Bad Soden and Bad Homburg.

In the last 20 years the passengers per working day on these lines increased by 625%. In order to meet the needs of the passengers, the capacities and the quality of existing services were improved. Therefore, the ‘Fahrzeugmanagement Region Frankfurt RheinMain GmbH (fahma)’, a 100% associated company with limited liability of the RMV, purchased new railcars and provided them to the HLB.

In 2004 fahma published a European tender for the production and delivery of ten two-part railcars.[2] All railcars have been in operation on the lines since December 2006.

fahma is responsible for the finance, the procurement and the hosting of vehicles for the regional rail transport and the supply of these to railway companies. Since 2003 fahma purchased and tendered for vehicles and services for the ‘Odenwaldbahn’ and ‘Taunusbahn’ with an overall budget of 112 Million Euro. Over 30% of the procurement activities have gone beyond the legal minimum requirements for environmental criteria, especially focussing on reducing emissions by applying EU stage IIIa and EU stage IIIb emission standards earlier than required.[3]

The winning bidder for the ten railcars was Alstom LHB GmbH (Alstom)[4], offering vehicles of the type CORADIA LINT 41 / H that are equipped with two powerpack©® engines provided by the company MTU of each 335 kW and particle filters provided by the company Hug Engineering.

2 The tender is published under the identification number 2004/S 240-206797 – Public announcement for the award of contract.

3 Rail Traction Engine standards adopted by the European Parliament on 21 April 2004 (Directive 2004/26/EC) for engines from 130 kW to 560 kW used for the propulsion of railroad locomotives and railcars need to fulfil the following limits: from 1 January 2007 stage IIIa (CO 3,5 g/kWh, HC -, HC+NO_x 4,0 g/kWh, NO_x -, PM 0,2 g/kWh), from 1 January 2012 stage IIIb (CO 3,5, HC -, HC+NO_x 4,0 g/kWh, NO_x -, PM 0,025 g/kWh).

4 Alstom LHB GmbH and its German site Alstom LHB in Salzgitter offers railway technique all over the world, focussing on high environmental standards and on the same time pushing innovation to get the first mover advantage regarding environmentally friendly products.

4.2 The new Eco-Technology

In 2003 MTU started an EU-funded pilot project to assess the possibilities of including particle filter systems into the engine system. In the CORADIA LINT series, a catalytic coated filter is used consisting of two functional filter units in parallel connection. It is based on the wall flow principle that uses a holed and coated wall through which the exhaust emissions flow, reaching a filtration efficiency of 95% of the particulate matters. The passive regeneration is achieved by the catalytic elements (coated wall).

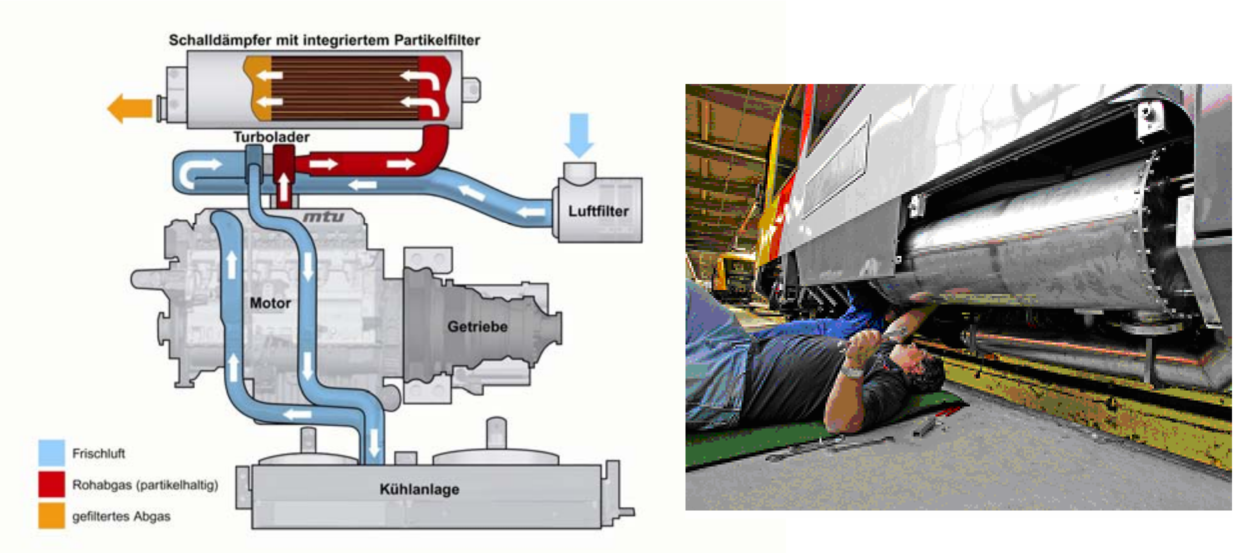

Figure 2 Technical scheme of the engine + particle filter (left); the mounted particle filter (right) (Graphic/Photo: MTU/Alstom/B. Rosenthal)

The availability of the whole product (railcar) has a delivery timeframe of two years. The additional costs for the environmental friendly version are for each filter 45 000 Euro, resulting in approximately 3% additional costs of the total product costs of approximately 2,7 million Euro. With current testing, fuel consumption is the same as those railcars that do not use a particle filter. There are negligible costs for the maintenance of the filter system.

4.3 The drivers responsible for this new Eco-Technology

In 2005 a national discussion about the high emission levels of particulate matters[5] in the air of cities like Munich and Frankfurt/ Main influenced local politicians to take measures in reducing the particulate matters in urban transport.

The discussion on particulate matters in the region Higher Taunus also influenced the tendering of railcars for the 'Taunusbahn'. The Head of the District Authority of Higher

[5] Particulate matters are defined as "A small discrete mass of solid or liquid matter that remains individually dispersed in gas or liquid emissions (usually considered to be an atmospheric pollutant)" (Source: www.wordwebonline.com)

Taunus gave clear political backing of the tendering process and supports the introduction of particle filters in railcars. Additionally, the RMV climate protection strategy builds the base for reducing the emission levels in public transport. It is an objective of the RMV to use vehicles that meet the standards that will come into effective in future years.

4.4 The tendering process

The tender was issued on a European level and the procurement used a negotiated procedure. That means companies showing interest in the tender are invited to discuss the options and possibilities before a modified binding tender is issued. In these consultation sessions companies showing interest in the tender had the possibility to ask questions and communicate remarks to the tender documents and technical specifications. This method proved to be very valuable because the purchaser and supplier were able to discuss technical requirements such as how to achieve EU stage IIIa/ IIIb emission standards. fahma asked for a concept note for a particle filter as part of the tendering procedure with the aim to find a suitable solution to reduce costs for Research and Development and ensure the railcars could be delivered in a two-year timeframe.

4.4.1 Developing the green procurement criteria

The initial development of the green criteria for the tender took place in co-operation among fahma, the RMV and the HLB. They used internal technical knowledge and special expert knowledge on green criteria provided by 'GreenDeltaTC' consultancy as well as criteria relating to the life cycle cost calculation (LCC) developed by 'Die Ingenieurwerkstatt'.

Following the call for tender and during the consultation phase Alstom stated that this approach was the correct approach in that it was focussing on strong environmental impacts during the usage phase of the product. Alstom were also able to use their experience gained with fulfilling the obligations of public tenders in Sweden which have even more stringent requirements and focus more on the whole lifecycle including research and development, production, use and disposal/recycling.

The GreenDeltaTC study delivered a set of green criteria addressing noise reduction, emission levels, fuel consumption, avoiding harmful substances, recycling manual, and life cycle assessment (LCA) among others. The most relevant criteria (emission levels, fuel consumption and avoiding harmful substances) were included into the technical specifications (see 5.3).

4.4.2 The green procurement criteria

The first tender document, which included technical specifications, contained the following minimum green requirements:

Table 1 Minimum green requirements

Noise levels referring to ISO 3095 (L_{Amax} = 90 dBA)	Lowest fuel consumption as possible
Avoidance of specific toxic materials (e.g. arsenic, chrome)	Emission standards based on the Directive 97/68/EG Stage IIIa

These minimum requirements meet current legislation. The selection process was using a quality management system with a scoring matrix, supported by a bonus/malus-system. The selection criteria were as follows:

Table 2 Selection criteria

Price of the offer (60%)	Maintenance – exchange time (10%)
Fuel consumption (10%)	Delivery time (8%)
Maintenance – activities (7%)	Downtime during warranty (5%)

After the consultation round additional green criteria were included into the technical specification parts of the tender documents, focussing on engines that can use low sulphur content fuel (<0,005%) and on the requirement to equip the engines with particle filters or developing an obligatory retrofitting concept. The requirement to equip the engines with particle filters was a key impetus for the further development of this new Eco-Technology and to assist with bringing it onto the market (see section 4.5). Contract performance clauses included tests and environmental documentation related to the above-mentioned criteria. Tests, especially about the performance of the particle filter, are scheduled for 2007.

The green criteria did not refer to any eco-labels, but used current EN and ISO standards. However, self-declarations[6] of the supply and sub-suppliers were used to assess whether the product complies with the requirements set in the tender documents.

4.4.3 Assessing the tender

The tender was issued on 2 December 2004 including both the tender document and the technical specifications. Companies interested in participation had time until 16 February 2005 to express their interest and indicative prices. 5 European-based companies and 2 Asian-based companies presented the required documents. Four bidders were pre-selected using defined selection criteria (see below). The consultation process took place from 18

[6] Technical documents provided by the supplier e.g. showing the fuel consumption of the railcar or that materials used to build the railcar do not contain certain chemicals

March 2005 until 4 April 2005, leading to the adaptation of the tender documents and the technical specifications that were mailed out on 22 April 2005. During this time the inclusion of a particle filter was discussed and included as optional criteria. After this point, the bidders had one month to complete their offer. After receiving two offers fahma awarded the contract to Alstom on 26 June 2005.

4.5 Results of the tendering process and key factors that triggered the market for Eco-Technology

The particle filter using the wall flow system was the first to be included into a diesel railcar at an international level. It has been presented to different regional, national and international stakeholders as a leading example of how innovation, environment and being the first on the market come together and build a real business case that is economically viable. Sigmar Gabriel, Environmental Minister of the Federal Republic of Germany commended the efforts of fahma and Alstom by saying that this Eco-Technology proves that "*ambitious environmental policies and prosperous economic developments do not exclude each other*" (Alstom press release 15/09/2007).

The Eco-Technology 'particle filter for diesel railcars' corresponds to recent technologic developments whose objective is to reduce emissions by improving the engine technologies. The 'Taunusbahn' procurement approach not only stimulated R&D to develop economic efficient eco-solutions at Alstom, MTU and Hug Engineering, but also provided a business case that ended in a breakthrough of this Eco-Technology on international markets.

In the case of the 'Taunusbahn' the inclusion of the particle filter into the tendering process followed a four-step approach:

1. Assessing the current market availability of the product;
2. Calculating the risk for stimulating innovation and fostering development of a new Eco-Technology;
3. Calculating the expected costs;
4. Introducing optional criteria in the post-award phase of the tendering process by demanding a concept note for a particle filter.

The assessment of the market availability was done in advance of the tender with key European suppliers asking for the actual technical capacities to fulfil EU stage IIIb emission standards. The outcomes clearly indicated that technical solutions are ready to be adapted to the specific demands of railcar engines, but that the demand so far (in 2005) did not permit series production. fahma stepped into this gap and awarded the contract to the supplier with the most economically efficient but also ambitious concept to include particle filters. Therefore, a key result of the procurement process was the demand created for the particle filter.

Before including the requirement 'concept note on particle filters' into the technical specification document, fahma undertook a risk calculation including the anticipation of additional costs and the validation of legal requirements and impacts on market distortion. This risk calculation was a key element to get political back up even though additional costs were anticipated at that stage of the process.

The assessment of the market availability together with the risk calculation provided a realistic figure of the expected additional costs (45 000 Euros per filter).

Excerpt of the technical specifications document – 'Concept note particle filters':

"The diesel engines have to be equipped with particle filters. If there does not exist the possibility to include a technical solution in the binding offer, the offer of the bidder must deliver adequate information on future technical solutions to be developed, time of realisation and preliminary cost calculations for the retrofitting.

The railcar has to be supplied with technical possibilities to retrofit the engines with particle filters. The supplier is obliged to retrofit the engines with particle filters when the required technical solution is available. The costs have to be included in the offer."

After awarding the contract, the concept note on the particle filter was further developed among the purchaser (fahma), the user (HLB railway company) and the supplier (Alstom), in order to get out a suitable solution that is both economic efficient and meets the high emission reduction standards set by fahma (stage IIIb in 2006). This highlights the importance of a good relationship between the purchaser and supplier.

Along with increasing political discussions about particulate matters across Europe and the impending emission standard stage IIIb coming into force 1 January 2012, a steadily growing demand is anticipated by companies further developing engines and filter systems (e.g. Hug Engineering).

When focussing on the element 'particle filter', the impacts on the supply chain, resulting of the issued tender can be seen on three levels: (1) Alstom as the supplier of the whole product, (2) MTU as the suppliers of the engine and (3) Hug Engineering as the supplier of the particle filter.

(1) Since the delivery of the ten railcars for the 'Taunusbahn' end of 2006, Alstom offered the CORADIA LINT series with particle filter in other competitive tender processes, and this has been a strong asset for receiving the award of contract. Due to cost reasons the particle filter was not purchased, but the retrofitting concept developed for fahma was highly appreciated by the purchasing authorities.
(2) For MTU the case 'Taunusbahn' completed a series of R&D activities on how to include particle filters in railcar engines. It was also advantageous that the already developed engine was already emitting less particulate matters. The green procurement of fahma resulted in a business case for MTU and related sub-suppliers for particle filters in railcar engines. MTU raised most but not all the costs for R&D.

Normally, a big engine producer like MTU would not invest too much time in developing specific solutions for the small market of engines for railcars, but the strong signal coming from the tender for the 'Taunusbahn' encouraged MTU to enlarge the offer of environment friendly products (here: engines with particle filter systems).

(3) As one of the leading filter solution providers. Hug Engineering AG sees big development and market potentials. Until now they equipped hundreds of locomotives all across Europe (250 in Switzerland alone) with particle filters of similar construction. Today it is possible to include filter systems into railcar engines with a propulsion power of up to 2 MW, allowing nearly any engine of different power levels to be equipped with a particle filter.

As Eco-Technologies to reduce emissions are steadily developing, the use of this specific particle filter in the 'Taunusbahn' was an important step to make technologic solutions available on the market. It also pushed forward the possibilities to retrofit old railcars with particle filters to meet future EU emission standards before 2012.

Currently, engine producers, in co-operation with railcar suppliers, work on the further development to reach the high emission standards of the whole stage IIIb coming into force in 2012. This requires further developments in the whole motor system. The case 'Taunusbahn' helped to put pressure on this technologic development demonstrating the market demand and economic efficiency.

4.6 Barriers and difficulties

Mentioned obstacles include missing European standards for recent technological developments as well as some difficulties about how to verify the fulfilment of the green criteria when fahma depends on self-declarations (e.g. used materials).

Although the costs are moderate and even include an Eco-Technology that even now fulfils nearly all European emission standards for 2012, the additional costs of approximately 3% of the total product costs mean a barrier for public authorities to purchase this product.

4.7 Lessons learned

The success of this green tender was secured mainly due to political backup resulting from recent discussion about particulate matters and air quality in the region. Therefore, taking the risk to demand innovative product components was limited. It also lead to further discussions of whether these environmental friendly railcars could also ensure competitive advantages in the future, when regulations on vehicles that are allowed to drive into the Frankfurt / Main inner city circle might be tightened, allowing only railcars with stage IIIb emissions to enter.

The external knowledge provided by consultants on how to include green criteria was valuable for a suitable selection procedure. The negotiated procedure gave good results especially when considering the inclusion of the new Eco-Technology of particle filters for railcars. Detailed tables and figures in the technical requirements allowed the supplier to easily fulfil the green criteria.

4.8 Outlook

fahma will include the lessons learned and the good experiences with implementing green criteria in their future tenders. Regarding the constantly increasing importance of life cycle costing the focus will mainly drift to represent real figures of the relation of purchasing, use and disposal costs in the tender documents by adapting the weighting of selection and award criteria.[7]

In future tenders fahma will include the stage IIIb emission standard as the minimum requirement, because of the existent availability of technical solutions to fulfil these standards for most of the engine power classes. The applied wall flow particle filter is one technical solution to reduce particulate matters. Researchers are currently discussing the possibilities to use filter systems similar to the Continuously Regenerating Technology (CRT), but at reduced maintenance costs.

At the same time discussions on European level arise towards abolishing the regulation to operate in non-compliance under a variance or continuation permit for railcars. If this will apply in the near future, strong requirements fostering the continuous retrofitting to meet the most recent standards can be included into tender documents.

In summary, the experiences with the procurement of railcars for the 'Taunusbahn' indicate the possibilities to trigger the market by introducing new Eco-Technologies and by using specific green criteria. This case study showed that:

- An open and communicative attitude is the key element for a successful tendering process;
- Political discussions foster the introduction of new Eco-Technologies (here: discussion about particulate matters);
- Tendering for Eco-Technologies in the phase of development (here: particle filter adapted to the requirements of diesel railcars) results in a business case (mass offer of the product).

[7] Out of a lifecycle perspective purchasing costs only refer to one-third of the total lifetime costs of the railcars. Out of economic efficiency the weighting of 60% for the purchase price might be reconsidered.

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4.10 Summary

Case study 1: Sustainable Procurement of Public Railcars with the Eco-Technology ‘particle filters’ for the Taunusbahn, GERMANY	
Purchasing authority	Fahrzeugmanagement Region Frankfurt RheinMain GmbH (fahma)
Subject matter	Tender for the production and delivery of ten two-part railcars
Environmental criteria required	Minimum environmental requirements • Noise levels referring to ISO 3095 (LAmax = 90 dBA) • Avoidance of specific toxic materials – comprehensive list including e.g. arsenic, chrome • Lowest fuel consumption possible • Emission standards based on the Directive 97/68/EG Stage IIIa Technical specifications • The diesel engines have to be equipped with particle filters. If this is not possible, the offer of the bidder must deliver adequate information on future technical solutions to be developed, time of realisation and preliminary cost calculations for the retrofitting. • It must be technically possible to retrofit the railcar engines with particle filters. The supplier is obliged to retrofit the engines with particle filters when the required technical solution is available. The costs have to be included in the offer. Award criteria • Fuel consumption (10%)

The new eco-technology	In the CORADIA LINT series, a catalytic coated filter is used consisting of two functional filter units in parallel connection. It is based on the wall flow principle that uses a holed and coated wall through which the exhaust emissions flow, reaching a filtration efficiency of 95% of the particulate matters. The passive regeneration is achieved by the catalytic elements (coated wall).
Key drivers for triggering market	• National discussion about the high emission levels of particulate matter in the air of cities like Munich and Frankfurt/ Main (2005) • Awareness of local politicians about the role of urban transport regarding particulate matters • Rhein-Main Transport Network (RMV) climate protection strategy setting ambitious targets • The demand of the particle filter was based on recent R&D activities that only needed a business case. A key result of the procurement process was the demand created for the particle filter.
Impact on supply side	• Alstom Transport offered the CORADIA LINT series with particle filter in other competitive tender processes • The green procurement of fahma resulted in a business case for the Engine producer MTU and related sub-suppliers for particle filters in railcar engines. • The filter solution provider Hug Engineering AG sees big development and market potentials all across Europe.
Cost implications	• The additional costs for the environmental friendly version for each filter are €45 000, resulting in approximately 3% additional costs of the total product costs of approximately € 2.7 million. • With current testing, fuel consumption is the same as those railcars that do not use a particle filter. There are negligible costs for the maintenance of the filter system.
Barriers and difficulties	• Lack of European standards for recent technological developments • Some difficulties about how to verify the fulfilment of the green criteria other than by self-declarations by the supplier (e.g. used materials)
Lessons learned	• Political support resulting from recent discussion about particulate matters and air quality in the region secured the green tender • Good external knowledge provided by consultants on how to include green criteria • Choosing a negotiated procedure gave good results • Detailed tables and figures in the technical requirements allowed the supplier to easily fulfil the green criteria.

5 Case study 2: Sustainable Procurement of Bus shelters in Barcelona, SPAIN

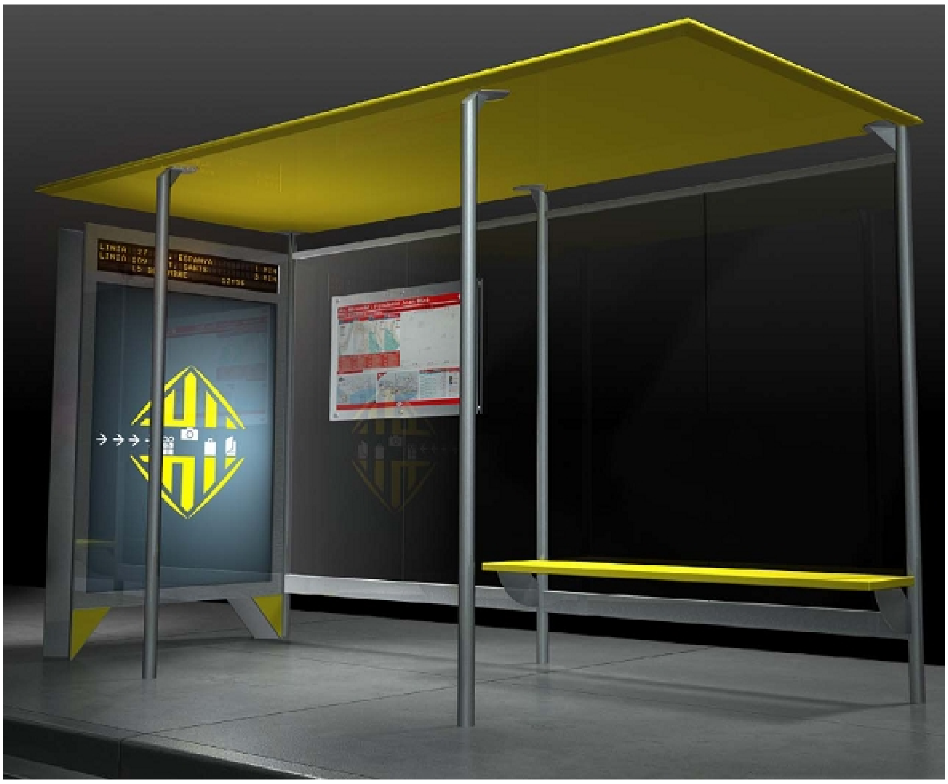

Figure 3 Source: JCDecaux (3D Prototype)

Prepared by ICLEI – Local Governments for Sustainability

With support from:

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5.1 Background information

The city of Barcelona, located on the Mediterranean coast of Spain, is the country's second biggest city with a population of 1 700 000 people. In 2002, the city approved Agenda 21, citizens' commitment to sustainability, in accordance with the guidelines of the United Nations Conference on Environment and Development (UNCED) ('Earth Summit') of 1992. The aim of Agenda 21 is to promote a new model of development based on satisfying present needs without compromising the capacity of future generations. Barcelona City Council, within the framework of Barcelona's Agenda 21, is now promoting the Sustainable City Council Programme[8] in an attempt to spread the incorporation of good environmental and social practices throughout the organisation.

One of the priorities of this programme is the incorporation of environmental and social criteria in the public procurement process. Within this framework, in September 2006 the general administrative tenders of the municipality to contract works, services and goods were modified and published to include environmental criteria which are in line with the new European public procurement directives. In detail, the latter refers to the criteria used to evaluate technical capacity, award criteria and the obligations and responsibilities of the contractor. Furthermore, Barcelona is an active participant of the Procura$^+$ Campaign led by ICLEI and this has pushed them to become a leader in Sustainable Public Procurement (SPP).

For the first time Barcelona included environmental criteria into the tendering process for the purchase of street furniture in 1998. Before reaching the end of this first contract, Barcelona developed a second tender for the conservation, implementation and maintenance of street furniture (including bus shelters).

5.2 Information on the product

Barcelona purchased 500 new bus shelters and adapted all 1200 old existing bus shelters. The winning bidder for the bus shelter in Barcelona was JCDecaux, an international group leader in outdoor communication, offering a unique prototype for the city: the "***Barcelona bus shelter model***", a model compatible with the old ones. Located on busy main streets and venues, near shops and points of sale, each shelter comprises two main elements:

- Bus shelter structure: roof, support structure, glass and bench;

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[8] www.bcn.cat/agenda21/ajuntamentsostenible. The objectives are: reduce CO_2 emissions, water consumption and waste production; promote a social and sustainable local economy; exclude products and services which cause social injustice; and create a culture of social responsibility and environmentally friendliness.

- OPI (Optical Point of Information): two large panels at eye level, with the option of placing advertisements on either side of each panel, and a bus timetable.

These two main elements of the bus shelter are comprised of a set of smaller elements made of different materials (the use of chlorine, PVC and non-recycling materials was prohibited); these may be found in Annex 1. For the maintenance of the product, JCDecaux implemented a new technology for the cleaning system using osmosed[9] water instead of conventional water, thus avoiding the need to use soaps/detergents in the cleaning process.

5.3 The developed new Eco-Solution and Eco-Technology

As a result of the tender, the ***'Barcelona bus shelter model'*** appears as a unique bus shelter prototype in the market. Three main elements distinguish this prototype to the rest: the inside part of the roof; the advertising panel; and the cleaning system of the bus shelter.

For the *roof*, the tender specified that it had to be able to resist a load of 500 kg/m^2 (a precaution against vandalism) and at the same time using recyclable materials. JCDecaux worked on the development of a beehive-shaped fibreglass material to go on the inside part of the roof. This particular inner light structure strengthens the roof, as well as being easy to disassemble at the end of its life cycle, enabling it to be recycled[10].

The *advertising panel* is unique for having replaced 4 lamps of high consumption with 3 low consumption T5 lamps[11] of 35 W each. Additionally, side panel reflectors improve the light dispersion, and only one electric balast supplies the energy to all lights instead of the four as before. The light system was highly improved by JCDecaux in comparison with the other bidders. JCDecaux searched the market for new elements to satisfy all requirements from the tender, and to reduce the number of lights from 4 to 3 while still improving the lighting of the panel. For more information see Annex 1.

Finally, the first time world wide in a large scale JCDecaux implemented a new cleaning system exclusive for the maintenance of the bus shelter using osmosed water instead of conventional water, avoiding the need to use soap/detergents in the cleaning process. Cleaning water is obtained in a reverse osmosis plant that JCDecaux has built on their premises in Barcelona.

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[9] Water filtered by osmosis procedures. Osmosis is the net movement of water across a partially permeable membrane from a region of high solvent potential to an area of low solvent potential, up a solute concentration gradient.

[10] The inner part of the old roof was made of expandable Polystyrene that could not be disintegrated from the other materials and was impossible to recycle at the end of its life cycle.

[11] Narrow-diameter fluorescent light tube, 3-4 times more effective than a standard fluorescent bulb of similar wattage.

Figure 4 Cleaning system

Initial water comes from rainwater (when available) or tap water, which is treated through a reverse osmosis process that eliminates the chloride and the dissolved salts. By the end of the process still water is obtained with only 17 ppm of dissolved salts in it, and stored in a tank placed at the back of the cleaning vehicle.[12] The water is then pumped into a special cleaning brush and applied as a water mist system so that the total surface area of the extinguishing water is multiplied many times by fine droplet formation. This special mechanism, together with a special design of the cleaning brush, means that soap or detergents are not needed.[13] Additionally, the structure does not need to be dried after being cleaned, as the water is free of salts and no salt film is left on the surface of the bus shelter.

5.4 The drivers responsible for this new Eco-technology

Leading cities such as Barcelona purchase a great number of products and services using green criteria. GPP helps them to achieve their sustainable policy goals.

As stated earlier, Barcelona intends to lead in SPP and set an example Europe-wide, developing a more challenging tender with the aim of creating new technologies or solutions. It is also important to note that Barcelona provides a good service to their citizens and therefore wanted bus shelters of high quality. The suppliers wanted to develop a new technology to improve the technology of the previous tender that they had with Barcelona, to show their commitment and put them in a strong position for any future tenders. It was also an opportunity for JCDecaux to improve their existing technology which would keep them as a leader in the market.

[12] The cleaning vehicle runs on biodiesel 10 (10% bio, 90% Diesel).

[13] Usual dirt on bus shelters includes dust and non-fatty dirt, easy to eliminate with this system. For that reason, this system is only applied on street furniture and not elsewhere.

5.5 The tendering process

The tender for the bus shelter was part of a larger tender, requiring cooperation among a number of departments. As the tender was also quite large the suppliers were motivated to spent additional effort in order to be successful in their bid. The first tender that included environmental criteria in the purchase of street furniture in Barcelona was issued in 1998. In May 2005, the city did a second call for tender for the purchase of street furniture. After the first publication of the second call for tender, there was a four-month period for the bidders to comment on the tender and to ask clarification questions. The final publication of the tender was on 9 September 2005.

5.5.1 Developing the green procurement criteria

The initial development of the green criteria for the tender took place in co-operation among multiple stakeholders, including the Departament d'Urbanisme i Infrastructures (Urban Planning and Infrastructure sector), TMB (Metropolitan Transports in Barcelona), Via Pública (giving advice on bus shelter placement), Communication Department (giving advice on the advertisements to go in the PIMs[14]), Urban Environmental Department (giving advice on incorporation of bus shelters without causing a visual impact on the environment) and IMI (Computer Services-Informatics Municipal Institute). The involvement of so many departments in the development of the tender presented the challenge of satisfying all their requirements. The bidders could comment on the environmental criteria and their applicability between the first publication of the tender in May 2005 and the closure of the publication in September 2005.

5.5.2 The green procurement criteria

The tender document and the technical specifications included green criteria. It was specified in the technical specifications that during the manufacture phase of the new bus shelters it was preferable to use:

Glass laminate and/or tempered glass of high resistance	Smelting Aluminium type AG-3
Stainless steel – quality AISI 316 L	Stainless steel microfusion
Composites exempt of chlorine	Recycled materials

In addition, the use of PVC and non-sustainable timber was excluded. Special attention was taken in the selection of raw materials, manufacturing procedures and production of the elements composing the bus shelter, assembly and disassembly systems and energy

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efficiency of the lighting. These criteria ensured, amongst others, the recycling of the different elements and the careful reintroduction of waste in the manufacturing process.

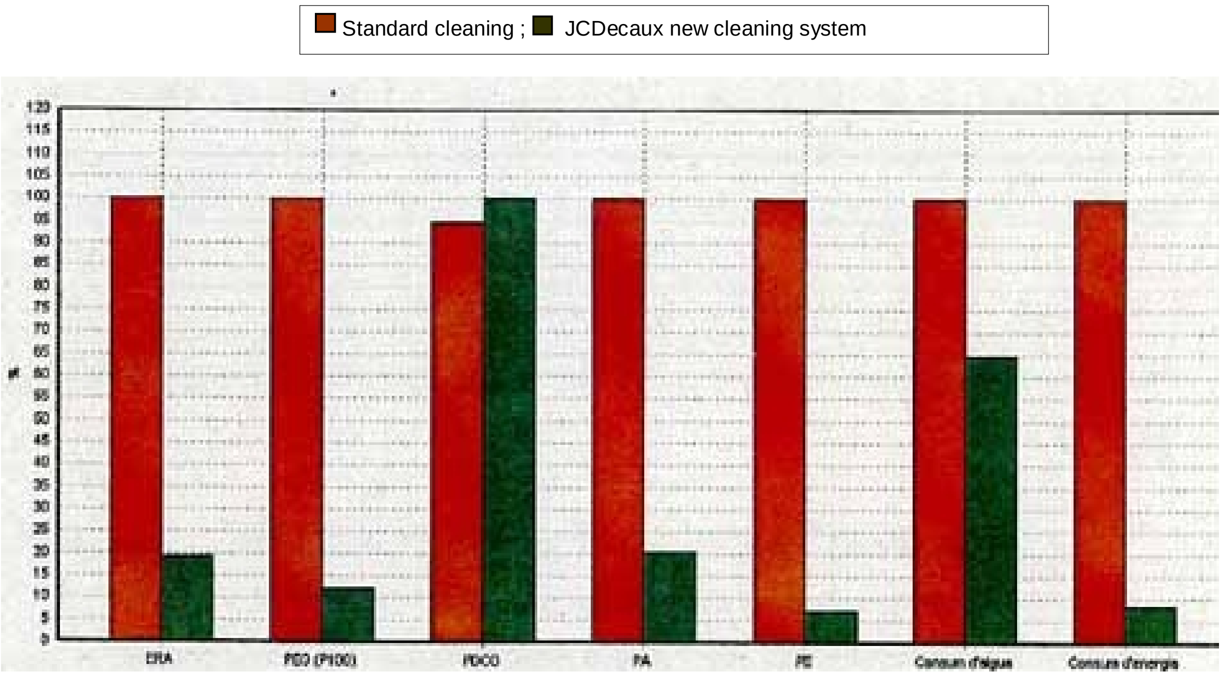

Figure 5 The graphic shows the little impact on the environment caused with the new system. The last two columns show how the new system consumes just half the amount of water, and consumes 80% less energy than the old cleaning system.

The bidders had to include a Life Cycle Analysis (LCA) for each element of the bus shelter in order to justify its compatibility with sustainable development. JCDecaux elaborated a very detailed LCA of all elements comprising the bus shelter, and also included the LCA of all elements, which take part in the maintenance process. Furthermore, for elements containing electrical devices or lighting a document had to be included confirming their compliance with the Spanish *Low Strain Electrotechnic Regulation and Complementary Technical Instruction*[15].

The criteria triggered the development of a new prototype for the bus shelter, which fulfils all requirements. The selection process was using a quality management system with a scoring matrix.

15 Royal Decree 842/2002, 2 August, BOE number 224 of 18/09/2002

The total amount of the selection criteria was 120 points:

Table 3 Selection criteria

<table>
<tr><th>Price of the offer (60 points)</th><th>Information service on the bus (10 points)</th></tr>
<tr><td>Improvement regarding the old bus shelters (15 points)</td><td rowspan="2">Technological improvement and level of environmental respect of the materials and methods used in the construction, imple-mentation and maintenance of the bus shelter. In concrete:
- Use of recycled materials and recyclable materials (5 points)
- Use of non pollutant manufacture procedures (5 points)
- Use of no pollutant maintenance products (5 points)
- Quality and effectiveness of the best proposed technologies on any of the elements of the bus shelter (5 points)</td></tr>
<tr><td>Material's quality (5 points), appearance (assessing their positive relation between the elements design and their integration into the city's landscape) (5 points), and their easy maintenance (5 points).</td></tr>
</table>

The tender required that bidders develop a proposal on how to improve the bus shelter itself as well as including new elements to improve the quality of the service e.g. cleaning. This paragraph in the tender was a key element in stimulation of research for adequate solutions because it provided the specifications and allowed the bidders to develop new ideas and technologies. JCDecaux went one step further in the tender and also proposed the implementation of a new technology for the cleaning maintenance avoiding the use of soap / detergent.

The bidder also had to prove its technical capacity. They had to commit to the whole maintenance and costs associated with the bus shelter (electricity, water consumption) during the contract period (10 years), as well as covering all costs of the leasing agreement with the city. All street furniture elements included in the tender were used to include all sorts of advertisements, thus becoming an enormous source of income for the company owning the street furniture. In order for the bidder to have the right to advertise and make a business out of it, the tender included a leasing agreement where the winner bidder had to pay an annual fee of € 18 Million to the city council.

Regarding the selection criteria, an Environmental Management System of the company was not required. However, JCDecaux was certified according to ISO 14001, pushing the other bidders to present a certification as well, in order to compete for the contract. Contract performance clauses included several tests and environmental documentation related to the above-mentioned criteria. Every four years, the company has to present a report to the city council of Barcelona on the status of bus shelters. In any case, JCDecaux, is interested in maintaining the good status of bus shelters anyway, as they are their main source of income.

5.5.3 Assessing the tender

The tender was issued on 9 September 2005, including both the tender document and the technical specifications. Companies interested in participation had until 13 December 2005 to present their interest including indicative prices. Four companies presented the required documents: JCDecaux, Cemusa, Viacom and Clear Channel. In February 2006 Barcelona awarded the contract to JCDecaux because of their innovative capacity in bringing new elements respectful of the environment and new Eco-technologies never used before in bus shelter maintenance. Barcelona is currently in the implementation phase of these bus shelters. They estimate that by the end of 2007, 200 new bus shelters will be in place.

5.6 Results of the tendering process and key factors that triggered the market for the Eco-technology

The city of Barcelona has a very high purchasing budget (2,8 Million € annually) and is therefore capable of moving the market and affecting the suppliers and sub-suppliers involved in the process.

The new Eco-solution developed as a consequence of the tender was a unique prototype of bus shelters with a new roof and a new lighting system of the advertising panel, given the name of ***'Barcelona bus shelter model'.*** In order to receive the contract, the bidder went one step further in the tender and implemented a new system for cleaning the bus shelter avoiding the use of soap. This technology to clean street furniture had major impacts on the market after implementation on a large scale for the first time. Although reverse osmosis water treatment systems have existed in the market for many years, they had never been used for the cleaning of street furniture. The first prototype was developed and tested, previously to the tender, in the International Exploitation Department that JCDecaux has in Paris, but was never used. It was implemented for the first time on a large scale (maintenance of around 1700 bus shelters, including the 1200 old bus shelters and the 500 new ones) in Barcelona as a consequence of the tender. This implementation moved the market as it entailed a big investment from the bidder's side, both to adapt the new system into their cleaning vehicles and facilities, as well as to train employees.

JCDecaux, as an international company with offices worldwide, has started to market this technology on a much wider basis. Following the tender, the cleaning system is now ready to be implemented by the 21 Spanish offices and in all other European subsidiaries of JCDecaux. Innovations successful in one subsidiary are regularly adopted as a standard for the other subsidiaries.

The purchase of these bus shelters in Barcelona has also triggered further demand in the market. At the local level, neighbour cities Badalona and Sabadell have already set up contracts with JCDecaux. In Badalona they are testing a new prototype with a photovoltaic panel on the roof of the bus shelter. Elsewhere in the country, the city of Vigo awarded the contract to JCDecaux for the same product in May 2007. The exchange of experiences in the drafting of public tenders between municipal experts has contributed to raising the interest and has greatly increased the potential of spreading this recently developed environmental technology.

As a result of this tender this system is now also applied to clean other street furniture like advertising panels, toilets attached to bus shelters, bus stops, MUPIs[16] and roadside posts when a new contract is awarded to any European subsidiary of JCDecaux.

A series of key factors enabled the new eco-solution (the new prototype for the bus shelter) and the implementation of a new eco-technology (the new cleaning system) to be developed and put on the market:

1. It was specified in the tender for the bidders to develop proposals on how to improve the quality of the service:

   Excerpt of the technical specifications document – 'conditions of the different elements':

   "Bidders will present proposals for the adaptability of the new bus shelters as well as new elements to improve the quality of the service". "Bidders will present to Barcelona's City Council technical solutions for a technological improvement or operation of the product or that improves its energy efficiency".

2. More points were given to the bidder presenting better technologies to improve the quality and the effectiveness of the product:

   Excerpt of the tender document – 'award points':

   "Quality and effectiveness of the proposed technological improvements on the product: 5 points".

   The high value given to environmental criteria both in the technical specifications and in the award criteria was a key factor that motivated JCDecaux to go further in the tender. They introduced new improvements in the advertising panel and implemented the new cleaning technology in order to stand out among the other bidders and win the contract.

3. The introduction of these new elements and the new cleaning system appear as improvements in relation to the old tender that was also awarded to JCDecaux in 1998. After 8 years experience in the maintenance of old bus shelters, they perfectly knew the weaknesses in the maintenance of the product (environmental pollution caused by the cleaning products, salt film left by poor quality water, high water consumption, etc.) and where to improve the system. As part of the company's strategy, JCDecaux is always willing to improve with time. One of the main reasons for JCDecaux to stand out among the other offers was its innovative capacity. They knew that with the new cleaning system

[16] Mobilier Urbain pour Publicité et Information

they could easily compete among the other bidders who still used the traditional cleaning system with water and soap.

4. Another key factor for JCDecaux to bid on the tender and to invest on an innovative Eco-Technology was the major source of income for the company: advertising on the bus shelters. JCDecaux are world leaders in outdoor communication, and bus shelters become strategic elements for advertising and to receive revenue. For that reason, they are the first ones interested in maintaining the good status of bus shelters.

5. Regarding the maintenance, it is specified in the contract that the bidder has to take care of the maintenance and the costs involved during the whole duration of the contract (10 years). This clause in the contract was another key factor that pushed them in the development of a new Eco-Solution with better lights that would hardly need to be changed, as well as to invest in the implementation of the new technology with a cleaning system that does not need soap.

6. As leaders in outdoor communication, JCDecaux want to showcase their improvements to the world, and show their innovative capacity.

5.7 Barriers and difficulties

The challenging criteria of the tender pushed the market to find new materials and new elements to fulfil all requirements. This market research had a multiplier effect on the supply chain. Sub-suppliers were faced to search for a much broader market in order to comply with the new requirements imposed by the main supplier. In some cases, such as the T5 lights, which had to be purchased in Sweden, it had a negative impact due to the need to source them from an overseas supplier. The fact that PVC and chlorine materials were excluded in the tender affected the supply chain, requiring alternative materials to introduce in the design of the new bus shelter. It was difficult to select specific criteria to satisfy all the different departments involved in developing the tender.

5.8 Lessons learned

The purchaser stated that they went for the economically most advantageous offer. They invested on the bidder with a higher innovative capacity, leading to a successful cleaning system that in the mid- to longer term implies a smaller environmental impact and a reduction in the maintenance costs. JCDecaux stated that they are really enthusiastic about the way they are performing, and are sure that they are following the right path. Both the purchaser and the supplier also agreed on the importance of analysing the status of each city, as it is not always possible to implement certain elements even if they are more attractive[17]. The external knowledge by other departments on the selection of green criteria was also valuable for a successful result.

5.9 Outlook

The city of Barcelona believes to have all new bus shelters implemented by the end of 2007. During the next 10 years (duration of the contract), JCDecaux will take care of the maintenance of bus shelters, using the new cleaning system with osmosed water. The city of Barcelona will include the lessons learned and the good experiences made with implementing green criteria in future tenders. Also, JCDecaux will showcase the implementation of the new eco-technology to their other international offices, serving as an example to follow by other cities. JCDecaux has settled a consistent strategy for the design of their products that will be applied much more broadly. For instance, the new cleaning system will be applied systematically into any new city managed by JCDecaux. The same is applied with the new lighting system for all MUPIs and bus shelters.

5.10 Contacts

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[17] In one of the offers, JCDecaux offered the implementation of solar panels on top of the roofs of the bus shelter. However, the offer was discarded because it required a really big dimension of the solar panel in order to supply enough energy to the OPI, the timetable and the bus shelter light. Moreover, more space would be needed for the batteries and therefore a new design of the bus shelter. Last but not least, most of the bus shelters are located in streets were the sun is hardly present during the day (the sunlight is covered by the shadow of street trees and buildings).

5.11 Summary

Case study 2: Sustainable Procurement of Bus shelters in Barcelona, SPAIN	
Purchasing authority	City of Barcelona, Urban Department
Subject matter	Tender for the purchase of 500 new bus shelters and adaptation of all 1200 old existing bus shelters.
Environmental criteria required	Minimum environmental requirements • Use of: Glass laminate and/or tempered glass of high resistance, Smelting Aluminium type AG-3, Stainless steel – quality AISI 316 L, Stainless steel microfusion, Composites exempt of chlorine, Recycled materials • Exclusion of PVC and non-sustainable timber • Life Cycle Analysis (LCA) for each element of the bus shelter in order to justify its compatibility with sustainable development. Selection criteria • Use of recycled materials and recyclable materials (5 points) • Use of non pollutant manufacture procedures (5 points) • Use of no pollutant maintenance products (5 points) • Quality and effectiveness of the best proposed technologies on any of the elements of the bus shelter (5 points)
The new eco-technology	The ***'Barcelona bus shelter model'*** is a unique bus shelter prototype in the market. Three main elements distinguish this prototype from the rest: • The roof: the inside consists of a beehive-shaped fibreglass material. This strengthens the roof, and makes it easier to disassemble at the end of its life cycle, enabling it to be recycled. • The advertising panel is unique for using 3 highly efficient T5 lamps of 35W each instead of 4 inefficient lamps. Additionally, side panel reflectors improve the light dispersion, and only one electric balast supplies the energy to all lights. • New cleaning system developed exclusively for the maintenance of the bus shelter using osmosed water instead of conventional water, avoiding the need to use soap/detergents.
Key drivers for triggering market	• It was specified in the tender for the bidders to develop proposals on how to improve the quality of the service. • More points were given when presenting better technologies to improve the quality and the effectiveness of the product. • The introduction of new elements and the new cleaning system appear as improvements in relation to the old tender also awarded to JCDecaux in 1998. • JCDecaux's major source of income for the company: advertising on the bus shelters. JCDecaux are world leaders in outdoor communication, and bus shelters become strategic elements for advertising and to receive revenue • Regarding the maintenance, it is specified in the contract that the bidder has to take care of the maintenance and the costs involved during the whole duration of the contract (10 years).

	This clause in the contract was another key factor that pushed them in the development of a new Eco-Solution with better lights that would hardly need to be changed, as well as to invest in the implementation of the new technology with a cleaning system that does not need soap. • As leaders in outdoor communication, JCDecaux want to showcase their improvements to the world, and show their innovative capacity.
Impact on supply side	• The new technology to clean street furniture was implemented on a large scale for the first time, entailing a big investment from the bidder's side, both to adapt the new system into their cleaning vehicles and facilities, as well as to train employees. • JCDecaux marketed this technology on a much wider basis in all other European subsidiaries of JCDecaux. • At the local level, neighbour cities Badalona and Sabadell have already set up contracts with JCDecaux. Elsewhere in the country, the city of Vigo awarded the contract to JCDecaux for the same product in May 2007.
Barriers and difficulties	• Sub-suppliers needed to search for a much broader market in order to comply with the new requirements imposed by the main supplier. • The fact that PVC and Chlorine materials were excluded in the tender affected the supply chain, requiring alternative materials to introduce in the design of the new bus shelter. • It was difficult to select specific criteria to satisfy all the different departments involved in developing the tender.
Lessons learned	• The purchaser selected bidder with a higher innovative capacity, leading to a successful cleaning system that in the mid- to longer term implies a smaller environmental impact and a reduction in the maintenance costs. • Importance of analysing the status of each city, as it is not always possible to implement certain elements even if they are more attractive (Eg. in one of the offers, JCDecaux offered the implementation of solar panels on top of the roofs of the bus shelter, but due to the local conditions it was not possible). • Using the knowledge of other departments in the selection of green criteria was also valuable for a successful result.

6 Case study 3: 'The better floorlamps' of the City of Zurich, SWITZERLAND

Figure 6 Photo: Regent Beleuchtungskoerper AG

Prepared by ICLEI – Local Governments for Sustainability
Photo: Regent Beleuchtungskoerper AG

With support from:
Simon Markus (Simon Markus), Regent Beleuchtungskörper AG (Markus Binda), eteam GmbH (Stefan Gasser)

6.1 Background information

Zurich is the largest Swiss city with approximately 350 000 inhabitants and a public procurement budget of over one billion Euro per year.[18] The city is one of the most active Procura+ cities[19] and has put sustainability as a specific target on its political agenda since 1998. A recent draft Guideline on Sustainable Procurement states as an overall principle that *"all products and services that have to be purchased should comply with high economic, ecological and social requirements throughout their entire life cycle.*[20]

The city is subject to the Inter-cantonal Agreement on Public Procurement (IvöB 2003)[21] and bound to general procurement principles such as non-discrimination and transparency which are also valid at EU level. 'Sustainability' is legally recognised as an award criterion and can be inserted in public tenders to specify the nature of the product concerned.

For the last 10 years, the Building Construction Department of Zurich (Amt für Hochbauten der Stadt Zürich), which is responsible for the procurement of the product concerned, has been developing and including 'General Ecological Building Conditions' as minimum requirements in all contracts on public construction works. This list of conditions includes green criteria for product materials and constructions, for disposal and waste management. When purchasing new products the Building Construction Department of Zurich requires environmental product declarations that are checked by the Specialist Department on Sustainability Construction (Fachstelle Nachhaltiges Bauen)

Regent Beleuchtungskörper AG, the successful bidder of the product concerned (floor-lamps), is Switzerland's market leader in lighting systems and is ISO 9001 and 14001 certified. Currently, more than 80% of the lighting systems they sell are designed and manufactured on their own premises. The company has an environment policy which aims at reducing the use of non-renewable resources, recycling, waste management and awareness raising on sustainability issues. Energy-efficiency is regarded as a key objective in the production process and all products are composed of multiple units without being glued together. This means that individual parts can be replaced instead of the whole unit and the discarded parts can be recycled.

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[18] Zurich's public procurement budget: EUR 1.211.896.015,86 / year

[19] See ICLEI's European Sustainable Procurement Campaign Procura+ - online at: www.procuraplus.org

Some sustainable purchasing examples in 2005:
- 2,166 energy efficient computers = 127,114kg CO_2 saved during its use
- Energy efficiency & sustainable building materials criteria = (45,081 m^2) 175.1Million EUR
- Organic food worth 390,000 EUR (5.6%) of its total budget

[20] Stadt Zürich *"Leitfaden – Die Stadt Zürich beschafft nachhaltig"* 2006

[21] Interkantonale Vereinbarung über das öffentliche Beschaffungswesen

MINERGIE® is a sustainability brand and labelling system initially developed for new and refurbished buildings[22]. MINERGIE® is an association, which is supported by the Swiss Confederation, and the Swiss Cantons along with the department of Trade and Industry. It is registered in Switzerland and around the world. The MINERGIE® lighting standard was developed in connection with the tendering process regarding Zurich's purchase of 2 000 floorlamps.

To be in compliance with the MINERGIE® Standard, products must fulfil the following requirements:

- Energy consumption must be at least 25% and the fossil energy consumption at least 50% below the average consumption of the state of the art;
- The cost must not exceed 10% of a comparable standard product;
- Used products must be disposable in at least the same way as average standard products.

6.2 Information on the product and the developed new Eco-Technology

In 2002, the Building Construction Department of Zurich, in collaboration with the Electricity Power Company ("EWZ"), launched a project for the development of MINERGIE® floorlamps, which, at the same time formed part of the tendering procedure for floorlamps. The aim was to renovate Zurich cities administration centre "Werd" to meet the MINERGIE® Standard with a need of 2 000 lamps in total, including approximately 800 floor lamps.

Zurich did not encounter difficulties in finding bidders for the specific product on the market, which is clearly shown by the fact that 13 suppliers produced 18 floorlamps that could meet the tender specifications. Eventually, REGENT Lighting was the successful bidder with a floorlamp called Level/MDT®. The new floorlamp reduces energy consumption by half compared to a standard floorlamp and lowers the life cycle costs significantly. It also offers ergonomic advantages and reduces electromagnetic radiation.

Apart from a minimum stand-by-power of 0,3 watt and a sensor that cuts off all power when no light is needed, the new Micro Downlight Technology® (MDT®) allows optimal light output suitable for all desk monitors and working spaces. Four sub-suppliers were involved in the development of the lamp, including the producer of electronic components, of aluminium parts, light directing and of the lighting tubes. Neither Regent nor Zurich undertook any life cycle assessment on the product.

The project and tendering procedure for 'better' floorlamps triggered the development of a specific product that was not previously on the market before. Almost 30 different new floorlamps were specifically developed in view of Zurich's tender. They all met the newly

[22] see MINERGIE® - online at: www.minergie.ch

developed MINERGIE® criteria for floorlamps that contain a series of challenging minimum requirements for floorlamp manufacturers. Eventually, 18 floorlamps met the MINERGIE® standards (see Table 1 below) that were also included in the tender.

Table 4 Standard versus MINERGIE floorlamps

	Conventional floorlamp	**MINERGIE® standard floorlamp**
Illumination level at working place	500 Lux	500 Lux
Max. operating performance	240 watt	140 watt
Power in stand-by mode	0,2 watt to 1,2 watt	0,2 watt to 1,2 watt
Consumption of floorlamp with standard use	22,3 kWh/m^2 Standby: 4,5 watt	11,9 kWh/m^2 Standby: 0,5 watt
MINERGIE® requirement for illumination	13,1 kWh/m^2	13,1 kWh/m^2
Norm SIA 380/4: Threshold	22,5 kWh/m^2	13,1 kWh/m^2

From an environmental perspective, the innovation of the product lies mainly in terms of energy-efficiency, sustainable material and reduced electromagnetic radiation (≤ 2V/m). More specifically, apart from granting an environmentally friendly production process, all floorlamps had to use sustainable, long-lasting material and guarantee that the floorlamp is assembled without the use of harmful adhesives.

Regent succeeded with its floorlamp Level/MDT® to reduce the stand-by mode by a factor of 10, meaning from 4 watt to 0,4 watt. With sufficient daylight, the floorlamp switches off automatically by virtue of a special sensor.

Another technical advantage of the Level/MDT® floorlamp was the new type of anti-glare used the so-called Micro Downlight Technology® (MDT®) which allows an optimal surrounding anti-glare of the working space.

6.3 The drivers responsible for procurement

The main driver for the city of Zurich was the “7 Milestones for Ecological and Energy-Efficient Construction” that include several key targets to be implemented for all public buildings until 2010. These milestones were developed by the Building and Construction Department as strategic guidelines and engage all departments and affiliated bodies to organise their work and construction according to these parameters.

Milestone 3 refers to lighting systems where MINERGIE® lighting and devices are seen as a priority. They should be purchased according to www.topten.ch standards[23] and fulfil energy class A[24].

6.4 The tendering process

The tendering procedure was set up in two phases (see Table 2) over a period of two years involving internal and external sources and including the participation of producers and sub-suppliers, such as the producers of electronic components, of aluminium parts, light directing and of the lighting tubes.

Within the Building Construction Department, several sub-departments such as the Administration Centre Werd, the Special Department on Sustainability, the Special Department on Energy and Electronics and the Real Estate Department were involved in the project, together with the assistance of the Energy Manager of the city of Zurich. *The eteam GmbH* was contracted as external expert for the development of a specific MINERGIE® standard for floorlamps to be used for the tender criteria.

Table 5 Tendering procedure for floorlamps

PHASE I		
Date	**Activities**	**Background**
January 2002	Start of project/tendering procedure	
August 2002	Workshop on floorlamps	- 27 participants (companies) - Discussion and development of proposed criteria
October 2002	Final list of requirements for call for tender on floorlamps	List included - Conditions for participation - Criteria for floorlamps - Timetable
November 2002	Registration	Note: registered participants committed to hand in floorlamp prototypes

[23] Topten is a new web portal to help consumers find out the most energy efficient appliances and cars in Europe. With a simple click, responsible consumers can check the best products available in their country. Each national Topten website points consumers to the most energy efficient cars, TVs and appliances available in their country, and provides detailed information in local language(s) on product characteristics, including photos and manufacturer contact information.
Topten is supported by the EU-programme "Intelligent Energy – Europe" (IEE), through the project Euro-Topten, co-ordinated by ADEME (French Agency for Environment and Energy Management). It organises a competition for best campaigns on efficient products (see online at: www.topten.ch)

[24] ‘Energy classes’ refer to the level of energy consumption and efficiency of products. The more energy efficient they are the higher the class. The classes go from G (less efficient) to A (more efficient) A+ products are therefore top products in terms of energy saving and efficiency.

PHASE I		
Date	**Activities**	**Background**
April 2003	Date of submission for prototype of floor lamp	Note: prototype had to be ready for mass production starting from October 2003
June 2003	11 out of 27 floor lamp prototypes fulfilled the criteria	Note: Till the publication of the tender registered suppliers were given the possibility to submit additional prototypes. Cost of new compliance verification: EUR 1500,00 Eventually, 18 floorlamps fulfilled the criteria
PHASE II		
April 2004	Call for tender	13 bidders
August 2004	Contract	Successful bidder: REGENT Beleuchtungs-körper

6.4.1 Developing the green procurement criteria

The project to develop the floorlamp with MINERGIE standards and the tendering procedure started at the beginning of 2002.

In a first phase, almost 30 floorlamp manufacturers, mainly from the greater area of Zurich, participated in a workshop on floorlamps. At the workshop, an initial list of criteria for floorlamps that had been prepared by the eteam GmbH together with the Building Construction Department was discussed and further developed, in particular with regards to the electronic parts. This draft served first as production guidelines for potential bidders and later as a basis for the actual tender. Any revision of criteria took place in the first phase only. Following the publication of the call for tender on April 2004, the bidders were given two months to submit their bid. By the end of July all 13 bids were evaluated and in August 2004 REGENT Beleuchtungskörper was informed that its bid had been successful.

6.4.2 The green procurement criteria

The ‘General Ecological Building Conditions’ represent a catalogue of minimum green requirements that are an integrated part of all works contracts with the Building Construction Department of the city of Zurich and has to be fulfilled by every supplier interested in submitting a bid.

To ensure they meet these minimum green requirements, bidders had to provide Environmental Product Declarations (EPDs)[25] according to the recommendation SIA 493 ("Declaration of ecological characteristics of building products") that were checked by the Specialist Department on Sustainability Construction (Fachstelle Nachhaltiges Bauen). The catalogue lists a series of ecological requirements for building material, such as concrete, timber products ('sustainable origin') and insulation material (excluding toxic material) etc. One of the green criteria relevant for floorlamps was:

"all conductor materials for electric assets […] have to be halogen-free"

The first specification sheet that was developed together with floorlamp manufacturers already included a series of technical specifications for suppliers that were maintained in the call for tender. Producers interested in submitting a floorlamp prototype, which was at the same time a precondition for being admitted to the tendering procedure, had to meet technical specifications in the field of energy-efficiency, ergonomics and electronics. In terms of energy efficiency, the technical specifications included the following specifications:

- *The Stand-by performance must not exceed 2 watt: the use of a regulator or control system depending on daylight is mandatory. […]*
- *With sufficient daylight the floorlamp must automatically switch off or turn on the stand-by mode. Continued operation at minimum light power (e.g. 10%) is not permitted.*
- *The electrical output must not exceed the standard output of the floorlamp (see Table 6)*

Table 6 Requirement for electrical output – as included in the tendering document

				Standard	
Stand-by power	0.0 watt	0.5 watt	1.0 watt	**133 watt**	2.0 watt
Max. power with sensor	145 watt	141 watt	137 watt	**133 watt**	129 watt
Max. power without sensor	116 watt	112 watt	109 watt	**106 watt**	103 watt

25 The international community has developed a set of standards for environmental labelling. These ISO standards define three types of environmental labels.
Type III "environmental product declarations" provide environmental data about a product. These declarations are produced by the company making the product or service, and are often certified by a third party. They usually take the form of brochures, rather than a simple label or logo. The declaration is typically based on a life cycle study, as required by the ISO technical report for Type III declarations. The declaration contains quantified data from various life cycle stages of the product, including: material acquisition, manufacturing, transportation, use and end-of-life disposal or recycling. The declaration may also contain qualitative data about the product and the company. Type III declarations allow consumers to compare products based on all of their environmental impacts and make their own decision about which product is preferable. Competition among companies on environmental grounds is encouraged by this kind of declaration.

Furthermore, the floorlamp had to be constructed in a way to reduce electromagnetic radiation to a minimum (≤ 2 V/m)

Regarding the contract performance clauses, the integrated 'General Ecological Building Conditions' state that all packaging material has to be taken back by the suppliers. The costs for the environmentally friendly disposal have to be included in the unit price. The working tools and containers have to be cleaned in an ecological manner by avoiding chemicals that could enter the water system. Upon request, the suppliers have to provide a disposal certificate for disposal and recycling of material.

According to the 'General Ecological Building Conditions', random checking of the compliance of the product with the tender criteria is possible at any time. Following the completion of the works, the contracting body reserves the right to measure the air quality of the room, for example, Zurich's specification for formaldehyde is <60 $\mu g/m^3$, total volatile organic carbons (TVOC) <1 000 $\mu g/m^3$ as measured by the standard conditions of VDI 4300.

6.5 Results of the tendering process and the key factors that triggered the market for the eco-technology

The following were the key factors in developing the new eco-technology:

- The political commitment to sustainability;
- The strong experience in sustainable procurement;
- The 2010 target of the '7 Milestones for Ecological and Energy-Efficient Construction' that include several key targets for all public buildings;
- The lack of floorlamps on the market conforming to the demanding criteria of the MINERGIE® standard.

The first project phase, which at the same time was part of the tendering procedure, included a workshop with 27 manufacturers and led to the production of 27 floorlamp prototypes. After the technical examination phase, 11 lamps were deemed to comply with the specific requirements. Following the publication of the tender, 7 more floorlamps were approved. In other words, the effect of Zurich's procurement action resulted in the production of 18 new high-quality floorlamps which were subsequently put on the market.

The competition among suppliers helped to keep the price of the floorlamps at a reasonable level. It also generated a significant production activity in the field of floorlamps manufacturing as all 27 companies were competing for the best lamp. The production process for floorlamps did involve a considerable number of subsuppliers on the market, more specifically the producers of the various floorlamps components, such as the electronics, the aluminium, the directional light components and the light tubes.

The bidders, and in particular the successful bidder Regent Lighting, applied the advanced criteria to other products as well and, hence, developed a new series of products in compliance with the tender criteria.

Approximately 2 500 of these floorlamps have been sold so far, mainly to the city of Zurich. Currently, further MINERGIE® conforming floorlamps are in process of being developed.

Figure 7 MINERGIE® Conforming Floorlamp

Despite the interest in purchasing these new floorlamps, no Swiss city has tendered for MINERGIE® conforming floorlamps up to now. At private sector level, however, the interest in these floorlamps is growing. The banking sector followed the example of the city of Zurich and started tendering for floorlamps by using the same criteria. Approximately 15 companies, all active in the public service field, tendered or ordered MINERGIE® conforming floorlamps. Organisations interested in the specific product now have the possibility to choose between at least 13 new high-quality floorlamps from different companies that are also displayed on the Swiss 'topten' website[26]. The winning bidder also felt that it was very important to be involved in the discussion of the tender criteria for its own production line. As a direct impact, in the same year of the tender, the company started to include the criteria in the production process even though at that stage they had not been awarded the contract. Even if they hadn't been awarded with the contract, they would have maintained the new changes in production.

[26] see online: www.topten.ch

As far as the costs of green versus standard floorlamp are concerned, initial costs were needed for the improvement of the components. From the supplier's perspective, overall, the cost of the Level/MDT® floorlamps did not increase as the initial investment in research led to new expertise, which was used for the development and design of several new lighting products (mostly floorlamps), and a reduction of costs was possible for the electronic components. Especially in the electronics sector the impact of the tender was significant as it resulted in the development of a new technology (stand-by mode; new Micro Downlight Technology® (MDT®)). Any initial investment costs were borne by the company and were not reflected in the final price that was 303 Euros per lamp (excluding VAT of 7.5%). By contrary, the city of Zurich calculated for approximately 800 lamps significant economic savings amounting to approximately 485 000 Euros over a period of two years. Since 2004 more than 2500 Level/MDT® floorlamps have been produced, mostly for the city of Zurich (2 000 units). Apart from the difficulty to quantify the direct impact on the supply chain, in particular on the sub-supplier, an indirect impact is evident as the number of orders for these specific floorlamps is growing. Thanks to the Zurich tender, Regent was able to strengthen its profile on the national market, benefiting also its subsuppliers. This applies, to a certain extent, also to the other bidders whose floorlamps met the tender criteria but did not succeed in winning the tender.

According to the successful supplier, Zurich's tender also had an impact on the perception of the product concerned. The city of Zurich sent a signal that the price was not the only criterion and that it would maintain this attitude in the long term.

The contract covered a period of 3 years, which – considering the product concerned – presents a long contract period. This was certainly another convincing argument for many suppliers to participate in the tendering process and to invest in the development of the product concerned. The fact that Zurich is planning to expand the MINERGIE® conforming lighting to all its public buildings certainly added to the attractiveness of the tender. Regent is now in the third year and is confident to have the contract extended for another year.

6.6 Barriers and difficulties

The specific tender requirements were regarded as highly challenging from a technical perspective. The main difficulty was to obtain maximum light output with minimum energy input in order to reach a clearly defined light level. A delay in the delivery of Regent's floor-lamps was caused by legal disputes following the marketing strategy of other floorlamps manufacturers that promoted themselves as successful bidders though their success was based on parts of the criteria only.

6.7 Lessons learned

To split the tender procedure in two phases was seen as a very effective approach to obtain the best offer on the market of the product concerned. To invite interested suppliers to assist in defining the tender criteria gave a strong signal to the market and triggered the production process. The approach added to the transparency of the tendering process and opened it up to fair competition.

6.8 Outlook

Following the excellent feedback by floorlamps manufacturers, other cities but also the private (especially service) sector are now showing an increasing interest in purchasing MINERGIE® conforming floorlamps. The Building Construction Department of Zurich is now planning to expand the new lighting in all public buildings. Regent Lighting, the successful bidder, has already started to include the tender criteria in the production of new products. In the light of the increasing interest in the newly developed floorlamps other floorlamps manufacturers are likely to follow suit. The approach might be further fostered by the wide promotion of the MINERGIE® conforming floorlamps that are also displayed on the Swiss topten website[27].

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[27] see online: www.topten.ch

6.9 Summary

Case study 3: ‘The better floorlamps’ of the City of Zurich, SWITZERLAND	
Purchasing authority	Building Construction Department of Zurich (Amt für Hochbauten der Stadt Zürich)
Subject matter	Tender for the delivery of MINERGIE® conforming floorlamps
Environmental criteria required	The ‘General Ecological Building Conditions’ as minimum environmental requirements include: • Environmental Product Declarations (EPDs) according to the recommendation SIA 493 (“Declaration of ecological characteristics of building products”) • List of ecological requirements for building material, such as, concrete, timber products (‘sustainable origin’) and insulation material **Technical specifications** • The Stand-by performance must not exceed 2 watt: the use of a regulator or control system depending on daylight is mandatory. • With sufficient daylight the floorlamp must automatically switch off or turn on the stand-by mode. Continued operation at minimum light power (e.g. 10%) is not permitted. • The electrical output must not exceed the standard output of the floorlamp • The floorlamp has to be constructed in a way to reduce electromagnetic radiation to a minimum (≤ 2V/m) **Contract performance clauses** • All packaging material has to be taken back by the suppliers. • The costs for environmentally friendly disposal have to be included in the unit price. • The working tools and containers have to be cleaned in an ecological manner by avoiding chemicals that could enter the water system. Upon request, the suppliers have to provide a disposal certificate for disposal and recycling of material. • Zurich reserves the right to carry out indoor air quality checks
The new eco-technology	• Focus on energy-efficiency, sustainable material and reduced electromagnetic radiation (≤ 2V/m). • Apart from using an environmentally friendly production process, all floorlamps use sustainable, long-lasting material and guarantee that the floorlamp is assembled without the use of harmful adhesives. • Winning floorlamp Level/MDT® reduced the stand-by mode by a factor of 10, meaning from 4 watt to 0.4 watt. • With sufficient daylight, the floorlamp switches off automatically by virtue of a special sensor. • New type of anti-glare used (MDT®) which allows an optimal surrounding anti-glare of the working space.
Key drivers for triggering the market	• Zurich’s political commitment to sustainability • 2010 target of the “7 Milestones for Ecological and Energy-Efficient Construction”

	• Lack of MINERGIE® conforming floorlamps on the market • Involvement of 27 floorlamp manufacturers in the pre-tendering phase • 3-year-contract periods • Zurich signalised that it was planning to expand the MINERGIE® conforming lighting to all its public buildings.
Impact on supply side	• Zurich's procurement action resulted in the production of 18 new high-quality floorlamps, which were subsequently put on the market. • The production process for floorlamps did involve a considerable number of subsuppliers on the market, more specifically the producers of the various floorlamp components, such as the electronics, the aluminium, the directional light components and the light tubes. • The bidders, and in particular the successful bidder Regent Lighting, applied the advanced criteria to other products as well and, hence, developed a new series of products in compliance with the tender criteria. • Approximately 2500 of these floorlamps have been sold so far, mainly to the city of Zurich. Currently, further MINERGIE® conforming floorlamps are in process of being developed. • Especially in the electronics sector the impact of the tender was significant as it resulted in the development of a new technology (stand-by mode; new Micro Downlight Technology® (MDT®). • Apart from the difficulty to quantify the direct impact on the supply chain, in particular on the sub-supplier, an indirect impact is evident as the number of orders for these specific floorlamps is growing.
Cost implications	From the supplier's perspective, overall, the cost of the Level/MDT® floorlamps did not increase as the initial investment in research led to new expertise, which was used for the development and design of several new lighting products (mostly floorlamps), and a reduction of costs was possible for the electronic components. Zurich calculated for approximately 800 lamps significant economic savings amounting to approximately €485 000.00 over a period of two years.
Barriers and difficulties	• Technical difficulty to obtain maximum light output with minimum energy in order to reach a clearly defined light level. • Legal disputes with other manufacturers that promoted themselves as successful bidders delayed delivery of product
Lessons learned	To split the tender procedure into two phases, i.e. inviting interested suppliers to assist in discussing the tender criteria gave a strong signal to the market and triggered the production process.

7 Case study 4: Sustainable Procurement of the Public Lighting Service of the City of Lille, FRANCE

Figure 8 Photo Jean-Marc Charles

Prepared by ICLEI – Local Governments for Sustainability

With support from:

Danielle Poliautre (Deputy Mayor of the City of Lille), Richard Julian (Sustainable Procurement Officer), Eric Decaillon (Public Lighting Service), Christophe Montélimard (ETDE/SOSIDEC), Dominique Fourtune (ADEME)

7.1 Background information

With over 226 000 inhabitants the City of Lille, together with the associated towns Helemmes and Lommes, is the largest in the North of France. Despite this relatively small population, the City of Lille is part of France's fourth largest metropolitan area called „*Lille Métropole Communauté Urbaine*" - consisting of Lille and 85 suburban municipalities and comprising more than 1,1 million inhabitants (2005).

The City of Lille, one of the pioneer cities on sustainable development in France, is a signatory to the 'Charter of European Cities & Towns Towards Sustainability' (1995) and to the 'Aalborg Commitments' (2004).

In 2000, Lille became one of the first French cities to implement Local Agenda 21 and since then has undertaken 180 projects and more than 500 activities in the field of sustainable development. Several major campaigns have been carried out in the framework of Agenda 21, such as the Water Campaign (2001-2002), the Food Campaign (2003-2004), the Campaign *'Lille Ville Nature'* and in 2007 the Campaign 'Acting together for a sustainable and fair city'[28]. Lille is integrating sustainable procurement into these campaigns. In 2004 Lille joined ICLEI's European Procura[+] Campaign[29] on Sustainable Procurement and since April 2007 has been the Chair of the Campaign.

The most important tender in recent years has been the city's street, façade and passage way lighting which involved the Public Lighting Service of the city of Lille, five bidders and several subcontractors (such as SEPI, SEV, LUMIVER, SMDR). External technical expertise was provided by HEXA Engineering. The contract involved a budget of 35,2 million EUR - 4,4 million EUR per year.

The winning bidder ETDE is an affiliated company of the Bouygues Construction group with branches all over the world. ETDE/SOSIDEC is active in the field of utility networks construction and services (lighting systems and illumination of buildings), electrical, mechanical and HVAC[30] engineering, facility management real estate (performance of building) and telecommunications. Even though the group was starting to make headway in terms of environmental performance by progressively integrating environmental considerations into its global strategy, the contract signed with Lille was the first real eco-solution developed by ETDE.

Lille's old lighting systems will also be made more energy efficient and transferred to Lille's twinning town in Senegal, Saint-Louis. Local engineers will be taught by Lille's technical services department on how to construct and manage the old lighting system.

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28 *La Campagne 'agir ensemble pour une ville durable et solidaire'* (2007)

29 See ICLEI's Procura[+] Campaign at: www.procuraplus.org

30 Heating, Ventilating and Air Conditioning

7.2 Information on the product

The City's main objective for this service was to ensure that public lighting be managed in an exemplary manner and achieve the best results possible in terms of energy efficiency and environmental performance. The subject matter of the European tender of the city of Lille was based on the maintenance of the City's street lighting services and the service package included:

- General maintenance of the whole system;
- Reconstruction and replacement of the 300 control boxes and 22 000 lighting units;
- Operation of the lighting systems, and
- Energy management.

ETDE is in charge of the management of the whole service package and the tasks to be carried out by the four subcontractors, which are as follows:

- SEPI and SEV – for the reconstruction works,
- LUMIVER – for the lighting waste treatment (bulbs, tubes, glass, mercury, metal components) disposal, and
- SMDR – for waste recycling of remaining materials.

The new approach of Lille was to apply green criteria throughout the implementation process and for all different contract components.

Lille's sustainability policy ensured that key objectives of its Agenda 21 were integrated into the tenders. These were, for example, reducing energy consumption and greenhouse gas emissions into the management of its public lighting system. As a result of this ETDE adapted its usual management approach to public lighting to take on board these objectives. Several components of ETDE usual service package were revised to present the new lighting service as a new eco-solution (see section 3). Lille also had a number of social objectives its call for tender; however, these are not addressed in this case study. Lille joined the European GreenLight project[31] after the Public Lighting contract was signed. GreenLight is an on-going voluntary programme whereby private and public organisations commit to reducing their lighting energy use, thus reducing polluting emissions. ADEME[32] introduced the programme at a national level.

[31] GreenLight was launched in February 2000. See online at: http://www.eu-greenlight.org/

[32] ADEME is the French Environment and Energy Management Agency.

7.3 The developed new Eco-Solution

Lille was the first city in France to hand over control of its lighting system to a private company and request that this company provide an eco-solution. Lille's eco-solution comprised the following innovative aspects:

Part 1 Integration of green criteria throughout the implementation of the tender (see Table 7);

Part 2 Continuous improvement through a 'Virtuous circle scheme';

Part 3 New environmental technology tested and applied;

Part 4 Continuous auditing and monitoring system of the strategy and management of the lighting system.

7.3.1 Integration of green criteria throughout the implementation of the tender

From an environmental perspective, the following measures have to date been implemented:

Table 7 Lille's 'green' lighting service

Components of the tendered Lighting service	Green components
General maintenance of the installation	- Digital public lighting system (management software) to guarantee automatic and flexible lighting service, save time and costs as well as avoid excessive paper use - Use of LPG vehicles in carrying out the contract to limit CO_2 emissions
Reconstruction and replacement of the asset base	- Replacement of the equipment with energy-efficient equipment - Recycling of the old material and reconstruction with recyclable material (98%), such as glass or cast aluminium
Operation of the lighting systems	Focus on the reduction of the energy consumption: - Implementation of power reducers and electronic ballasts[33] - Automatic light modulation (dimmer switch) - Reduction of light pollution
Energy management	- 25,7% green energy provided from hydropower, including 16% from small hydro. - Use of solar power is in schoolyards and parks is currently being piloted

[33] Ballasts: an electrical device for starting and regulating fluorescent and discharge lamps.

7.3.2 Continuous improvement through a 'virtuous circle scheme'

The so-called 'virtuous circle scheme' implies that the financial gains through energy saving are continuously reinvested, primarily in the development of new environmental technologies, products and services. ETDE's approach of managing public lighting services according to the virtuous circle scheme (Figure 9 below), offered high expectations in terms of quickly achieving significant results for the cities involved, especially in terms of cost efficiency and ecology.

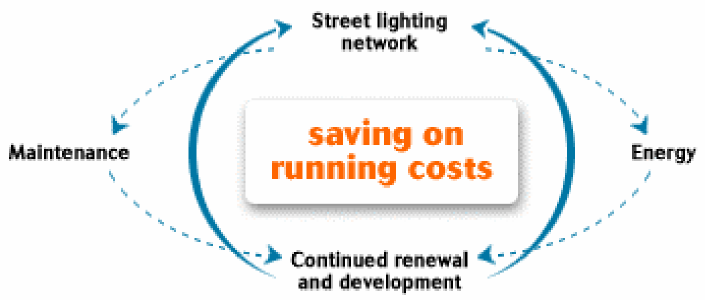

Figure 9 Virtuous Circle for the management of public lighting systems

The 'virtuous circle' approach was adapted to take on board environmental considerations following Lille's tender see Figure 10 below.

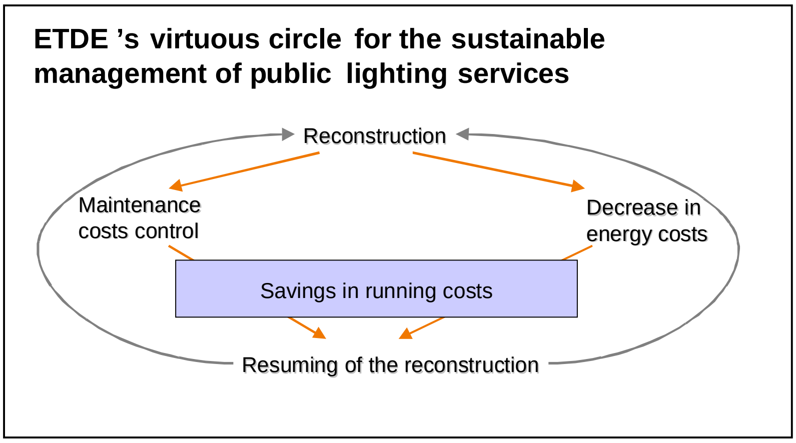

Figure 10 ETDE's virtues circle model for Lille's public lighting service

Over a period of only three years, the investment in the reconstruction of energy-efficient assets already allowed the City to save 32 to 35% of its energy. By the end of the contracting period, Lille will have made more than 40% savings in energy efficiency. In terms of global costs, there are also savings for the City since the budget for public lighting was lowered by 5% in comparison to Lille's former contract. The average cost per lamp in the previous contract was 210 EUR, with the new contract total 200 EUR per lamp.

7.3.3 New technology applied and tested

The new eco-technologies in which ETDE particularly invested are electronic power reducers. At the beginning of the contract period, in November 2004, 360 power reducers developed by the company Honeywell were already being installed. Electronic ballasts[34] are being tested and implemented on power values higher than 400 W SHP.

An experiment on solar energy is being carried out. So far, luminaires from photovoltaic solar energy were implemented in some schoolyards and parks. If this experiment proves efficient, their implementation could expand to other sites. For this project ETDE and Lille are working in partnership with L2EP- Lille's Labor for Electrical Power Engineering.[35]

The public lighting system is also being monitored through innovative IT technology. An embedded computing system has been installed at the beginning of 2005 in the aerial work platform[36] and in the tracking vehicles, which identify defects in the lighting system. This system allows the City's street lighting services to access and monitor in real time processing the information gathered by the teams such as failures, repairs, modifications of the equipment, etc.

Apart from the technology mentioned above, which ETDE is constantly improving through the virtuous circle model, new eco-technologies are being discussed by the Public Lighting Department of Lille and the service provider. Recent developments and testing of new eco-technologies currently regard new energy-efficient lamps, new types of ballasts cabinets and wireless.

7.3.4 Continuous auditing and monitoring system

In order to ensure the interaction between the 3 main aspects of the contract (reconstruction, energy management, and maintenance) and integrate environmental considerations throughout all aspects, a big part of auditing is included in the service package. ETDE thus carries out many surveys to analyse and follow-up the results, plan the next steps of the strategy, or test new products and services and integrate them to the service package. For these auditing tasks, ETDE associated a consulting firm, ProG' HEI[37].

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[34] Ballasts: an electrical device for starting and regulating fluorescent and discharge lamps

[35] L2EP -"*Laboratoire d'électrotechnique et d'électronique de puissance*" – is an inter-university research institute in the fields of electrical power engineering.

[36] Aerial devices used on construction sites to lift the personnel working at height.

[37] ProG'HEI – the Project "*Hautes Etudes d'Ingénieur*" is a junior enterprise composed of students in Engineering Technologies

7.4 The drivers responsible for this new Eco-Solution

A key driver that laid the ground for the tendering procedure on public lighting was Lille's political commitment to sustainable development in the framework of its Agenda 21 activities. A commitment taken in partnership with 46 associations and several important public institutions, such as the Chamber of Commerce and Industry, ADEME, the Regional Council etc.

In 2001, Lille adopted an integrated approach of sustainable procurement. The growing experience in sustainable procurement eventually led to this important tender on Public Lighting. The Deputy Mayor also wanted Lille to become a lead in the field of sustainable procurement. Therefore a big tender needed to be identified and greened. In this case the lighting tender was the next big tender. Lille also has a charter of for clean construction works. It includes a series of recommendations for the disposal of waste, the use of environmentally friendly packaging and recyclability of material as well as materials that should be avoided. For instance, suppliers are not allowed to use PVC for the lighting envelope.

From the supplier side they knew that environment issues were important to Lille because they were aware of all the commitments made by Lille to sustainable development. This encouraged trying and achieving the best environmental eco-solution as possible in their bid. The tender was also a large amount of money and covered a period of 8 years; therefore it allowed for a long-term commitment reducing the enterprises' risk. The supplier also wanted to expand their market and build up a presence in the north of France.

Lille's tender took place in the context of the progressive liberalisation of the energy market.[38] Since July 2004, French local governments are able to choose their electricity supplier and also the origin of the energy they consume. Regarding France's commitments towards the EU to achieve a part of 21% of electricity from renewable sources (RES-E) by 2010[39], and given the poor share of RES-E consumption in France so far (15% in 2005), the opportunity for local governments to purchase a certain amount of green energy should contribute to achieve these goals. On this subject, Lille was in 2004 one of the first signatories of a national campaign launched by WWF and the Ecological Mayors Association "Ecomaires" to encourage 100 local authorities to a 21% share of RES-E consumption.

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[38] The national supplier EDF – Electricité de France – losing his historical monopoly.

[39] Dir. 2004/77/EC of 27 September 2001

Another driver for this new eco-solution was the perspective of the energy certificates scheme, which was to be implemented in 2006 in France. This environmental policy system is based on green and white certificates, which are tradable on the market[40].

In France, these certificates are managed by the French labelling body Observ'ER[41], who is responsible for the controlling, auditing and certification of producers and buyers.

7.5 The tendering process

Lille's tender, the 'General management and maintenance of the public lighting system'[42], was published at European level on 19 June 2003 in the European Union Official Journal.

This tender followed a result-oriented approach, offering the bidders a large margin of discretion within defined key objectives. Instead of providing details about how to do the tender, there was more of a focus on the aims and results. Neither quantitative objectives nor specific thresholds were given, leaving it up to the market to develop solutions. In order to push the market through its full potential, the City of Lille decided to engage and send strong signal to the market.

It is mainly at the evaluation stage (award criteria) that the offers were examined and judged by the tender commission (city of Lille's Department of public lighting, public procurement department and HEXA INGENIERIE).

Table 8 Key stages Lille's tendering procedure

Key dates	**Introduction of criteria**
Notification - 24 March 2003: Deliberation n° 03/189 authorising the call for tender - 19 June 2003: Preinformation Notice in the European Official Journal - 29 August 2003: Notice of the Call for Tender **Pre-selection** - 16 October 2003: Opening to the Applications -> 8 application files - 12 November 2003: Reunion of the Tender Commission – Selection of the applicants => 5 bidders selected **Preparation** - 15 January 2004: Tender documents are being sent to the bidders - 18 February 2004: Night tour of the city to review the public lighting asset base with all the bidders	Green criteria included in the tender as general goals to achieve.

40 Green certificates are documents guarantying that the energy supplied comes from renewable sources, and white certificates that a certain reduction of energy consumption has been achieved.

41 Observ'er ('Observatoire des Energies renouvables') is the national representative of the European RECS (Renewable Energy Certification System) organisation.

42 '*Maintenance globale et maintien a niveau des ouvrages d'eclairage public*'

Key dates	**Introduction of criteria**
Examination of the offers by the Tender Commission - 17 March 2004: Meeting of the Tender Commission – official opening of the offers (5 application files) - 14 April 2004: meeting of the tender commission – stages report, presentation of the offers, examination of the questions to ask to each bidder **Interviews / dicussions stage** - 4 May 2004: Reunion of the tender commission – audition of each bidder during 90 min to present the bid and answer questions. **Awarding the contract** - 7 July 2004: the contract is being awarded to the group ETDE/SOSIDEC - 9 September 2004: Notice of the award - 1° October 2004: Beginning of the contract period for 8 years	Evaluation of the offers according to the award criteria, including detailed green criteria

7.5.1 Developing the green procurement criteria

Given the level of technical knowledge required to develop the environmental criteria, the two municipal departments, the Department for Public Tenders and the Department for Public Lighting Services, involved in the tendering procedures sought external expert assistance. This was provided by the consultant firm HEXA INGENIERIE, based in Douai, France. HEXA INGENIERIE helped the City Departments develop the green criteria according to the political objectives of the City, addressing issues such as energy efficiency, renewable energy, reduction of light pollution, and use of recycling material. The consultant firm was also part of the tender commission, and hence participated in the examination of the offers provided by the bidding parties.

The aims of the tender were defined in the call for tender, it was up to the bidders to suggest and describe the means of achieving these results. They had therefore to include in their bids a detailed technical document containing the specific technical terms and conditions of the service they wanted to offer.

After submitting their bids, the bidders were also invited, one by one, to technical interviews, to discuss the technical means of the contract with the tender commission. This particular stage of discussion, which took place on the 4th May 2004, was also an opportunity to improve and complete the reviewed offers. Between the publication of the tender and the announcement of the successful bidder was a period of 18 months.

7.5.2 The green procurement criteria

As previously mentioned the intention of the City of Lille was to give indications rather than defining specific quantitative specifications. The green criteria included in the tender were:

- Reduction of the energy consumption;
- Optimal use of renewable energies;

- Improvement of life quality: suppressing excessive lighting and light pollution (e.g. by taking off globe lamps, to avoid directing light upwards into the sky)
- Use of recycling materials (lamps, masts, apparatus, wall brackets, etc.);
- Replacement of obsolete materials;
- Development of new innovating eco-technologies.

As far as the pre-qualification of the suppliers is concerned, the tender commission essentially focused on the experience of the supplier to provide this kind of maintenance services, and no "green" criteria were required to participate in the tendering process.

The bidders were allowed to submit a maximum of two variants of the offer on the condition that they wouldn't exceed the fixed annual budget.

It was only at the evaluation stage on 17 March 2004, that the Tender Commission presented its detailed attribution scheme, including the green award criteria chosen for the evaluation of the bids and the corresponding attributive points (see Table 10). The table below is an extract of the award scheme table used by the Tender Commission to evaluate the results. The original document contained 3 parts ("Reconstruction and commitments to the results"; "Energy"; and "Maintenance and quality of the service"), each of them divided into several sections and subsections. In the table below, only the sections and subsections containing or corresponding to green criteria are appearing, also leaving aside the criteria corresponding to other aspects of sustainable development than the environment.[43]

Table 9 Green criteria used for the award phase

Sections and green award criteria used	Points
1. RECONSTRUCTION AND COMMITMENTS TO THE RESULTS:	**/140**
• **Reconstruction of the asset base:**	**/90**
• waste management policy	/5
• **Implementation of innovating and cost-effective equipment with positive impacts on sustainable development:**	**/40**
• Quality, choice and life-cycle of the equipment	/15
• Reduction of light-pollution	/10
• Technologic innovation	/15

[43] As the aim of the tender was to integrate the goals of the City's Agenda 21 into Public Lighting, the award criteria also contained many ethical and social considerations, i.e. good governance, equity of lighting in the different districts, local development, development aid, etc.

Sections and green award criteria used	Points
2. **ENERGY**	**/100**
• **Commitment of the bidder towards the reduction of energy consumption**	**/50**
• Commitments in terms of kWh consumed /year	/10
• Year of implementation of the commitments of consumption in kW	/20
• Operation mode of the installations	/7
• Critical examination of the existing asset base	/5
• Power reduction	/5
• Control of the applied power	/3
• **Commitment of the bidders towards the provenance of the electricity and towards sustainable development**	**/35**
• Suggestions for handling sustainable development	/20
3. MAINTENANCE AND QUALITY OF THE SERVICE	**/60**
• **Assistance and attendance on the City's sustainable development projects**	**/8**
• integration and environmental considerations	/4
• suggestions for communication	/4
TOTAL (IN BOLD)	**300**

With regards to lamps containing toxic content, the tender documents specify that the supplier had to recycle them according to a specific procedure and to provide justification to the public lighting service.

The main tender document itself did not include any specific targets in the green criteria; however, bidders were directed to a number of related documents e.g. Lille's charter for clean construction works. They include a series of recommendations for the disposal of waste, the use of environmentally friendly packaging and recyclability of material as well as materials that should be avoided. For instance, suppliers are not allowed to use PVC for the lighting envelope. The bids also had to comply with the local urban planning documents and road regulations as well as the recommendations of the French Agency for Lighting (A.F.E).[44]

7.5.3 Awarding the contract

Following the evaluation phase, ETDE was awarded the contract, mainly because sustainability was integrated throughout the whole offer, according to a transversal approach. The strong points of the offer were especially the commitments taken by the

[44] The A.F.E (*Agence Francaise de l'Eclairage*) produces recommendations and technical guides on lighting, and among others a collection of general and technical recommendations for the street lighting sector.

service provider towards environmental performance (i.e. achieving 40% of energy savings by the end of the contract, using 25% of renewable energies) and reconstruction.

Following the award phase, the commitments made by the awarded service provider were inserted in the contract as contract clauses.

7.5.4 Contract management

ETDE is responsible for the management of the public lighting services. This is a public service delegation: the City stays in charge of the public lighting service and owner of the assets but delegates the management function to one private society for the contracting period. During the contracting term, ETDE is responsible for the operation of the whole street lighting systems, the management, and the energy supply (the energy producer being the main national supplier group EDF, at least for the period 2004-2008), the reconstruction of the assets and the replacement of the lamps.

As it was specified in the tender documents, the service is regularly evaluated and discussed with the City's Department for Public Lighting:

- Regular discussion and continuous evaluation of the results, compliance with the results engagements: correction actions when the results are not satisfying or do not correspond to the City's expectations;
- Yearly reports to the City council are undertaken.

In order to encourage the participation of citizens, the actions are also presented at the annual meeting for Saint Lucia's Day, the Feast of Light, where all municipal elected officials and district councils are invited to help choosing the coming year's program.

7.6 Results of the tendering process and key factors that triggered the market for the Eco-Technology

The sustainable management of public lighting systems is a complex service package, which represents a new "eco-solution". It is only in response to Lille's tender that the service provider ETDE decided to concentrate its management strategy of street lighting systems on environmental performance, and to transform its existing practices into a new green service package. With a value of 32,5 million EUR and a contract period of over 8 years, the tender presented a very attractive service package, including many components (maintenance, reconstruction, and operation of the system's energy management) and involving several suppliers and subcontractors. It was certainly a challenge for suppliers to identify the best strategy to modulate the different components in line with the new environmental strategy. ETDE was thus very motivated to be awarded Lille's contract. Apart from the economic advantage of a long term contract for the exclusive management of the whole street lighting, the tender also offered them a key business advantage in the entire north region, at the time the only area of France where they were not yet well positioned.

Three years after the publication of the tender, the public lighting system of Lille is increasingly attracting interest at the national and international level. The good practice example is also prominently showcased in the French National Action Plan on GPP.

The main motivation for Lille to “green” the tender was the potential energy savings to be achieved. Following the first assessment after three years, it is very likely that by the end of the contract, the French city will have made at least 42% energy savings through energy-efficient street lighting. Following their Agenda 21 strategy, including several major campaigns and around 500 activities in the field of sustainable development, this tender definitely strengthened Lille’s position as one of the French leading cities in the field of sustainable procurement.

A few French cities, including Lille’s neighbouring municipalities, for example, Bondues, Saint-André and Marquette-Lez-Lille, but also cities from other French regions, for example, Rouen, Sevran, Nevers and Fougères have already published similar tenders and signed contracts according to the same approach for the sustainable management of their public lighting systems. Of course, many cities are also interested in purchasing such services, and still are preparing their green tender based on Lille’s pioneering approach, for example, the case of Marcq-en-Bareuil and Villeneuve d’Asq.

Lille’s call for tender was setting environmental performance as a priority, and included strategic aims such as the use of renewable energies, a cut in energy consumption, and avoiding light pollution. However, since the tender was result-oriented with generic criteria, the market was free to develop an appropriate offer. The dialogue between the contractor and supplier engaged in the tender process was also a key factor that pushed the market to its full potential, and encouraged the creativity of the bidders.

Even though all of the bidders had made the effort to “green” their offer, ETDE was the one who put more emphasis on environmental performance. It committed to achieving 40% of energy saving by the end of the contract period and to reinvest all the savings into the reconstruction of the assets (and replacement with new energy-efficient equipment), eco-technologies, and into environmental projects in the fields of public lighting (i.e. technology transfer to Senegal or awareness-raising actions).

The contract value was fixed at 4,4 millions EUR per year. According to the contract, potential extra costs caused by the improvement of the service would not be passed on to the City of Lille. ETDE performed a life cycle costs analysis to prepare its green offer before the tender, but an analysis is being undertaken regularly to allow a continuous improvement in the strategy. At the beginning of the contract period, ETDE in fact had to bear some additional costs - in comparison to its standard management practices -, mainly due to the purchase of renewable energies (small hydro, solar), which are on average 25% more expensive than non-green energy. Concerning the equipment (energy-efficient lamps), the prices are 10 to 20% higher than standard equipment. However, over the medium term, the increase in costs is compensated by the savings made through energy-efficiency measures:

- a reduction of 1,3 million Euros in Lille's running costs from 2005 on (- 47% of 2004's budget)
- The energy consumption was reduced by more than 30% in average (42% foreseen by the end of the contract period): from 20,6 million kWh in 2004 to 14,3 million kWh in 2006.

The new eco-solution gave ETDE a temporary advantage on the market, and helped the company obtain the same type of contract for some of Lille's neighbouring municipalities, thus positioning itself in northern France. ETDE's strategy was soon replicated by many of its competitors. The example of Lille's contract with ETDE showed clearly that it is possible and profitable for such service providers to focus their strategy on energy efficiency and environmental performance. More and more suppliers are now offering green services for the management of public lighting systems, especially the companies that participated in Lille's tender, and learned from the process. Those companies have since made efforts to adapt and "green" their offers as well.

According to ETDE, the tender and the changes it caused on the public lighting market also had impacts on other sectors. For example, the 'virtuous circle of energy-efficiency' and reinvestment at the heart of ETDE's offer expanded in the Bouygues group, and the approach is being implemented in lots of their public contracts, such as public building and construction.

According to the 'virtuous circle' of continuous improvement through gains and reinvestments on which the new eco-solution is based, ETDE is continuously investing in new eco-technologies as well as improving the new technology in use (electronic power reducer; digital lighting system, etc). The Department for Public Lighting and the service provider are regularly discussing the possibilities and the availability of new eco-efficient products on the market, and continuously testing new green products and services.

7.7 Barriers and difficulties

No major barriers or difficulties have been mentioned; neither by the supplier nor by the public service provider. As a minor difficulty, ETDE spoke about the energy market in Europe: though the national electricity market is now partially open, only few companies (EDF) control the market. Only five out of 36 suppliers currently offer green electricity in France. In the northern part of France, the offer of green electricity is even more limited, making for electricity operators to identify their suppliers, to manage the prices etc.

7.8 Outlook

There are now 5 years left until the end of the contracting period (2004-2012). By then, all the lighting equipment will have been replaced by energy-efficient equipment; the City is expecting to have made at least 42% savings in energy consumption for public lighting, in comparison with the reference year of 2004.

There are 7 millions lighting units in France. The electricity used for public lighting represent 1,5 billion kWh a year, that is to say 1,2% of the country's total consumption in electricity.

7.9 Contacts

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7.10 Summary

Case study 4: Sustainable Procurement of the Public Lighting Service of the City of Lille, FRANCE	
Purchasing authority	City of Lille, Public Lighting Department
Subject matter	Tender for the general maintenance of the municipal street lighting services
Environmental criteria required	The intention of the City was to give indications rather than defining specific quantitative specifications. The green criteria included in the tender were : • Optimal use of renewable energies • Waste management policy during the reconstruction phase and use of recycled materials • Environmental impacts of the equipment implemented (life cycle costs, reduction of light pollution) • Development of new and innovative eco-technologies • Reduction in energy consumption (commitments in terms of kWh/year, duration to achieve commitments, power reduction and power control) • Suggestions for handling sustainable development • General integration of environmental considerations • Communication, training and awareness raising The bidders were invited to bring their offers in line with these general objectives, and to present their commitments (i.e. energy savings achieved by the end of the contract period, percentage of renewable energy to be used, etc.) and suggestions (ideas on how to integrate sustainable development to the service) during the interview stage. The main tender document also referred to a number of related documents the offers had to comply with, such as Lille's charter for clean construction, the local urban planning documents and road regulations, etc.

The new eco-solution	The management of Lille's street lighting services represented an "eco-solution" including many components (maintenance, reconstruction, operation of the systems, energy management). Lille was the first city in France to hand over control of its lighting system to a private company and at the same time requested that this company provide an eco-solution. Lille's eco-solution comprised the following innovative aspects: • Integration of green criteria throughout the implementation of the tender • Continuous improvement through a 'Virtuous circle scheme' of energy savings and reinvestment into eco-efficient equipment • New environmental technology tested and applied • Continuous auditing and monitoring system of the strategy and management of the lighting system
Key drivers for triggering the market	• Lille's political commitment to sustainable development in the framework of its Agenda 21 activities, as well as its charter for sustainable construction. • The City's integrated approach of sustainable procurement to all public tenders (public lighting being the first tender of a substantial size). • Motivation of the supplier, ETDE, to be awarded the contract involving a budget of 35,2 million EUR and a long commitment over 8 years. • ETDE has a long history of experience in the management of public lighting management in general and seized the opportunity to create a cost-efficient eco-solution by investing from the start into energy-efficient equipment. • General context of the progressive liberalisation of the energy market and the ability for French local governments, since July 2004, to choose their electricity supplier and also the origin of the energy they consume. • France's commitments to achieve a part of the 21% target of electricity produced from renewable sources (RES-E) by 2010. • Perspective of the energy certificates scheme, which was to be implemented in 2006 in France.
Impact on supply side	• Lille's public lighting system is increasingly attracting interest at the national and international level. Several other French cities have replicated Lille's tender, while others are planning or considering it. • The first mover advantage the supplier (ETDE) benefited from did not last very long, since its strategy was soon replicated by many of its competitors, which have since made efforts to adapt and "green" their offers as well. • According to ETDE, the tender also had impacts on other sectors. For example, the virtuous circle of energy-efficiency and reinvestment at the heart of ETDE's offer expanded in the Bouygues group. • The contract includes a continuous investment in new ecotechnologies and an improvement of the new technology in use (i.e. electronic power reducer; digital lighting system). They are regularly discussing with the City the opportunities and the availability of new eco-efficient products on the market, and continuously testing new green products and services.

Cost implications	• The supplier had to bear some additional costs concerning the purchase of electricity from renewable energy sources (on average 25% more expensive) and of materials (energy efficient lamps with prices 10 to 20% higher). However, this increase was not passed on to the procurer since the contract budget was blocked by 4,4 million EUR annually, and since these additional costs were balanced with greater savings in energy. • For the City of Lille, global costs went down by 5% in comparison with their last contract, mostly thanks to the savings achieved in running costs (42% savings in energy consumption).
Lessons learned	• Tenders on performance-based specifications allow more scope to push the market to its full potential, and encourages bidders to be more creative. • Handing over the entire street lighting services to one supplier is a challenge for a City, but proves to be a good way to implement an efficient eco-solution which integrates the City's environmental objectives throughout all aspects of the service package.

8 Case study 5: Sustainable Procurement of Low Emission Buses for Göteborg, SWEDEN

Figure 11 Photos: Vasttraffik/Ingemar Carlson

Prepared by ICLEI – Local Governments for Sustainability

Thanks to:

Lennart Löfberg (Västtrafik Göteborgsområdet AB), Peter Danielsson (Volvo),
Pierre Modini (Göteborgs Spårvägar AB)

8.1 Background information

The city of Göteborg, located on the west coast of Sweden, is the country’s second biggest city. The population of the Göteborg region is 750 000 with approximately 470 000 people living within the city boundaries. Non-commercial traffic has been growing steadily at an annual rate of 2-4% in the urban area and 4-6% in suburban areas.

Trafikkontoret (Traffic and Public Transport Authority) regulates the City’s public transport system, which since 1991 has been the “purchaser-operator” within the City administration. In 1999, the Västtrafik public transport authority was formed at the regional level and this authority has a subsidiary, Västtrafik Göteborgsområdet, for the Greater Göteborg Area. Västtrafik Göteborgsområdet now undertakes planning and tendering for Göteborg.

8.2 Information on the product

Various low emission buses are in use in the Göteborg region. In 1998, the city bus fleet consisted of 117 diesel buses with CRT-filters, 94 diesel buses without a filter and 38 biogas or natural-gas-fuelled buses. Today Västtrafik operates a total of 93 Compressed Natural Gas (CNG) buses, 10 biogas buses and 32 ethanol buses. However, the biogas and ethanol buses are not used in Göteborg but in smaller towns in the south-west of Sweden. Around 40 different bus operators currently have contracts with Västtrafik AB. Around half of the total bus traffic commissioned by Västtrafik takes place in the Greater Göteborg Area.

8.3 The new Eco-Technologies

One of the effects of the procurement practises in the Göteborg region is that companies were encouraged to develop vehicles using recent Eco-Technologies. The development of particle filters, engines adapted to high blends of agro-fuels, natural gas, LPG (liquefied petroleum gas), hydrogen, electric motors and hybrid vehicles combining combustion engines with electric motors was stimulated. Göteborg is seen as a forerunner with regard to starting to implement the clean vehicle procurement obligations of the European Commission.

8.4 The drivers responsible for procurement of the buses

There have been overarching national, regional and local political goals of achieving a sustainable society and a sustainable public transport system in Sweden for many years. In addition, national law in Sweden has required the provision of public transport services to be tendered since the early 1990s. These factors are reflected in the transport plan for Göteborg, which formulates a vision based on competition and sustainability. Over several years, the transport authority has tried to develop transport infrastructure in a way that makes best use of existing facilities in order to minimise the use of the private car. Specific aims are to:

- Improve the local environment by reducing traffic sources and other forms of pollution;
- Improve the overall quality and accessibility of public transport, as well as its safety record.

To achieve this, Göteborg aims to develop the public transport system further and to make it more efficient. Bus operation is very important. The environmental goals are intended to be achieved with the use of more natural gas/biogas powered buses, using latest Eco-Technologies and the application of an environmental protection zone in the city centre.

In Göteborg the objective when implementing national law at the local level has been to use the new tender specifications and contract agreements to:

- Increase the quality and frequency of public transport services;
- Achieve a better relationship between public subsidies granted and transport provided;
- Increase environmental standards;
- Enable small bus companies to access the market; and
- Allow public as well as private companies to participate in tenders (there is no intention to privatise).

8.5 The tendering process

The first call for tender by Trafikkontoret of the public transport system was issued in 1992, which covered one third of the bus operation. The second and third followed in 1996 while the remainder occurred in 1998. Following the introduction of Västtrafik as the regional traffic authority, subsequent tenders have been made, such as that in late 2003 which awarded the contract for bus transport within the region to Göteborgs Spårvägar AB (a transport company wholly owned by, but independent of, the City of Göteborg). The latest tender was in 2005 for the Göteborg regional transport area. Bus operations are carried out by private enterprises, but Västtrafik, as the region's public transport authority, sets the requirements and issues the calls for tender. The bus suppliers sell the buses to the operators – such as the service provider Göteborgs Spårvägar AB – who acts as both purchasers (from the bus suppliers) and suppliers of the service to the region – which is part of the tender requirements. Göteborgs Spårvägar AB passes on the tender requirements to their suppliers, and chooses a supplier who can best fulfil these obligations.

8.5.1 Developing the green procurement criteria

The sustainable development focus is introduced at the very beginning of the procurement process. Before Västtrafik act, they first must consult their annual policy document for future tenders/bids and then take up the question of sustainability. Parallel to this, the owners of Västtrafik – the local authorities of the region – are consulted about the environmental needs they consider applicable. This forms the foundation of the requirements / demands issued to suppliers.

8.5.2 The green procurement criteria

In order to achieve the objectives outlined on the previous pages, two strategies have been followed. The first targeted environmental emissions:

- Strict emission standards were achieved by including the requirement as part of the technical specifications of the call for tender. The requirements for NO_x and particulate matter were already strict in Sweden and in 1999 the City of Göteborg specified that NO_x levels would have to be below 5 g/kWh and particulate matter below 0,11 g/kWh. These requirements reflected the EURO 3 standards, which applied to all fifteen EU Member States since 2001. While these standards were required, some flexibility was left on how to achieve them. Between 2006 and 2008 the requirements will adjust to incorporate the EURO 4 and 5 standards respectively;
- Previous specifications required that by 2000, 10% of fuels would have to come from renewable resources and that the maximum age of the bus fleet should not be more than 10 years, with the average age being no higher than 5 years old. Contracts prescribe that all new buses shall be equipped with diesel particulate filters. Older diesel buses that enter the “environmental zone” of the inner city of Göteborg must be retrofitted with particulate filters in order to meet the local exhaust regulations that apply to that zone.

In the second approach, incentives to strive for better results than demanded were set:

- The tendering authorities have consistently made attempts to advance the quality of results by opting for challenging target setting. This is not necessarily a scientific process, in the sense that decisions have been made deliberately to advance the science and force new technological developments. In the award phase of such tendering processes, companies who could deliver emissions reductions in advance of the target were rewarded with bonuses. Volvo says that such tactics have in turn resulted in aggressive product development on their part as a supplier. The motivation for staying ahead of the game is higher, as the company has a better chance of securing future contracts and receives a good public profile for its innovation and eco-efficiency as a consequence. As similar initiatives have occurred in other Swedish cities, this also reflects the need of companies such as Volvo to respond to their consumers;
- Awarding 25% of the income generated from transport fares to the operator set incentives for good quality service. This differs from standard practice, which is for all income generated from fares go to the authority and for operators to be paid according to the number of operated vehicle kilometres; and

- The tender process allows potential bidders about 60 days to react and/or modify their approach before calculations (with an extra 30 days in summer). Within the 60 days, potential suppliers have the right until 14 days prior to the submission deadline to ask written questions regarding all aspects of the tender. Västtrafik must respond to any such demands. After the deadline passes, bids cannot be altered except in the case of urgent clarifications.

The key people involved in the development of the criteria and the nature of those criteria were officials at the public transport authority and through sources such as consultants.

8.5.3 Contract management

The bus operators' present annual written reports document how all the environmental requirements of the tender specification have been fulfilled. Some random testing of a few vehicles has also been done, but not every year. The operators have met mostly all the environmental requirements. Also, contracts containing specific targets were used which set certain performance goals and procedures of monitoring their achievement, for example an independent market research institute assesses the quality of service.

8.6 Results of the tendering process and key factors that triggered the market for the Eco-Technology

One of the key elements to achieve real improvements in raising standards for low-emission buses was the continuos competitive tendering of Västtrafik. This secured that the bidding suppliers were encouraged to achieve low emission levels earlier than the respective Directives for emission standards of heavy vehicles come into force.

The tendering proceedings especially fostering new Eco-Technologies while at the same time not being prescriptive on the way on how to achieve this, together with the included environmental standards were key factors to successful triggering of the market for products with Eco-Technologies. The inclusion of environmental criteria in the tendering process contributed to getting buses on the road meeting EURO 3, EURO 4 and EURO 5 standards earlier than the legal requirements. Also the aim of increasing the share of renewable resources, hence decreasing the reliance of fossil fuels, was achieved two years earlier than required by the tender specification in Göteborg. Furthermore, in 1998, fuels from renewable sources covered 15% of total fuel consumption (compared to 10% in the tender specification).

These demands together with similar demands from other Swedish cities primarily have resulted in achieving a critical mass that strongly supports a business case for the use of low emission buses.

The winning service supplier – Volvo – not only maintained this practice but also made it even more stringent and changes were implemented in a number of other supply contracts held by the supplier. The full cost increase was passed on to the procurer. The costs increased by 10% of the total bus cost. This cost was sustained until the next generation of technology was implemented. The increase in costs is attributed as follows:

- 50% were incurred in the development of the technology; and the other
- 50% in new components.

Within the Volvo Group, they have a set of environmental requirements applicable to all their suppliers. There is a questionnaire that has to be completed and a scoring system in place to evaluate their environmental performance. The outcome is very positive since both Volvo and the suppliers have a better control and follow up of the environmental performance. Volvo has a list of forbidden or restricted chemicals/ materials and an environmental management system is in operation.

Volvo suggests that the first-mover advantage i.e. that they were the first company to green their bus fleet in response to the tender has been a positive outcome of the tendering process. They did this because the home market supports and demands innovation and this provides a platform for development of higher standards and strengthening of the brand’s domestic and international image.

This approach has succeeded in its attempt to influence market supply and there has been a guarantee for the supplier that this policy of procurement practices will be sustained.

Following Göteborg’s tenders other public-sector buyers across Sweden have also influenced the market in Sweden. Volvo stated that once a critical mass has been reached, with similar demands coming from similar cities, the business case for low emissions buses becomes sound. Supporting this claim, figures from another company Scania AB show that the company sold 283 buses to Swedish cities in the first two months of 2005, 123 of which were ethanol-fuelled products for the Stockholm transport authority. Stockholm, like Göteborg, has consistently set ambitious emissions-related targets. Other Swedish cities, such as Malmö and Uppsala, pursue similar objectives.

According to Volvo, this practice has influenced the wider market demand, which has started to change and now cities in several EU countries carry out similar practices. The key changes regarding the purchasing behaviour of customers are more focus on environmental features in general and a willingness to pay a premium for these features. Customers of public transport are also noticing the environmental improvements gained by improved bus technology and an increase in social standards.

8.7 Barriers and difficulties

There have not been specific barriers or difficulties related to the implementation of green criteria into the tendering process with the aim to trigger the market of new Eco-Technologies. Nevertheless, experiences with green tenders developed steadily since 1992, sometimes struggling with difficulties in the availability of the desired products and sometimes taking time to adapt the environmental policies to the daily work of the procurement departments.

8.8 Lessons learned

For those cities willing to undertake a similar project, it is recommended to set specific emission levels as a criterion when tendering, not demand a specific technology, for example, demanding diesel fuelled buses. The body which sets the tender will theoretically then only receive the reduction in emission levels, whilst the suppliers must then provide the adequate technology to achieve the reduction. Competition in Göteborg has shown to bring major cost savings in traffic operation whilst improving social and environmental standards and increasing the number of passenger by 7,5%. Financial savings were used to increase the service level and to reduce ticket prices. Competitive tendering has also enabled modernisation of the bus fleet.

8.9 Outlook

In a related development, the European Commission has proposed new legislation aimed at contributing towards the creation of a market for “clean” vehicles in order to reduce pollutant emissions and make energy savings in the transport sector. By requiring public bodies to earmark a quarter of their annual procurement requirements to such vehicles, the new European rules will make it possible to give manufacturers the assurances they need in order to develop these vehicles for a wider market. At present, the technologies needed remain more expensive than conventional vehicle manufacturing technologies.

Consequently, the Commission proposal provides that public bodies (state, regional or local authorities, bodies governed by public law, public undertakings and operators contracted by public bodies to supply transport services) will be obliged to allocate a minimum quota of 25% of their annual procurement (purchasing or leasing) of heavy-duty vehicles (with a weight greater than 3,5 tonnes) to ‘enhanced environmentally friendly vehicles’ as defined in the European Performance Standard (EEV). Heavy-duty vehicles include buses and most utility vehicles, such as refuse collection lorries.

The Commission proposal on the procurement of clean and energy efficient vehicles has been dropped in the meantime, because no agreement was achieved in the European Parliament. Nevertheless, the Directorate-General Energy and Transport is now working on a new initiative that is likely to be proposed in the end of 2007.

If adopted and implemented the Directive could increase the demand for less-polluting vehicles that make it possible to support their development by manufacturers establishing a viable market by creating sufficient demand to generate economies of scale. Former studies carried out by the Commission have demonstrated the positive impact on the competitiveness of the European motor industry. The supply of ‘clean’ vehicles by manufacturers will become an important factor in competitiveness given the urban pollution problems encountered by a number of countries experiencing rapid economic growth.

8.10 Contacts

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Volvo
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Göteborgs Spårvägar AB (bus operator)
Pierre Modini
Sweden
E-mail: pierre.modini@sparvagen.goteborg.se

8.11 Summary

Case study 5: Sustainable Procurement of Low Emission Buses for Göteborg, SWEDEN	
Purchasing authority	Västtrafik Göteborgsområdet, for the Greater Göteborg Area
Subject matter	Delivery of low emission buses partly with alternative fuel technologies
Environmental criteria required	Two strategies have been followed. The first targeted environmental emissions: • Strict emission standards were achieved by including the requirements as part of the technical specifications of the call for tender. • Between 2006 and 2008 the requirements will adjust to incorporate the EURO 4 and 5 standards respectively; • Previous specifications required that by 2000, 10% of fuels would have to come from renewable resources and that the maximum age of the bus fleet should not be more than 10 years, with the average age being no higher than 5 years old. • Contracts prescribe that all new buses shall be equipped with diesel particulate filters. • Older diesel buses that enter the "environmental zone" of the inner city of Göteborg must be retrofitted with particulate filters. In the second approach, incentives to strive for better results than demanded were set: • In the award phase of such tendering processes, companies who could deliver emissions reductions higher than the targeted amount (i.e. specified in the technical specifications) were rewarded with bonuses.
The new eco-technology	One of the effects of the procurement practises in the Göteborg region is that companies were encouraged to develop vehicles using recent Eco-Technologies. The development of particle filters, engines adapted to high blends of agro-fuels, natural gas, LPG (liquefied petroleum gas), hydrogen, electric motors and hybrid vehicles combining combustion engines with electric motors was stimulated. Göteborg is seen as a forerunner with regards to starting to implement the clean vehicle procurement obligations of the European Commission.

Key drivers for triggering the market	• The continuos competitive tendering of Västtrafik secured that the bidding suppliers were encouraged to achieve low emission levels earlier than the respective Directives for emission standards of heavy vehicles came into force. • The tendering procedure fostered the development of new Eco-Technologies but at the same time was not prescriptive on the way on how these should be achieved. • The inclusion of environmental criteria in the tendering process contributed to getting buses on the road meeting Euro 3, Euro 4 and Euro 5 standards earlier than the legal requirements. • The aim of increasing the share of renewable resources, hence decreasing the reliance of fossil fuels, was achieved two years earlier than required by the environmental tender specifications used in Göteborg. • These specific tenders together with similar demands from other Swedish cities have resulted in achieving a critical mass that strongly supports a business case for the use of low emission buses.
Impact on supply side	• Following the Göteborg tender, the winning service supplier - Volvo Group - developed a set of stringent environment requirements which was applied to all their suppliers. • Volvo stated that once a critical mass has been reached, with similar demands coming from similar cities, the business case for low emissions buses becomes sound. • Supporting this claim, figures from another company Scania AB show that the company sold 283 buses to Swedish cities in the first two months of 2005, 123 of which were ethanol-fuelled products for the Stockholm transport authority. • Following Göteborg's tenders other public-sector buyers across Sweden have also influenced the market in Sweden.
Cost implications	The full cost increase was passed on to the procurer. The costs increased by 10% of the total bus cost. This cost was sustained until the next generation of technology was implemented. The increase in costs is attributed as follows: • 50% were incurred in the development of the technology; and • the other 50% in new components. Competition in Göteborg has shown to bring major cost savings in traffic operation whilst improving social and environmental standards and increasing the number of passenger by 7.5%. Financial savings were used to increase the service level and to reduce ticket prices.
Barriers and difficulties	• No specific barriers or difficulties related to the implementation of green criteria into the tendering process. • Some difficulties were found regarding the availability of the desired products • Some time was needed to adapt the environmental policies to the daily work of the procurement departments.
Lessons learned	• It is recommended to set specific emission levels as a criterion (target) when tendering and not demand a specific technology, for example, demanding diesel fuelled buses. Subsequently, it is then up to the suppliers to provide the adequate technology to achieve the level of emissions specified. • Competitive tendering has also enabled modernisation of the bus fleet.

9 Sources

9.1 Sources case study 1

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- Interview with Wolfgang Späth, Björn Vitt, Sabine Groß and Rüdiger Wendt (all Alstom LHB GmbH), 4 June 2007, Salzgitter
- Telephone interview with Hug Engineering AG Switzerland, 31 May 2007
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9.2 Sources Case study 2

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9.3 Sources Case study 3

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- Interview with Markus Simon (Regent Beleuchtungskoerper AG) Zurich, Switzerland, 25 May 2007
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- Regent Lighting - http://www.regent.ch
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9.4 Sources case study 4

Meeting in Lille's City hall, 30 May 2007 and interview with:

- Danielle POLIAUTRE, Deputy Mayor for the Quality of Life and Sustainable Development, City of Lille.
- Christophe MONTELIMARD, Operation Director in charge of Lille's public lighting, ETDE
- Eric Decaillon, Head of Public Lighting Department, City of Lille

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9.5 Sources case study 5

- Telephone interviews and questionnaire response from Lennart Löfberg, Vice VD/Affärsområdeschef Stadstrafik, 10 January 2006 and 24 May 2007
- Telephone interview and questionnaire responses Mr Pierre Modini, Göteborgs Spårvägar AB, Sweden, 12 January 2006
- Questionnaire responses from Peter Danielsson, Volvo, 20 January 2006
- Västtrafik Göteborgsområdet AB, Tel. 031-629244 0708-629244, Besöksadress: Folkungagatan 20, Box 405, 401 26 Göteborg, Sweden.
- Ragnar Domstad, Consultant on public transport, "Västrafik GO", Truelsväg 11, S-433 46, Partille, Sweden, ragnar.domstad@spray.se.
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10 Appendix 1: Questionnaires for the Sustainable Procurement of Public Railcars with the Eco-Technology 'particle filters' for the Taunusbahn, Case Study

10.1 Questionnaire purchaser

Name der verantwortlichen Person für die Ausschreibung	Volker Sparmann (verantwortlich) Gerolf Wogatzki und Joachim Michels (Ausführung)
Name der Organisation	fahma GmbH
Was (Produkt/ Service) wurde ausgeschrieben?	Dieseltriebzug
Wie lautet der Name/ Titel der Ausschreibung (Betreff)? (*Bitte fügen Sie eine Kopie der Ausschreibung bei.*)	D-Hofheim am Taunus: Eisenbahn- und Straßenbahnpersonenwagen und Oberleitungsbusse, 2004/S 240-206797
Wann wurde die Ausschreibung veröffentlicht (Datum)?	2.12.2004
Kontaktangaben (Adresse, Telefon, E-Mail)	Dipl.- Ing. Joachim Michels Alte Bleiche 5 65719 Hofheim am Taunus Tel. (06192) 294-660 Fax. (06192) 294-665 info@fahma-rheinmain.de www.fahma-rheinmain.de
Wir würden uns freuen, Ihre Kontaktangaben in der Fallstudie benutzen zu dürfen, um zu einem besseren Erfahrungsaustausch beitragen zu können. Sind Sie damit einverstanden?	☒ Yes ☐ No

Hintergrundinformationen

Wie hoch ist das Gesamtbudget für Beschaffung ihrer Organisation/ Abteilung?	68 Mio. (Odentalbahn), 27 Mio. (Taunusbahn), 15 Mio. (Odentalbahn Aufstockung) = 110 Mio. seit 2000
Wie hoch ist der Anteil umweltfreundlicher Beschaffung (in Proxent)? (*Bitte schätzen.*)	45 Mio. von 112 Mio. erfüllen stage IIIa + Russpartikel stage IIIb; Odentalbahn II soll stage IIIb komplett erfüllen (Ausschreibung geplant für 2007)
Was für Erfahrungen haben Sie mit grüner öffentlicher Beschaffung?	Bisher zufällig umweltfreundliche Kriterien eingebaut. Aus Gutachten (green delta) Kriterien zu Material, Treibstoffverbrauch eingebaut. RPF optional verlangt. Für Triebwagen wird ungern neu entwickelt (zu geringer Absatzmarkt), sondern eher

	bestehende Komponenten (zB LKW Motoren) angepasst und aufgerüstet. Die politische Debatte um Feinstaub Anfang 2005 hat maßgeblich zum Einbau der RPF beigetragen.

Informationen zum Produkt

Wieviel wurde eingekauft? (*Anzahl und Gesamtkosten in Euro*)	10 Triebwagen ALSTOM CORADIA LINT H, Gesamtkosten 27 Mio. Euro
Wie hoch ist die Verfügbarkeit des Produkts auf lokalen, regionalen und nationalen Märkten?	Lokaler Markt: nicht zutreffend Regionaler Markt: nicht zutreffend Nationaler Markt ☐ niedrig ☒ mittel ☐ hoch Internationaler Markt: 2 von 7 Bietern Durchschnittlich 2 Jahre Lieferzeit
Haben Sie vergleichbare Daten (zusätzliche Kosten oder Einsparungen) für umweltfreundliche und konventionelle Produkte? (*Wenn verfügbar fügen Sie bitte Daten zu den Lebenszykluskosten ein.*)	45.000 Euro pro Filter (= 900.000 insgesamt, 2x10 Filter) ca. 3% Mehrkosten Verbauch - vorraussichtlich gleichbleibend Wartungskosten: geringer Mehrbedarf (vernachlässigbar) durch jährliche Filterreinigung

Die “Zugpferde” für umweltfreundliche Beschaffung

Was waren die Hauptgründe, bestimmte umweltfreundliche Produkte auszuschreiben? Gab es politische Unterstützung? Andere Gründe?	Diskussion um Feinstaub, Landrat Hoch-Taunus (wohnhaft entlang der Strecken) setzt sich für Partikelfilter ein Neue Partikelstrategie Frankfurt: Einfahrt in City nur mir IIIa/b für LKW, noch nicht bei Zügen, aber denkbar)
Hat Ihre Organisation ein politisches Leitbild zu nachhaltiger und/oder umweltfreundlicher Beschaffung? Wenn ja, halfen diese, die Ausschreibung voranzutreiben?	fahma=nein, RMV Klimaschutzstrategie
Hat Ihre Organisation Ziele zu nachhaltiger und/ oder umweltfreundlicher Beschaffung aufgestellt? Wenn ja, halfen diese, die Ausschreibung voranzutreiben?	Grundsätzlich nicht, eher technische Spezifikationen
Hat Ihre Organisation eine Umsetzungsstrategie zu nachhaltiger und/ oder umweltfreundlicher Beschaffung aufgestellt? Wenn ja, halfen diese, die Ausschreibung voranzutreiben?	RPF 1) Wer hat was im Angebot? 2) Abwägung des Risikos bei Vorreiterrolle 3) wichtig: Preisabfrage im Vorwege 4) als Option erwähnt

Der Ausschreibungsprozess

Entwicklung der umweltfreundlichen Kriterien

Wer war an der Entwicklung der umweltfreundlichen Kriterien beteiligt?	fahma, RMV, Betreiber, ext. Berater
Wieviel **interne** Beratung war für die Entwicklung der Kriterien und der Ausschreibung notwendig (z.B. mit Hilfe der Umweltabteilung, der Finanzabteilung, der Energieabteilung, etc.)?	
Wieviel **externe** Beratung war für die Entwicklung der Kriterien und der Ausschreibung notwendig (z.B. Consultants, Ingenieure, andere Kommunalverwaltungen, andere Anbieter)?	Consultants: 1) Green delta studie für Odenwaldbahn als Vorlage vorhanden 2) Die Ingenieurwerkstatt (macht viel zu LCC)
Waren die Anbieter/ Bieter zu irgend einem Zeitpunkt im Ausschreibungsprozess involviert (z.B. Informationsgespräche)?	Verhandlungsrunde: Was ist machbar (mit 4 Anbietern getrennt, Protokoll)

Die umweltfreundlichen Kriterien

Welche umweltfreundlichen Mindestanforderungen haben Sie an die Anbieter gestellt?	Kraftstoffverbrauch LCC System Disposal (ein wenig), recycling erfüllt aber eher durch schwedische Vorlage Weitere s. Lastenheftauszug s. 33ff.
Brauchten Sie bestimmte technisches Wissen, um die Mindestanforderungen aufzustellen?	Ja, durch consultants geliefert
Welche technischen Anforderungen haben Sie gestellt?	Siehe Lastenheft s. 33
Was waren die Auswahlkriterien?	s. Vergabebekanntmachung (VGB) EU
Wurden Kriterien für die Zuschlagsphase verwendet? Wenn ja, welche?	ja, s. VGB EU
Was waren die Vertragsbedingungen?	s. VGB EU
Wurden Hinweise auf Umweltlabel verwendet? Wenn ja, welche?	Nein, nicht gebräuchlich, aber DIN/EN Normen und teilweise Kriterien für noch nicht bestehende Normen
Wurden Kriterien nach der Zuschlagsphase angewendet? Wenn ja, welche?	Ja, RPF als Option
Welche Beweise wurden vom Anbieter eingefordert, um die Anforderungen einzuhalten?	Self declaration + test (incl. penalties), e.g. RPF Messprotokoll, Test Kraftstoffverbrauch

Daten zur Ausschreibung

Wie war der Zeitplan der Ausschreibung?	Startdatum: 1.10.04 Zeit für Vorbereitung: 2 Monate Veröffentlichungsdatum: 2.12.04

	Wieviel Zeit hatten die Bieter, um zu reagieren? 2,5 Monate Wieviel Zeit brauchte es, die Angebote zu prüfen? 3 Monate Datum der Zusage an den erfolgreichen Bieter: 26.06.05
Wieviele Bieter gab es?	1) 7, 2) 4, 3) 2 Angebote
Wieviel Zeit wurde potenziellen Bietern gegeben, um zu reagieren und/ oder ihre Herangehensweise zu ändern?	3 Monate Verhandlungen

Vertragsmanagement

Gab es Probleme bei der Erfüllung der Kriterien?	Grenzwertig aber wahrscheinlich erreicht
Wie wurde Durchführung, Monitoring und Evaluation sichergestellt?	Technische Begleitung durch Vollzeitstelle (im Bereitstellungspreis enthalten) Tests

Marktpotential

Welche Veränderungen in Lieferung/ Angebot können direkt auf die Ausschreibung zurückgeführt werden (inklusive nicht verlangter/ beabsichtigter Veränderungen)?	MTU hat etwas neues und muss auch weiterentwickeln, da IIIb mit stand of the art nicht erreichbar
Was für Auswirkungen konnten auf dem Markt gesehen werden? Gab es Auswirkungen auf die Versorgungskette? Welche? Wurden Auswirkungen bei der Nachfrage auf Wurden Auswirkungen auf andere Sektoren gestg	HUG Engineering vergrößert die Produktion von Partikelfiltern MTU hat business case durch Taunusbahn Auftrag, RPF ist aus Testphase herausgekommen.
Hat der Anbieter die Veränderungen nach Ablauf der Vertragszeit beibehalten oder ist er in "alte Praktiken" verfallen?	Beibehalten und ausgebaut
Sind die Kosten angestiegen? Wenn ja, warum und wie hoch?	Zusätzliche Kosten zum RPF sinken kontinuierlich (kommt auf das Fahrzeug/ Motortyp an)
Wenn die Kosten angestiegen sind, haben sie sich über die Zeit amortisiert? Falls ja, wie lange dauerte dies?	Amortisierungsphase nicht relevant
Wenn die Kosten angestiegen sind, wurden sie auf den Einkäufer übertragen?	Ja
Wie weit in der Versorgungskette sind die Auswirkungen der Ausschreibung/ des Vertrags sichtbar?	Filterproduzent – Motorproduzent - Anbieter
Konnten Sie irgendwelche ungewollten Auswirkungen aufgrund der Ausschreibung feststellen?	Nein

Hindernisse und Schwierigkeiten

Welche Schwierigkeiten traten bei der Entwicklung und Umsetzung der Ausschreibung auf?	EN Normen tlw. nicht vorhanden schwierig, Kriterien nur mit self-declaration zu überprüfen
Traten Probleme bei der Einhaltung der aufgestellten Kriterien auf?	Nein

Gemachte Erfahrungen

Was können Sie anderen öffentlichen Einrichtungen empfehlen?	Politik: aktuelle Umweltdiskussionen (hier Feinstaub) aufgreifen, pol. Rückendeckung einholen. Wettbewerbsvorteile (Einfahrt City) in Zukunft ausschöpfen
Was kann wo anders wiederholt werden?	Verhandlungsverfahren green criteria Bonus/Malus System TSI Lärm einbauen

Zusätzliche Informationen

Zukunstaussichten LCC: 1/3 Beschaffung (Anschaffungskosten) IIIb fordern - es gibt Motoren mittlerweile (differenziert nach geforderter Leistung) Bestandsschutz ist am wanken (vielleicht demnächst Nachrüstgebot nach 5 Jahren, dann härtere Ausschreibungen push) Agrokraftstoffe: Motoren < 250 kw Mehrverbrauch? Tankstellen/Infrastruktur Bsp Priegnitzer Eisenbahn CRT (entwicklung ohne Harnsäure nutzen zu müssen aus LKW Motorenentwicklung

Kontaktangaben

Bitte fügen Sie Ihre vollständigen Kontaktangaben, wie Sie in der Fallstudie erscheinen sollen, ein.	s.o.

Quellen

Bitte geben Sie verwendete und hilfreiche Quellen an (z.B. Internetquellen, Publikationen).	fahma allianz pro schiene EU Ausschreibung

10.2 Questionnaire supplier

Allgemeine Informationen

Name der verantwortlichen Person für das Angebot	Wolfgang Späth/ Björn Vitt
Name des Anbieters	Alstom LHB GmbH
Kontaktangaben (Adresse, Telefon, E-Mail)	Linke-Hofmann-Busch-Straße 1, 38239 Salzgitter Tel. 05341-900 4525 (Späth) wolfgang.spaeth@transport.alstom.com Tel. 05341-900 6797 (Vitt) bjoern.vitt@transport.alstom.com
Wir würden uns freuen, Ihre Kontaktangaben in der Fallstudie benutzen zu dürfen, um zu einem besseren Erfahrungsaustausch beitragen zu können. Sind Sie damit einverstanden?	☒ Ja ☐ Nein

Hintergrundinformationen

Bitte beschreiben Sie kurz ihre Organisation/ Firma.	Alstom Transport gehört zu den weltweit führenden Anbietern von Bahntechnik. Zwei STandorte repräsentieren Alstom Transport in Deutschland: Die Alstom LHB GmbH im niedersächsischen Salzgitter und die Alstom Lokomotiven Service GmbH in Stendal. Alstom Transport in Deutschland liefert als Systemhersteller komplette Schienenfahrzeuge.
Stellen Sie die relevanten Produkte selber her oder vertreiben Sie ausschließlich die Produkte?	Das Unternehmen entwickelt und produziert die Produkte zum größten Teil selbst.
Bitte geben Sie einige Kerndaten zu ihren umweltfreundlichen Produkten an (Umsatzanteil, Auftragvolumina etc.)	Alstom Transport ist per se dem Umweltschutz verpflichtet und produziert mit Schienefahrzeugen grundsätzlich umweltfreundliche Produkte.
Was für Erfahrungen haben Sie mit grüner öffentlicher Beschaffung oder öffentlichen Ausschreibung die umweltfreundlich ausschreiben?	Ausschreibung Hamburger S-Bahn (DT5) Verhandlungen zum Einbau von RPF (Nürnberg, Augsburg, S-H.)

Informationen zum Produkt

Bitte beschreiben Sie kurz das umweltfreundliche Produkt.	Zweiteiliger Dieseltriebzug Coradia LINT mit RPF zur Reduzierung von Feinstaub. Der Filter reduziert die Emissionen von Rußpartikelfiltern um mehr als 95% und unterbietet damit die stage IIIb Emissiongrenze für Feinstaub (gültig 2012) von 0,025 g/kWh schon heute. Der

	eingebaute Wandstromfilter von HUG wurde in Zusammenarbeit mit dem Motorenhersteller MTU entwickelt.
Wie viele Unterauftragnehmer/ Zulieferer sind an der Erstellung des Produkts beteiligt? Wofür?	HUG - MTU - Alstom
Verwenden Sie eine Lebenszyklusberechnung bei dem Produkt? Wenn ja, wie gehen sie dabei vor?	LCC klein: ja (zB Wartungszeiten, Tauschintervalle) LCC komplett für Schwedische Aufträge (S-Bahn Stockholm), inkl. R&D, Produktion, Nutzung, Entsorgung
Gibt es Unterschiede in den Kosten/ Preis zwischen Standard- und umweltfreundlichen Produkten (selber Zweck, Leistung etc)?	Mehrkosten von 45.000 Euro pro Filter
Wie viel wurde von dem o.g. Produkt geliefert? An wie viele Kunden? (*Anzahl und Gesamtkosten in Euro*)	10 Coradia LINT an die Taunusbahn mit RPF weitere Coradia LINT in Verhandlungen
Wie hoch ist die Verfügbarkeit des Produkts auf lokalen, regionalen und nationalen Märkten?	Lokaler Markt ☐ niedrig ☐ mittel ☐ hoch Regionaler Markt ☐ niedrig ☐ mittel ☐ hoch Nationaler Markt ☐ niedrig ☒ mittel ☐ hoch

Die "Zugpferde" für umweltfreundliche Beschaffung

Warum bieten Sie umweltfreundliche Produkte an?	Wettbewerbsvorteil, Einsparung von Lebenszykluskosten, Kundenanforderungen, Image
Warum haben Sie sich dazu entschlossen, in die (Weiter)entwicklung dieses umweltfreundlichen Produkts zu investieren?	Wettbewerbsvorteil, da hohe Umweltstandards in Zukunft immer wichtiger werden. (EU) Normen vorausgreifen
Verfolgen Sie eine spezielle Firmenstrategie hinsichtlich umweltfreundlicher Produkte? Ziele? Politische Unterstützung?	Alstom LHB hat Umwelt-, Arbeits-, Gesundheitsschutz und Qualitätswesen in einem integrierten Managementsystem gebündelt. Ziel ist, die Umweltausweirkungen bei der Herstellung, beim Betrieb und bei der Entsorgung der Produkte so gering wie möglich zu halten. Alstom ist seit langem EMAS und ISO 14001 zertifiziert

Der Ausschreibungsprozess – Kriterien

Gab es Probleme bei der Erfüllung der Kriterien? Falls ja, in welcher Phase des Ausschreibungsprozesses?	Nein

Marktpotential

Glauben Sie, dass die "grüne" Ausschreibung die Markfähigkeit/ Verfügbarkeit des Produkts erhöht hat (auch: Degressionseffekt)?	RPF wurde dadurch marktfähig
Welche Veränderungen in Lieferung/ Angebot können direkt auf die Ausschreibung zurückgeführt werden (inklusive nicht verlangter/ beabsichtigter Veränderungen)?	n/a

Dauer und Nachhaltigkeit der veränderten Produktionsabläufe

Haben Sie die Veränderungen nach Ablauf der Vertragszeit beibehalten?	Der Coradia LINT mit RPF wird vermehrt angeboten, obwohl leider bisgher der zusätzliche Preis des RPF abschreckend wirkte.
Wurden die Veränderungen auch für andere Angebotsabgaben/ -verträge verwendet?	s.o.

Einfluss auf die Vertragsgestaltung über die Zulieferkette, die auf die vertragsführende Einrichtung zurückzuführen sind

Sind die Kosten angestiegen? Wenn ja, warum, wo und wie hoch? Wurden die Kosten (inkl. R&D) an den Einkäufer weitergegeben?	Ja, um ca. 45.000 Euro pro Filter
Welche Auswirkungen hatte die Ausschreibung auf die Wettbewerbsfähigkeit (über die gesamte Zulieferer- und Produktionskette betrachtet)? (Positive Wirkungen sind Vorreitervorteile, Anheben von Standards, Exportvorteile. Negative: Abhängigkeit von ausländischen Zulieferern)	MTU hat nun ein neues aktuelles Produkt im Angebot. R&D wurde größtenteils von MTU getragen.

Auswirkungen auf andere Sektoren

Wurden die Anforderungen auch bei z.B. privaten Ausschreibungen berücksichtigt/ übernommen?	Nicht bekannt
Fördert der Staat die Umsetzung der aufgestellten Anforderungen? Falls ja, wie nützlich ist dies für die Entwicklung dieses Produkts gewesen?	Es gibt eine Diskussion zur zukünftigen Förderung von RPF in Schienenfahrzeugen, an der sich auch Alstom beteiligt.

Auswirkungen auf die Zuliefererkette

Wie weit können Auswirkungen innerhalb der Zuliefererkette durch diese Ausschreibung festgestellt werden?	n/a
Welche Anforderungen haben Sie an Zulieferer weitergegeben? Wie wurden diese kommuniziert und	Das erstellte Konzept Partikelfilter wuirde an die Zulieferer weitergegeben (zB MTU).

aufgefasst?	

Unbeabsichtigte Auswirkungen

Konnten Sie irgendwelche unbeabsichtigten (positiven/ negativen) Auswirkungen aufgrund der Ausschreibung/ Angebotsabgabe feststellen? (Unbeabsichtigte Auswirkungen können entstehen bei der Zulieferung, durch Preisschwankungen, bei der Verfügbarkeit etc.)	Nicht bekannt, aber der Umweltminister S. Gabriel interessierte sich für den Fall.

Auswirkungen auf die Marktversorgung

Hat diese Herangehensweise dazu beigetragen, den Markt zu beleben? Warum? (Bitte beschreiben Sie Gründe für Erfolg/Misserfolg, z.B. lange Vertragszeiten gaben positive Signale an den Anbieter, um seine R&D Kosten zu amortisieren.)	Ja, da dringend notwendige Beweise zur Markttauglichkeit von RPF erstellt wurden.
Haben konsistente öffentliche Ausschreibungen in der EU den Markt beeinflusst?	EU Ausschreibungen nur ein Teil der Ausschreibungen. Ansonsten viele private Eisenbahnunternehmen, die auch in andere Richtung experimentieren (s. Prignitzer Eisenbahn Biokraftstoffe).
Wie hat sich die Kommunikation zwischen ausschreibender Organisation und Anbieter aus ihrer Sicht gestaltet?	Sehr erfreulich - gute Verhandlungsbasis und Kommunikation (Transparenz)
Hatten Sie Probleme mit EU Richtlinien zu öffentlicher Beschaffung? *Bitte erläutern.*	Nein

Auswirkungen auf breitere Marktnachfrage

Haben die Aktivitäten eine erhöhte Marktnachfrage stimuliert?	Ja, HUG vergrößert seine Produktion auf europäischer Ebene
Welche Veränderungen gibt es hinsichtlich des Einkaufsverhaltens von Kunden, Anbietern und/oder anderen involvierten Organisationen (z.B. Consultants)?	n/a

Verwendete Öko-Technologie/ umweltfreundliche Lösung

Glauben Sie, dass ihr Produkt auf einer neuen oder aktuellen Umwelttechnologie beruht?	Ja, angepasste Filtertechnologie, speziell für Dieseltriebwagen weiterentwickelt.
Wie entwickelte sich der Absatzmarkt für dieses Produkt nach der Zuschlagserteilung?	RPF werden bei Verhandlungen erwähnt. Es wird davon ausgegangen, dass neue technische Lösungen (zB Harnsäureeinspritzung im Motorblock) den RPF ersetzen werden. Dennoch ist die Filterbranche am boomen, da alle Neufahrzeuge ab 2012 den Standard IIIb einhalten müssen

Hindernisse und Schwierigkeiten

Traten Probleme bei der Einhaltung der aufgestellten Kriterien auf?	Nein

Zusätzliche Informationen

Kontaktangaben

Bitte fügen Sie Ihre vollständigen Kontaktangaben, wie Sie in der Fallstudie erscheinen sollen, ein.	s.o.

Quellen

Bitte geben Sie verwendete und hilfreiche Quellen an (z.B. Internetquellen, Publikationen).	s. Pressespiegel

11 Appendix 2: Questionnaires responses for Sustainable Procurement of Bus Shelters in Barcelona, Case Study

11.1 Questionnaire purchaser

Name of person responsible for the tender	Adolf Creus
Name of the authority	Urban Department, Barcelona City Council
What (product/ service) was tendered?	Bus shelters and other street furniture
What was the name/title of the tender (subject matter) (*Please attach a copy*)	"Plec de clàusules administratives reguladores de la concessió per a la conservació, instal.lació i explotació de mobiliari urbà de la ciutat de Barcelona, i de la seva adjudicació per concurs".
When was the call for tender (date)?	9 September 2005
Contact details	Urban Department – Barcelona City Council Av. Diagonal 240 2a planta 08018 Barcelona Spain Tel. +34 93 2914 422 E-mail: acreus@bcn.cat
In order to foster exchange of best practises in Europe, may ICLEI use your contact details in the case study?	X☐ Yes ☐ No

Background information

Is the authority a member of a relevant (purchasing) network?	Yes. In 2002, the city approved its Local Agenda 21, the "Citizens' Commitment towards Sustainability". Within this framework, Barcelona is now promoting the +Sustainable City Council Programme in an attempt to spread the incorporation of good environmental and social practices throughout the organisation. One of the priorities of this programme is the incorporation of environmental and social criteria in the public procurement process. Barcelona is an active participant of the Procura+ Campaign led by ICLEI, being the Vice-Chair of the Campaign since 2005. The city is also member of the Eurocities Working Group on Responsible Consumption. Barcelona was one of the local organisers of the EcoProcura2006 conference.
What is the total procurement budget of your organisation/department?	€ 2,800 Million € annually

What is the amount spending on green purchasing? (*If not known please estimate*)	Aprox. 28% (estimate)
Do you have further experience with green public procurement?	Yes. A Green Procurement policy was passed in 2001. Since then almost all centralised purchases (IT equipment, paper, office material and machines, office furniture, building cleansing, etc.). Other tenders that have greened are: urban lighting, urban cleansing and waste collection, fountains maintenance, parks and gardens maintenance, urban furniture, public housing and some public buildings among others. Also social and ethical criteria has been included in tenders for workwear and fair trade products. In September 2006 the general administrative tenders of the municipality to contract works, services and goods were modified and published to include environmental criteria which are in line with the new European public procurement directives. In detail, the latter refers to the criteria used to evaluate technical capacity, award criteria and the obligations and responsibilities of the contractor.

Information on the product

How much was purchased? (*Number of units and total costs in EURO*)	Of a total amount of 1.200 bus shelters, a minimum of 500 new bus shelters and a minimum of 200 elements to be adapted in the old bus shelters.
What is the availability of the product on the local, regional, national market?	Local market X☐ low ☐ medium ☐ high Regional market X☐ low ☐ medium ☐ high National market X☐ low ☐ medium ☐ high
Are there any comparative figures (additional cost or savings) between costs of green and standard products? (*Please include life cycle costs figures if available*)	Yes, in the LCA done by JCDecaux. Graphic included in the case study.

The drivers responsible for procurement

What were the **main reasons** for tendering for the specific green product? Was there any political support? Any other drivers?	Sustainability Local Authority policy goals Barcelona wants to lead on SPP Barcelona wants to provide a good service for the citizens, and improve in regards to the old tender.
Does your organisation have a sustainable or green procurement policy	Yes. A green procurement government measure was passed in 2001, stating the

and did this assist in pushing for this tender?	willingness of the City Council in greening the municipal services and buildings, creating the "+Sustainable City Council" programme and internal cross-cutting working group.
Does your organisation have any sustainable or green procurement targets and do these assist in pushing for this tender?	Yes, as part of the +Sustainable City Council Programme: reduce CO_2 emissions, water consumption and waste production; promote a social and sustainable local economy; exclude products and services which cause social injustice; and create a culture of social responsibility and environmentally friendliness.
Does your organisation have a sustainable or green procurement implementation strategy and did this assist in pushing for this tender?	There is and internal cross-cutting working group, and annual work plan that has follow-up indicators. Also there is trainning to municipal workers, a bimonthly newsletter, 2 environmental guides have been published, a web page and an e-mail to which the workers has write in case they need assistance for greening tenders. An external technical assistance has been contracted in order to help in the process.

The tendering process

Developing the green procurement criteria

Who was involved in the development of the criteria?	Alfons Creus from the Urban Department of Barcelona
How much advice was received from internal sources in developing the tender and criteria, e.g. through the environment department, finance department, energy department etc?	6 Departments: Urban Planning and Infrastructure sector, TMB (Metropolitan Transports in Barcelona), Via Pública (giving advice on bus shelter placement), Communication Department (giving advice on the publicity to go in the PIMs[45]), Urban Environmental Department (giving advice on incorporation of bus shelters without causing a visual impact on the environment) and IMI (Computer Services- Informatics Municipal Institute).
How much advice was received through external sources in developing the tender and criteria, e.g. consultants, consulting engineers other government departments, or suppliers?	Not too much, it was more from internal advice, through the other departments.
Were the suppliers/bidders at any stage involved in the tendering process? (e.g.	The bidders could comment on the environmental criteria and their applicability

[45] Municipal Information Point

consultation round)?	between the first publication of the tender in May 2005 and the closure of the publication in September 2005.

The green procurement criteria

Did you define any green pre-qualifications for suppliers?	Yes, technical capacity and financial capacity.
Was there any technical capacity required?	Yes, the bidder had to prove that they were able to do it (page 14 in the tender).
What were the technical specifications?	Yes. See tender document page "Plec resultant". Life Cycle Analysis of the different elements was requiered.
What were the selection criteria?	In the tender it was not specified for the bidder to have an EMS.
Was there any award criteria, if so what?	Yes. See in the tender (pages 15-16)
What were the contract performance clauses?	They can be found in chapter 8 of the "Plec de condicions administratives - Obligacions del concessionari". They include supply, maintenance and cleaning of all elements, electricity and water consumption, periodical actualization of cartographic data, insurance, and every 4 years an external company has to evaluate the state and operation of the bus shelters. Every six months all departments involved will meet with the supplier to discuss the amount of bus shelters and elements to implement and where to place them, according to the necessities each time.
Was there any reference to eco-labels, if so what?	No
Were there any post-award criteria, if so what?	Once the tender was awarded, they could always discuss the new design of the bus shelter with the winning bidder.
What forms of evidence/proof were required from the supplier to demonstrate compliance?	Every four years, the company has to present a report to the city council of Barcelona on the status of bus shelters.

Assessing the tender

Which were the dates of the tendering process?	Starting date:9 September 2005 Time for preparation: Publishing date: 13 December 2005 How much time did the bidders have to react?: How much time did it take to evaluate the offers? 3 months Information date to the successful bidder : March 2006
How many bidders were there?	4: JCDecaux, Cemussa, Biacom & Clear

	Channel
How much time were potential bidders given to react and/or modify their approach?	4 months

Contract management

Were there any problems with compliance with the criteria?	hard to develop criteria to satisfy all departments involved in the tender
How was the monitoring/enforcement handled?	

Potential of triggering the market

What changes in supply/offering resulted that can be directly attributed to the tender, including those not explicitly required?	Development of a new prototype of bus shelters using a less polluting cleaning system, and consuming less energy
What has been the impact on the market supply following the tender? Has there been any impacts on the supply chain, if so what? Have there been any impacts on wider market demand? Have there been any impacts on other sectors?	These kind off activities move the market. The tender criteria have pushed into the development of a new roof structure, light system and implementation of a new cleaning system. The criteria were applied to other street furniture. Exclusion of PVC in all street elements.
Did the supplier maintain changes after the end of the contract period, or revert to old practices?	Maintain.
Did costs increase, and if so then by how much?	The new cleaning system involved an initial cost at the beginning.
Did this increase in costs amortise over the time? If yes, how long did it take?	Yes, in the mid-long term
If there was an increase in costs, were these passed onto the procurer?	no, the winning bidder assumed all costs
How far down the supply chain can the impacts of the tender/ contract been detected?	Sub-suppliers were faced to search for a much broader market in order to comply with the new requirements imposed by the main supplier. In some cases, such as the T5 lights, which had to be purchased in Sweden, it had a negative impact due to the need to source them from an overseas supplier. The fact that PVC and Chlorine materials were excluded in the tender affected the supply chain, requiring alternative materials to introduce in the design of the new bus shelter.
Have there been any unintended consequences as a result of the call for tender/ initiative?	More environmental friendly bus shelters for other clients of the bidder.

Barriers and difficulties

What were the difficulties with developing and implementing this tender?	To satisfy all departments. There were a lot of discussions involved.

Have there been any problems with compliance with criteria?	The supplier said it was hard to develop a roof with recicled materials and with a load of 500Kg/m^2

Lessons learned

What can you recommend to other public authorities?	They invested on the bidder with a higher innovative capacity, leading to a successful cleaning system that in the mid- to longer term implies a smaller environmental impact and a reduction in the maintenance costs. The external knowledge by other departments on the selection of green criteria was also valuable for a successful result.
What could be repeated elsewhere?	implementation of bus shelters with this cleaning system

Additional information

Contacts

Please, insert your full contact details as you wish that it will appear in the final cas study.	Adolf Creus Urban Department – Barcelona City Council Av. Diagonal 240 2a planta 08018 Barcelona Spain Tel. +34 93 2914 422 E-mail: acreus@bcn.cat

Sources

Please, indicate any used and helpful sources (e.g web sources, publications).	www.bcn.cat, tender, LCA book

11.2 Questionnaire supplier

General information

Name of person responsible for the bid	Luís Sánchez Olavarría
Name of the supplier	JCDecaux
Contact details	Director of the Catalan Office of JCDecaux C/Botánica. 172-174 – Polígono Gran Vía Sur 08908 L'Hospitalet de Llobregat (Barcelona) Spain Tel. +34 93 3357110 E-mail: luis.sanchez@jcdecaux.es
In order to foster exchange of best practises in Europe, may ICLEI use your contact details in the case study?	☒ Yes ☐ No

Background information

Can you provide a short description of your company?	JCDecaux is the 2nd largest outdoor advertising specialist in the world, the market leader in Europe and number 1 in China. The inventor of the "street furniture" concept in 1964, the JCDecaux Group is the only company worldwide to focus exclusively on outdoor advertising and develop activities in all three segments: street furniture, billboard, and transport advertising. JCDecaux is n°1 worldwide for street furniture, 1 in Europe for billboard advertising and n°1 worldwide for airport advertising with concessions in 141 airports, and n°1 worldwide in self-service bicycles. Employing a total of 8,100 people, the Group is present in 48 different countries and 3,500 cities of more than 10,000 inhabitants and generated revenues of €1,946m in 2006.
Do you also manufacture or only supply products?	Manufacture and supply
Can you provide figures about your green products (Sales percentage, volume etc)?	Check LCA graphics in the documents provided for the bid.
Do you have any experience with green public procurement or public authorities doing GPP?	Yes, JCDecaux works with many cities which include environmental criteria in their tenders.

Information on the product

Can you provide a short description of the specific product supplied?	New prototype of bus shelter with a beehive-shaped inner part of the roof, night lighting system with low emission lamps (T5

	of 38W each) and a new cleaning system with osmosed water avoiding the need to use soap/detergent in the cleaning porcess.
How many sub-suppliers are involved in the production process? What for?	Around 7 for: T5 lights, the síde reflectors and the electronic ballast
Has there been any life cycle (cost) assessment involved?	For every single element of the bus shelter and also for the cleaning sytem, a LCA has been done (See book)
Are there significant differences in costs between your standard and green product?	JCDecaux has an ecodesign criteria, and keep on improving their products each time something new is implemented.
How much was delivered – in general and to the specific authority? (Number of units and total costs in EURO)	A minimum of 500 new bus shelters and a minimum of 200 elements to be adapted in the old bus shelters
What is the availability of the product on local, regional, national market (competition, monopoly conditions)?	This bus shelter prototype is unique for the city of Barcelona, given the name of: Barcelona bus shelter

The drivers responsible for procurement

Why do you offer green products in principle?	It is part of the company's policy
Why did you decide to invest in the development of that specific green product?	Opportunity to improve in regards to the old tender also awarded to JCDecaux in 1998, and to improve their technology and keep them as leaders in the market More points were given to the bidder presenting better technologies Possibility to advertise in the bus shelters: major source of income
Do you pursue a specific policy? Any specific targets? Do you have a particular strategy? Was there any political support? Any other drivers?	Ecodesign Innovation Capacity building Environmentally respectful with the environment

The tendering process – criteria

Were there any problems with compliance with criteria? If yes, at what tendering stage?	It was hard to manufacture a roof with recycled materials and also with a load of 500Kg/m2

Potential of triggering the market

Do you think that the green procurement tender triggered the offer of the green product? If yes, how?	Yes, definitely. New search in the market to find new products, also new cleaning system: training of the employees, adaptation in their facilities.
What changes in supply/offering resulted that can be directly attributed to the tender, including those not explicitly required?	roof, cleaning system with osmosed water

Duration and sustainability of those changes

Did you maintain changes after the end of the contract period, or quickly revert to old practices?	Yes. innovations successful in one subsidiary are regularly adopted as a rule for the other subsidiaries.
Were the changes implemented in other supply contracts?	

Impact of the policy or contracts on costs throughout the supply chain, including those borne by the contracting authority

Did costs increase (i.e. any costs), and if so then by how much? Were these increases over the short term and in the medium-longer term? Where did the cost increases occur in the supply chain? Were these passed on to the procurer?	Yes, specially for the new cleaning system. An initial investment was done in order to place a reverse osmosis system to treat the water, to train the staff that has to use it, and to adapt the cleaning vehicles with the new system.
What was the impact of those changes on the overall competitiveness of the supplier and its supply chain? (Positive impacts would include e.g. first-mover advantage, raising of standards, supportive home market providing a platform for export. Negatives might include the need to source from foreign suppliers.)	T5 lights had to be purchased broad (in Sweeden), but in general they try to get local suppliers

Impacts on other sectors

Have sustainable purchasing initiatives in this area been adopted more widely? *(For example, have 'sustainable' specifications been adopted by procurers in the private sector?)*	Yes. The neighbouring cities of Badalona and Sabadell have already signed contracts with JCDecaux for the same reason. Also Vigo in Galicia. Cleaning system applied in all europeaan subsidiaries from JCDecaux.
Has this been influenced by the activity of the government?	By the Barcelona city council

Impacts on the supply chain

How far down the supply chain can the impacts of the policy or contract be detected?	Hard to tell
Crucially, what requirements are suppliers passing onto their own suppliers? How are these communicated and what is the result?	Lights, materials with no PVC and no Chlorine,…

Unintended consequences

Have there been any unintended positive or negative consequences as a result of the call for tender / initiative? (Unintended consequences could include impacts on market supply and subsequent price swings e.g. not enough renewable energy, organic produce or recycled paper	More contracts with other cities!

to satisfy demand.)	

Impact on market supply

Has this approach succeeded or failed in its attempt to influence market supply, and why? (Please, identify reasons for success/failure e.g. has a long contract position taken by a public-sector buyer given increased certainty to the supplier of demand being sustained)	Succeed: New search in the market to find new products, also new cleaning system: trainning of the employees, adaptation in their facilities,.. also its being adapted now european wide. Also cities have shown their interest.
Has concerted and consistent action by numerous public-sector buyers, across the wider EU, influenced the market?	Not really
Has inconsistency or lack of communication by the procurer led to confusion and a lack of influence on the suppliers?	No
Have you had any difficulties with EU public procurement rules / directives? Please explain.	No

Impact on wider market demands

Has this activity influenced wider market demand?	Yes, at national and European level
What changes have been seen regarding the purchasing behaviour of customers, suppliers, and/ or other organisations?	They have shown their interest in the new cleaning system

Eco-Technology / Eco-solution used

Do you think that the product is based on a new or recent eco-technology? If yes, please explain in more detail.	Eco-solution
What has been the impact on market supply following the tender?	Explained above

Barriers and difficulties

Have there been any problems with compliance with the criteria in the tender?	Roof (explained before)

Additional information

Contacts

Please, insert your full contact details as you wish that it will appear in the final cas study.	Luís Sánchez Olavarría Director of the Catalan Office of JCDecaux C/Botánica 172-174 Polígono Gran Vía Sur 08908 L'Hospitalet de Llobregat (Barcelona) Spain Tel. +34 93 3357110 E-mail: luis.sanchez@jcdecaux.es

Sources

Please, indicate any used and helpful sources (e.g web sources, publications).	www.jcdecaux.com

11.3 Bus shelter

Bus shelter structure	
Element	**Description**
Roof	Composed by two layers of polyester and fibreglass one in each side of the roof. The inner part is composed of fibreglass material in a beehive shape. This particular inner light structure allows the roof to be highly resistible (overload of 500Kg/m^2), as well as being easy to disintegrate at the end of its life cycle, enabling an easy recycle. This new model of the roof is more respectful with the environment in comparison with the old roof, where the inner part was made of expandable Polystyrene unable to disintegrate from the other materials, and therefore impossible to recycle at the end of its life cycle.
Support structure	Stainless steel material or carbonized steel (to prevent the structure to rust, due to water infiltration).
Glass	Tempered glass.
Bench	The inner part is made of stainless steel, covered with an outer part of fibreglass in yellow. Also the new model is more ergonomic, as the bench is a bit bigger.
PIM – Municipal Information Point	
Element	**Description**
Advertising panel	Panel to advertise in both sides of the panel. The number of lamps to illuminate the panel was reduced from 4 fluorescent lamps T8 of 58W each, to 3 fluorescent lamps T5 of 35W each, with electronic ballast that supplies the energy to all 3 lamps. This change in the number and type of lamps supposed a reduction in the electricity consumption of 45%. Also, the panel disposes of side reflectors enabling a better light dispersion. In addition they are back-lit, allowing for 24-hour visibility. Thanks to these lights, a more uniform and softer light is produced. So far, 95% of the lights in all bus shelters in Barcelona have been replaced with this new one.
Bus timetable	It includes information on the running hours of the bus. The old ones did not have a light, making it difficult for the user to read the information at night. The new prototype includes LED lights (34W) that work at night.
Lighting of the bus shelter	The old bus shelters did not include a light on top of the bench, creating a black area during the night. The new prototype includes one LED light (6W) with a movement sensor, so that when someone sits on the bench the light turns on.

12 Appendix 3: Questionnaires for the "The better floorlamps" of the City of Zurich, SWITZERLAND

12.1 Questionnaire purchaser

Allgemeine Informationen

Name der verantwortlichen Person für die Ausschreibung	Stefan Hösli Tel 0041 44 216 4005
Name der Organisation	Stadt Zürich
Was (Produkt/ Service) wurde ausgeschrieben?	Stehleuchten
Wie lautet der Name/ Titel der Ausschreibung (Betreff)? (*Bitte fügen Sie eine Kopie der Ausschreibung bei.*)	Stehleuchten nach dem Minergie Standard'
Wann wurde die Ausschreibung veröffentlicht (Datum)?	April 2004
Kontaktangaben (Adresse, Telefon, E-Mail)	XX
Wir würden uns freuen, Ihre Kontaktangaben in der Fallstudie benutzen zu dürfen, um zu einem besseren Erfahrungsaustausch beitragen zu können. Sind Sie damit einverstanden?	X Yes ☐ No

Hintergrundinformationen

Wie hoch ist das Gesamtbudget für Beschaffung ihrer Organisation/ Abteilung?	Laufende Rechnung pro Jahr 9,5 Mio. CHF für sämtliche Dienstleistungen (Materiallieferungen für neue Objekte nicht eingerechnet) der Immobilien-Bewirtschaftung (IMMO).
Wie hoch ist der Anteil umweltfreundlicher Beschaffung (in Proxent)? (*Bitte schätzen.*)	100%
Was für Erfahrungen haben Sie mit grüner öffentlicher Beschaffung?	Bei neuen Produkten werden die Materialdeklarationen verlangt und von der Fachstelle Nachhaltigkeit (Ökologie) überprüft.

Informationen zum Produkt

Wieviel wurde eingekauft? (*Anzahl und Gesamtkosten in Euro*)	Einkaufspreis pro Leuchte unter CHF 500.-- exkl. Mehrwertsteuer (7,5%) ca 1000
Wie hoch ist die Verfügbarkeit des Produkts auf lokalen, regionalen und nationalen	Lokaler Markt ☐ niedrig ☐ mittel X hoch

Märkten?	Regionaler Markt ☐ niedrig ☐ mittel X hoch Nationaler Markt ☐ niedrig ☐ mittel X hoch
Haben Sie vergleichbare Daten (zusätzliche Kosten oder Einsparungen) für umweltfreundliche und konventionelle Produkte? (*Wenn verfügbar fügen Sie bitte Daten zu den Lebenszykluskosten ein.*)	Nein

Die "Zugpferde" für umweltfreundliche Beschaffung

Was waren die Hauptgründe, bestimmte umweltfreundliche Produkte auszuschreiben? Gab es politische Unterstützung? Andere Gründe?	7 Meilenschritte des Hochbaudepartements -> Meilenstein 3
Hat Ihre Organisation ein politisches Leitbild zu nachhaltiger und/oder umweltfreundlicher Beschaffung? Wenn ja, halfen diese, die Ausschreibung voranzutreiben?	Legislaturschwerpunkte 2006 - 2010
Hat Ihre Organisation Ziele zu nachhaltiger und/ oder umweltfreundlicher Beschaffung aufgestellt? Wenn ja, halfen diese, die Ausschreibung voranzutreiben?	Siehe 'Allg. Bauökologische Submissionsbedingungen'
Hat Ihre Organisation eine Umsetzungsstrategie zu nachhaltiger und/ oder umweltfreundlicher Beschaffung aufgestellt? Wenn ja, halfen diese, die Ausschreibung voranzutreiben?	Nein

Der Ausschreibungsprozess

Entwicklung der umweltfreundlichen Kriterien

Wer war an der Entwicklung der umweltfreundlichen Kriterien beteiligt?	Siehe Projektteam
Wieviel interne Beratung war für die Entwicklung der Kriterien und der Ausschreibung notwendig (z.B. mit Hilfe der Umweltabteilung, der Finanzabteilung, der Energieabteilung, etc.)?	Zwischen Abteilungen
Wieviel externe Beratung war für die Entwicklung der Kriterien und der Ausschreibung notwendig (z.B. Consultants, Ingenieure, andere Kommunalverwaltungen, andere Anbieter)?	eteam -> Stefan Gasser
Waren die Anbieter/ Bieter zu irgend einem	In der 1. Phase, bei der Entwicklung der

Zeitpunkt im Ausschreibungsprozess involviert (z.B. Informationsgespräche)?	Leuchte (workshop mit 27 Herstellern)

Die umweltfreundlichen Kriterien

Welche umweltfreundlichen Mindestanforderungen haben Sie an die Anbieter gestellt?	Siehe Aussschreibung
Brauchten Sie bestimmte technisches Wissen, um die Mindestanforderungen aufzustellen?	eteam
Welche technischen Anforderungen haben Sie gestellt?	Siehe Aussschreibung und allg. Bauökologische
Was waren die Auswahlkriterien?	Internes Punkteverfahren
Wurden Kriterien für die Zuschlagsphase verwendet? Wenn ja, welche?	Siehe Aussschreibung
Was waren die Vertragsbedingungen?	S.4
Wurden Hinweise auf Umweltlabel verwendet? Wenn ja, welche?	Keine, aber Stehlampen sollten nach Minergie Standard sein
Wurden Kriterien nach der Zuschlagsphase angewendet? Wenn ja, welche?	Nein
Welche Beweise wurden vom Anbieter eingefordert, um die Anforderungen einzuhalten?	Siehe Ausschreibung

Daten zur Ausschreibung

Wie war der Zeitplan der Ausschreibung?	Startdatum: Anfang 2002 Zeit für Vorbereitung: 10.2002 Veröffentlichungsdatum: April 2004 Wieviel Zeit hatten die Bieter, um zu reagieren? 7 June Wieviel Zeit brauchte es, die Angebote zu prüfen? Ende Juli Datum der Zusage an den erfolgreichen Bieter: August 04
Wieviele Bieter gab es?	13
Wieviel Zeit wurde potenziellen Bietern gegeben, um zu reagieren und/ oder ihre Herangehensweise zu ändern?	2 Monate

Vertragsmanagement

Gab es Probleme bei der Erfüllung der Kriterien?	Nein
Wie wurde Durchführung, Monitoring und Evaluation sichergestellt?	Siehe Ausschreibung

Marktpotential

Welche Veränderungen in Lieferung/ Angebot können direkt auf die Ausschreibung zurückgeführt werden (inklusive nicht verlangter/ beabsichtigter Veränderungen)?	www.topten.ch großes Interesse von Banken 13 Minergie Lampen auf dem Markt
Was für Auswirkungen konnten auf dem Markt gesehen werden? Gab es Auswirkungen auf die Versorgungs Wurden Auswirkungen bei der Nachfrage auf Wurden Auswirkungen auf andere Sektoren festestgestellt?	Beleuchtung wird auf gesamte öffentliche Gebäude ausgeweitet Siehe Produktbeschreibung
Hat der Anbieter die Veränderungen nach Ablauf der Vertragszeit beibehalten oder ist er in “alte Praktiken” verfallen?	Beibehalten => siehe Hersteller
Sind die Kosten angestiegen? Wenn ja, warum und wie hoch?	Aufgrund Wettbewerb tiefere Kosten
Wenn die Kosten angestiegen sind, haben sie sich über die Zeit amortisiert? Falls ja, wie lange dauerte dies?	/
Wenn die Kosten angestiegen sind, wurden sie auf den Einkäufer übertragen?	/
Wie weit in der Versorgungskette sind die Auswirkungen der Ausschreibung/ des Vertrags sichtbar?	/
Konnten Sie irgendwelche ungewollten Auswirkungen aufgrund der Ausschreibung feststellen?	

Hindernisse und Schwierigkeiten

Welche Schwierigkeiten traten bei der Entwicklung und Umsetzung der Ausschreibung auf?	Teilweise Kommunikation. Manche Hersteller dachten, sie müßten bereits in der 1. Phase den Preis liefern, also bevor der Ausschreibung
Traten Probleme bei der Einhaltung der aufgestellten Kriterien auf?	Siehe oben

Gemachte Erfahrungen

Was können Sie anderen öffentlichen Einrichtungen empfehlen?	Zweistufige Ausschreibung erfolgversprechend
Was kann wo anders wiederholt werden?	/

Zusätzliche Informationen

Siehe beigelegtes Material

Kontaktangaben

Bitte fügen Sie Ihre vollständigen Kontaktangaben, wie Sie in der Fallstudie erscheinen sollen, ein.	**www.minergie.ch** www.topten.ch

Quellen

Bitte geben Sie verwendete und hilfreiche Quellen an (z.B. Internetquellen, Publikationen).	

12.2 Questionnaire supplier

Allgemeine Informationen

Name der verantwortlichen Person für das Angebot	Markus Binda
Name des Anbieters	Regent Beleuchtungskörpter AG
Kontaktangaben (Adresse, Telefon, E-Mail)	
Wir würden uns freuen, Ihre Kontaktangaben in der Fallstudie benutzen zu dürfen, um zu einem besseren Erfahrungsaustausch beitragen zu können. Sind Sie damit einverstanden?	X Ja ☐ Nein

Hintergrundinformationen

Bitte beschreiben Sie kurz ihre Organisation/ Firma.	Wird erbracht
Stellen Sie die relevanten Produkte selber her oder vertreiben Sie ausschließlich die Produkte?	Entwicklung, Herstellung und Vertrieb von Beleuchtungskörper 80 Eigenüproduktion
Bitte geben Sie einige Kerndaten zu ihren umweltfreundlichen Produkten an (Umsatzanteil, Auftragvolumina etc.)	Bei allen Produkten Energieeffizienz immer im obersten Marktsegment. Hoher Prozentsatz ZB alles trennbar, es gibt keine zusammengeklebten Produkte, immer energieeffizienz, Nach Minergiezertifkat gibt es nicht, dann wären aber mind 70% zertifize
Was für Erfahrungen haben Sie mit grüner öffentlicher Beschaffung oder öffentlichen Ausschreibung die umweltfreundlich ausschreiben?	Im Zusammenhang mit Minergie (label für beleuchtung im gesamten Gebäude zB energiebedarf in einem Jahr) Zürich nur noch Minergie (privat) Mehrere Auschreibungen – aber nicht die Leuchte, sondern die gesamte Beleuchtung. Zürich ist führend. Bei anderen Städten eher im Anfangsstadium.

Informationen zum Produkt

Bitte beschreiben Sie kurz das umweltfreundliche Produkt.	Produktbeschreibung wird nachgereicht
Wie viele Unterauftragnehmer/ Zulieferer sind an der Erstellung des Produkts	4 relevant sub-suppliers (elektronische Komponenten; Aluminumprofile

beteiligt? Wofür?	(Norditalien); Lichtlenkung; Rohrlieferant) Zusammengestellt in Basel.
Verwenden Sie eine Lebenszyklusberechnung bei dem Produkt? Wenn ja, wie gehen sie dabei vor?	Nein
Gibt es Unterschiede in den Kosten/ Preis zwischen Standard- und umweltfreundlichen Produkten (selber Zweck, Leistung etc)?	Initialkosten. Im speziellen Fall wurden Komponenten verbessert. Preis für Kunden hat sich nicht verbessert. Keine wesetnlcihen preisuntershciede.
Wie viel wurde von dem o.g. Produkt geliefert? An wie viele Kunden? (*Anzahl und Gesamtkosten in Euro*)	Knapp 2,5 tausend Größtenteils für Zürich (2000) , der Rest sonst Weiterentwicklung bestehender Leuchte
Wie hoch ist die Verfügbarkeit des Produkts auf lokalen, regionalen und nationalen Märkten?	Lokaler Markt ☐ niedrig ☐ mittel X hoch Regionaler Markt ☐ niedrig ☐ mittel X hoch Nationaler Markt ☐ niedrig ☐ mittel X hoch

Die "Zugpferde" für umweltfreundliche Beschaffung

Warum bieten Sie umweltfreundliche Produkte an?	Siehe Regents Umweltgrundsatzpapier
Warum haben Sie sich dazu entschlossen, in die (Weiter)entwicklung dieses umweltfreundlichen Produkts zu investieren?	Technische Herausforderung – wir haben alles inhause wissen, dass der Markt diese Produkte in absehbarer Zeit braucht war ein impuls
Verfolgen Sie eine spezielle Firmenstrategie hinsichtlich umweltfreundlicher Produkte? Ziele? Politische Unterstützung?	ISO 14001 zertifiziert Keine politische Vorgabe Keine Förderung

Der Ausschreibungsprozess – Kriterien

Gab es Probleme bei der Erfüllung der Kriterien? Falls ja, in welcher Phase des Ausschreibungsprozesses?	Besonders technische Herausforderung zb Gradwanderung zwischen sehr hohem Wirkungsrad in Beleuchtung und Blende, dh mit wöglichst wenig energie ein klare definiertes Lichtniveau erreichen sonst keine Probleme

Marktpotential

Glauben Sie, dass die "grüne" Ausschreibung die Markfähigkeit/ Verfügbarkeit des Produkts erhöht hat (auch: Degressionseffekt)?	Ganz klar, die private Beschaffung ist sehr schnell daruaf aufmerksam geworden. Besonders Bankengeschäfte! Nur Private, die haben sehr ähnliche Ausschreibungen gemacht. Es gibt offene Ausschreibungen auch im privaten Sektor. Städte keine!

Welche Veränderungen in Lieferung/ Angebot können direkt auf die Ausschreibung zurückgeführt werden (inklusive nicht verlangter/ beabsichtigter Veränderungen)?	Kausal schwer quantifizierbar

Dauer und Nachhaltigkeit der veränderten Produktionsabläufe

Haben Sie die Veränderungen nach Ablauf der Vertragszeit beibehalten?	Die Anforderungen der Stadt Zürichj wurdenauf anderen Firmenprodukte übertragen.
Wurden die Veränderungen auch für andere Angebotsabgaben/ -verträge verwendet?	Ja, kommt später

Einfluss auf die Vertragsgestaltung über die Zulieferkette, die auf die vertragsführende Einrichtung zurückzuführen sind

Sind die Kosten angestiegen? Wenn ja, warum, wo und wie hoch? Wurden die Kosten (inkl. R&D) an den Einkäufer weitergegeben?	Kosten sind nicht gestiegen, da wir das neue know-how Forschung gemäß der neuen Anforderungen entwicklung wurde auf andere Produkte übertragen In der Elektronik war Senkung der Kosten möglich
Welche Auswirkungen hatte die Ausschreibung auf die Wettbewerbsfähigkeit (über die gesamte Zulieferer- und Produktionskette betrachtet)? (Positive Wirkungen sind Vorreitervorteile, Anheben von Standards, Exportvorteile. Negative: Abhängigkeit von ausländischen Zulieferern)	Nach hinten in der Produktionskette keine, höchstens indirekt da er mehr auftraäg hat. Das Regent gewonnen hat, war sicher für die Firma sehr positiv . Auf nationaler Ebene.

Auswirkungen auf andere Sektoren

Wurden die Anforderungen auch bei z.B. privaten Ausschreibungen berücksichtigt/ übernommen?	Dienstleistungssektor – ab 100 leuchten - ca 15 Firmen Städte keine
Fördert der Staat die Umsetzung der aufgestellten Anforderungen? Falls ja, wie nützlich ist dies für die Entwicklung dieses Produkts gewesen?	Nein – Minergie ist private Geschichte

Auswirkungen auf die Zuliefererkette

Wie weit können Auswirkungen innerhalb der Zuliefererkette durch diese Ausschreibung festgestellt werden?	Ganz schwierig. Beinahe nicht auszumachen. Mit Zulieferanten gab es neue Entwicklungen, speziell im Elektronikbereich.

Welche Anforderungen haben Sie an Zulieferer weitergegeben? Wie wurden diese kommuniziert und aufgefasst?	Ziemlich früh – beim Workshop – weitergegeben. In diesem Fall an Elektroniklieferant speziell im Bereich standby

Unbeabsichtigte Auswirkungen

Konnten Sie irgendwelche unbeabsichtigten (positiven/ negativen) Auswirkungen aufgrund der Ausschreibung/ Angebotsabgabe feststellen? (Unbeabsichtigte Auswirkungen können entstehen bei der Zulieferung, durch Preisschwankungen, bei der Verfügbarkeit etc.)	Negativ: das Vorgehen anderer gewisser Mitbewerber war mitunter nicht immer seriös: Firmen, die Sieger in einem Punkt waren und sich quasi als Gesamtsieger vermarktet haben. Rechtliche Auseinandersetzung hat Lieferung zeitlich knapp gemacht -> 2 Monate blockiert.

Auswirkungen auf die Marktversorgung

Hat diese Herangehensweise dazu beigetragen, den Markt zu beleben? Warum? (Bitte beschreiben Sie Gründe für Erfolg/Misserfolg, z.B. lange Vertragszeiten gaben positive Signale an den Anbieter, um seine R&D Kosten zu amortisieren.)	Ja, es hat dann plötzlich 13 neuen, doch sehr qualitativ hochwertige Leuchten gegeben! Das hat den Markt belebt.
Haben konsistente öffentliche Ausschreibungen in der EU den Markt beeinflusst?	/
Wie hat sich die Kommunikation zwischen ausschreibender Organisation und Anbieter aus ihrer Sicht gestaltet?	Sehr gut und sehr transparent. Vorbereitung war ja beinahe 2 Jahre. Der Workshop war für diese Entwicklung bereits ein Auslöser.
Hatten Sie Probleme mit EU Richtlinien zu öffentlicher Beschaffung?*Bitte erläutern.*	/

Auswirkungen auf breitere Marktnachfrage

Haben die Aktivitäten eine erhöhte Marktnachfrage stimuliert?	
Welche Veränderungen gibt es hinsichtlich des Einkaufsverhaltens von Kunden, Anbietern und/oder anderen involvierten Organisationen (z.B. Consultants)?	Stellenwert hat sich geändert. Preis-leistung ist nicht mehr an erster Stelle. Für uns wichtig, dass auch über andere Punkte diskutiert wird. Das positive Signal war, dass es ein anhaltender Trend war. Schon im selben jahr wurde im Betrieb mit der Produktion umgestellt. Auch wenn wir den Vertrag nicht bekommen hätten, hätten wir die Veränderungen beibehalten.

Verwendete Öko-Technologie/ umweltfreundliche Lösung

Glauben Sie, dass ihr Produkt auf einer neuen oder aktuellen Umwelttechnologie	Standby modus um Faktor 10 gesenkt (von 4 watt auf 0,4 watt)

beruht?	Störemission – elektrischen Felder Nichts verklebt – alles recyclebar Betriebwirkungsgrad (wieviel licht im betrieb)
Wie entwickelte sich der Absatzmarkt für dieses Produkt nach der Zuschlagserteilung?	Steigend – Zahlen geht nicht

Hindernisse und Schwierigkeiten

Traten Probleme bei der Einhaltung der aufgestellten Kriterien auf?	Forschung Entwicklung Lichttechnik- Problem viel licht wenig blendung

Zusätzliche Informationen

Werden weitergegeben

Kontaktangaben

Bitte fügen Sie Ihre vollständigen Kontaktangaben, wie Sie in der Fallstudie erscheinen sollen, ein.	

Quellen

Bitte geben Sie verwendete und hilfreiche Quellen an (z.B. Internetquellen, Publikationen).	

13 Appendix 4: Questionnaires for the Sustainable Procurement of the Public Lighting Service of the City of Lille, Case Study

13.1 Questionnaire purchaser

General information

Name of person responsible for the tender	Ms Danielle POLIAUTRE Deputy Mayor for Public Lighting
Name of the authority	Directorate for the Management of Public Land and Environment Public Lighting Department
What (product/ service) was tendered?	Municipal Public Lighting
What was the name/title of the tender (subject matter) (*Please attach a copy*)	General Maintenance of street lighting services
When was the call for tender (date)?	Pre-information Notice in the EU Official Journal on the 19. June 2003 Opening to the offers on the 17 March 2004 Award Notice on the 9 September 2004

Contact details	Hôtel de Ville Place Augustin Laurent B.P. 667 59033 LILLE Cedex FRANCE Web: http://mairie-lille.fr
In order to foster exchange of best practises in Europe, may ICLEI use your contact details in the case study?	☒ Yes ☐ No

Background information

Is the authority a member of a relevant (purchasing) network?	Only campaign: Procura+, ecomaires, etc.
What is the total procurement budget of your organisation/department?	
What is the amount spending on green purchasing? (*If not known please estimate*)	around 5 million EUR a year if you count the Public lighting contract (4,4 million a year)
Do you have further experience with green public procurement?	No previous experience in GPP for the Public Lighting Department

Information on the product

How much was purchased? (*Number of units and total costs in EURO*)	8 years contract for the management of the public lighting services, icluding: the general maintenance of the whole system, the reconstruction and replacement of the 300 control boxes and 22,000 lighting units, the operation of the lighting systems and the energy management
What is the availability of the product on the local, regional, national market?	Local market ☒ low ☐ medium ☐ high Regional market ☒ low ☐ medium ☐ high National market ☐ low ☐ medium ☒ high
Are there any comparative figures (additional cost or savings) between costs of green and standard products? (*Please include life cycle costs figures if available*)	No, apart from the difference of global costs between this contract and the former one (from 210 EUR pro light point to 200 EUR)

The drivers responsible for procurement

What were the **main reasons** for tendering for the specific green product? Was there any political support? Any other drivers?	The City of Lille used the opportunity to reaward its contract for the maintenance of public ligting services to go from a contract setting obligations of means towards a contract setting obligations of results, through the service provider's commitments on a certain performance to guarantee in the service . the political support was definitely a driving power, given the politician in charge of the tender is also one of the main drivers for the Agenda 21
Does your organisation have a sustainable or green procurement policy and did this assist in pushing for this tender?	At the time of the tender, no concrete operational policy had been implemented yet, but they received some support from the Agenda 21 Department.
Does your organisation have any sustainable or green procurement targets and do these assist in pushing for this tender?	There were no real objectives appart from those of the Agenda 21 (reduce energy consumption and greenhouse gas emissions)
Does your organisation have a sustainable or green procurement implementation strategy and did this assist in pushing for this tender?	Not proper strategy but sustainable procurement was integrated into all actions. It was also integrated into the training of the procurers. Lille only joined Procura+ in 2004.

The tendering process

Developing the green procurement criteria

Who was involved in the development of the criteria?	Public Lighting Department Public Market Department
How much advice was received from internal sources in developing the tender and criteria, e.g. through the environment department, finance department, energy department etc?	Not much advice from internal sources given the specificity of the tender
How much advice was received through external sources in developing the tender and criteria, e.g. consultants, consulting engineers other government departments, or suppliers?	The consulting firm HEXA INGENIERIE(based in Douai, FR) was assisting in the development
Were the suppliers/bidders at any stage involved in the tendering process? (e.g. consultation round)?	They were not directly involved in the tendering process. But as it is a negociated tender, the bidders had to provide a technical document describing their offer in detail. They also discussed their offer with the tender commission during the interview of each bidder (4 May 2004)

The green procurement criteria

Did you define any green pre-qualifications for suppliers?	There were no green prequalification, only the experience of the bidders in managing public lighting systems counted
What were the technical specifications?	
Was there any award criteria, if so what?	See Case study, table 3 page 12
What were the contract performance clauses?	See tendering documents
Was there any reference to eco-labels, if so what?	No
Were there any post-award criteria, if so what?	i.e. 40% of energy savings, 25% of energy from renewable sources
What forms of evidence/proof were required from the supplier to demonstrate compliance?	

Assessing the tender

Which were the dates of the tendering process?	Starting date: 19 June 2003 Time for preparation:9 months Publishing date: 17 March 2004 How much time did the bidders have to react?:2 Months How much time did it take to evaluate the offers? 4 Months Information date to the successful bidder 7 July 2004
How many bidders were there?	5

Contract management

Were there any problems with compliance with the criteria?	No
How was the monitoring/enforcement handled?	Every-day control with the municapl services (LIlle, Hellemmes and Lomme) and yearly evaluation of the service provider's activity

Potential of triggering the market

What changes in supply/offering resulted that can be directly attributed to the tender, including those not explicitly required?	Reproducing of the tender by other cities, reproducing of the ETDE's strategy by other service providers.
What has been the impact on the market supply following the tender? Has there been any impacts on the supply ch Have there been any impacts on wider marke Have there been any impacts on other sec	
Did the supplier maintain changes after the end of the contract period, or revert to old practices?	The contract comes to end in 2012
Did costs increase, and if so then by how much?	No costs increase, the costs rather went down compared to the last contract (at n+3

	years). the price of each light point was 210 EUR, now 200 EUR (-5%).
Did this increase in costs over the time? If yes, how long did it take?	
If there was an increase in costs, were these passed onto the procurer?	
How far down the supply chain can the impacts of the tender/ contract been detected?	Development of new products for public lighting (new energy-performant material, power reducers, etc)
Have there been any unintended consequences as a result of the call for tender/ initiative?	

Barriers and difficulties

What were the difficulties with developing and implementing this tender?	
Have there been any problems with compliance with criteria?	

Lessons learned

What can you recommend to other public authorities?	Not to hesitate handling over their public lighting system to one service provider to manage it, in order to let them manage a strategy which integrates environmental criteria throughout the whole system
What could be repeated elsewhere?	The negociated tendering procedure can be repeated

Additional information

Contacts

Please, insert your full contact details as you wish that it will appear in the final cas study.	Hôtel de Ville Place Augustin Laurent B.P. 667 59033 LILLE Cedex FRANCE Web: http://mairie-lille.fr

Sources

Please, indicate any used and helpful sources (e.g web sources, publications).	Lille Agenda 21

13.2 Questionnaire supplier

General information

Name of person responsible for the bid	M. Gaëtan DESRUELLES - Président Directeur Général
Name of the service provider	ETDE
Contact details	1, avenue Eugène Freyssinet - 78062

	SAINT QUENTIN EN YVELINES - www.etde.fr
In order to foster exchange of best practises in Europe, may ICLEI use your contact details in the case study?	☒ Yes ☐ No

Background information

Can you provide a short description of your company?	ETDE is an integrator and full-service provider offering French and international clients prime know-how in utility network construction and services
Can you provide figures about your green service (Sales percentage, volume etc)?	Concerning the contract with Lille (= ETDE's first "green"contract): 42% savings in energy, 25% renewable energies, 15.000 energy-efficient luminaires
Do you have any experience with green public procurement or public authorities doing GPP?	Yes

Information on the product

Can you provide a short description of the specific product supplied?	Global maintenance of the public lighting services(energy supply, operation, reconstruction) (see case study, section 2, page 5)
How many sub-suppliers are involved in the production process? What for?	2 (SEPI and SEV for the reconstruction work) / LUMIVER (for the lamps treatment) / SMDR (for the waste recycling sector) (see case study, section 2, page 5)
Has there been any life cycle (cost) assessment involved?	Yes, for preparing the tender
Are there significant differences in costs between your standard and green services?	Not in terms of global costs, but electricity from renewable sources is in average 25% more expensive, and energy efficient equipment 10 to 20% (this is balanced with the energy savings achieved through a drastic reduction in energy consumption) (see Case study, section 6, page 14)
How much was delivered – in general and to the specific authority? (*Number of units and total costs in EURO*)	For the energy (25% from renewable sources); for the reconstruction all materials used (so far 3500 luminaires), replacement of 20.000 lamps, solar experiment (schoolyard and park), sending luminaries to Saint Louis in Sénégal, light vehicles running on LPG
What is the availability of the product on local, regional, national market (competition, monopoly conditions)?	National availability (energy - small hydraulic-solar), Europe (lamps supplier) and both national and Europe (materials)

The drivers responsible for procurement

Why do you offer green products in principle?	To adopt a voluntary approach of sustainable development and to answer

	Lille's expectations
Why did you decide to invest in the development of that specific green product?	To answer Lille's tender
Do you pursue a specific policy? Any specific targets? Do you have a particular strategy? Was there any political support? Any other drivers?	The group Bouygues committed to a sustainable development approach in order to deal with issues such as environment, social equity and economical efficiency

The tendering process – criteria

Were there any problems with compliance with criteria? If yes, at what tendering stage?	No

Potential of triggering the market

Do you think that the green procurement tender triggered the offer of the green product? If yes, how?	Yes, the criteria "sustainable development" was clearly set as a priority in the tender (Agenda 21, reduction of energy consumption, and of greenhouse gas emissions, etc.)
What changes in supply/offering resulted that can be directly attributed to the tender, including those not explicitly required?	ETDE's offer was based on 7 key points, developed according to specific criteria of sustainable development: Social equity and solidarity, cost-efficiency, improvement of the environment and of the quality of life, local and participatory democracy, mobilisation of partnerships, application of innovative technologies, communication and exchange)

Duration and sustainability of those changes

Did you maintain changes after the end of the contract period, or quickly revert to old practices?	The contract is still running until 2012. As the new practices were integrated into ETDE's standard offer, they are not going to revert to old practices. ETDE is now suggesting this new eco-solution to all cities tendering for the maintenance of their public lighting system.
Were the changes implemented in other supply contracts?	Yes, i.e. Bondues, Saint-André and Marquette-Lez-Lille, Rouen, Sevran, Nevers and Fougères (see case study, section 6, page 14)

Impact of the policy or contracts on costs throughout the supply chain, including those borne by the contracting authority

Did costs increase (i.e. any costs), and if so then by how much? Were these increases over the short term and in the medium-longer term? Where did the cost increases occur in the supply chain?	Yes. i.e. the electricity from renewable energy sources is in average 25% more expensive, concerning materials (energy efficient lamps) prices are 10 to 20% higher than those of standard equipment. The increase is not passed on to the procurer

Were these passed on to the procurer?	since the contract budget is blocked by 4,4 million EUR annually until the end of the contract period.
What was the impact of those changes on the overall competitiveness of the supplier and its supply chain? (Positive impacts would include e.g. first-mover advantage, raising of standards, supportive home market providing a platform for export. Negatives might include the need to source from foreign suppliers.)	ETDE benefited of the first mover advantage, but it was only a temporary advantage on the market, since many of its competitors reproduced the same strategy.

Impacts on other sectors

Have sustainable purchasing initiatives in this area been adopted more widely? *(For example, have 'sustainable' specifications been adopted by procurers in the private sector?)*	Yes, for the Bouygues group, in the field of construction (high environmental quality), this approach is also generalising to most ETDE public contracts and is integrated into its bids
Has this been influenced by the activity of the government?	No

Impacts on the supply chain

How far down the supply chain can the impacts of the policy or contract be detected?	There is a positive impact on the offer for products used in public lighting
Crucially, what requirements are suppliers passing onto their own suppliers? How are these communicated and what is the result?	ETDE and Lille enforced standards for the materials and the organisation of the construction site (waste management, noise pollution, etc.)

Unintended consequences

Have there been any unintended positive or negative consequences as a result of the call for tender / initiative? (Unintended consequences could include impacts on market supply and subsequent price swings e.g. not enough renewable energy, organic produce or recycled paper to satisfy demand.)	Yes, in terms of energy procurement, the market is not stabilised yet. It is therefore complicated to apprehend the scope of action. There is also a lack of knowledge regarding possible suppliers to buy energy from, following the liberalisation of the energy market. It is not simple to follow the changes in terms of legislation...

Impact on market supply

Has this approach succeeded or failed in its attempt to influence market supply, and why? (Please, identify reasons for success/failure e.g. has a long contract position taken by a public-sector buyer given increased certainty to the supplier of demand being sustained)	Yes, since other local authorities reproduce the same approach. As for the offer, it only depends on the legal frame (if regulated or not)
Has concerted and consistent action by numerous public-sector buyers, across the wider EU, influenced the market?	No

Has inconsistency or lack of communication by the procurer led to confusion and a lack of influence on the suppliers?	No
Have you had any difficulties with EU public procurement rules / directives? Please explain.	No

Impact on wider market demands

Has this activity influenced wider market demand?	Yes, concerning the evolution of products used for public lighting. But not regarding energy supply, which is too strictly reglemented and not flexible enough
What changes have been seen regarding the purchasing behaviour of customers, suppliers, and/ or other organisations?	Yes, sustainable procurement start to be integrated into ETDE's procurement approach

Eco-Technology / Eco-solution used

Do you think that the product is based on a new or recent eco-technology? If yes, please explain in more detail.	It is full service package including many green components, this is thus more a new eco-solution, which also encourages the development of new eco-technologies (through the
What has been the impact on market supply following the tender?	Development of new eco-technologies (see section 3.3, page 7)

Barriers and difficulties

Have there been any problems with compliance with the criteria in the tender?	No

Additional information

Contacts

Please, insert your full contact details as you wish that it will appear in the final cas study.	ETDE - 1 avenue Eugène Freyssinet 78062 SAINT QUENTIN EN YVELINES FRANCE www.etde.fr ETDE Métropole Lilloise 6 rue de l'Europe - 59160 LOMME (Christophe MONTELIMARD)

Sources

Please, indicate any used and helpful sources (e.g web sources, publications).	

14 Appendix 5: Questionnaires for the Sustainable Procurement of Low Emission Buses for Göteborg, SWEDEN

14.1 Questionnaire purchaser

General information

Name of person responsible for the tender	Lennart Löfberg (Vasttrafik), Pierre Modini (GS)
Name of the authority	Vasttrafik, Göteborgs Spårvägar AB (GS)
What (product/ service) was tendered?	Buses
What was the name/title of the tender (subject matter) (*Please attach a copy*)	Several tenders, titles with the subject matter "procurement of low-emission buses"
When was the call for tender (date)?	1992, 1998, 2003, 2005
Contact details	
In order to foster exchange of best practises in Europe, may ICLEI use your contact details in the case study?	Yes

Background information

Is the authority a member of a relevant (purchasing) network?	N/a
What is the total procurement budget of your organisation/department?	N/a
What is the amount spending on green purchasing? (*If not known please estimate*)	N/a
Do you have further experience with green public procurement?	

Information on the product

How much was purchased? (*Number of units and total costs in EURO*)	In total about 300 buses
What is the availability of the product on the local, regional, national market?	Local market ☐ low ☒ medium ☐ high Regional market ☐ low ☒ medium ☐ high National market ☐ low ☒ medium ☐ high
Are there any comparative figures (additional cost or savings) between costs of green and standard products? (*Please include life cycle costs figures if available*)	No

The drivers responsible for procurement

What were the main reasons for tendering for the specific green product? Was there any political support? Any other drivers?	National, regional and local political overall goals on reaching a sustainable society and a sustainable transport system.
How do sustainable procurement initiatives or actions interact with other policies and demands to influence the practices of procurers and suppliers?	Sustainable demands in the tendering process for bus operations are simply part of the many different demands set in the tendering documents. The form of the tender process, with a purchase-operator-supplier chain, creates downward pressure that is both economic and environmental. The City sets targets that demand ever-improving performance from the operator on emissions and renewable fuel usage, which in turn forces the suppliers to research, design and innovate. The process is not, however, completely arbitrary – whilst the targets are set by the City administration, there is an awareness as to what is scientifically achievable. The relationships between the three parties is one of constant 'utveckling' or development/ learning, where the outcome should be environmental improvements and economic efficiency.
Does your organisation have a sustainable or green procurement policy and did this assist in pushing for this tender?	Yes, it helped to give a base for the specifications The provision of public transport services was made subject to calls for tender by national law in Sweden in the early 1990's. Implementing this law at the local level, in Göteborg the objective was to use the new tender specifications and contract agreements to increase the quality and frequency of public transport services • achieve a better relationship between public subsidies granted and transport provided • maintain social standards in public transport • increase environmental standards. • provide small companies should access to the market.
Does your organisation have any sustainable or green procurement targets and do these assist in pushing for this tender?	During the mid 90's the politicians on the board of the Göteborg Transport Authority set the goal of increasing the number of travels in public transport by 20% by 1999 and having the cost coverage increased

	from 28 % to 50 % in 2-3 years. • Benchmarking/ targets; • Supplier pre-qualifications; • Establishing the Technical capacity
Does your organisation have a sustainable or green procurement implementation strategy and did this assist in pushing for this tender?	Yes, a management document helped to derive relevant information

The tendering process

Developing the green procurement criteria

Who was involved in the development of the criteria?	A few officials at the public transport authority and a few consultants.
How much advice was received from internal sources in developing the tender and criteria, e.g. through the environment department, finance department, energy department etc?	N/a
How much advice was received through external sources in developing the tender and criteria, e.g. consultants, consulting engineers other government departments, or suppliers?	Consultants working for Vasttrafik
Were the suppliers/bidders at any stage involved in the tendering process? (e.g. consultation round)?	Post award phase

The green procurement criteria

Did you define any green pre-qualifications for suppliers?	Yes, emission levels according to newest upcoming EU emission standards
Was there any technical capacity required?	N/a
What were the technical specifications?	Strict emission standards were achieved by directly integrating them into the specifications of the call for tender. Already from the beginning, the requirements for NOx and particulates were tough and in 1999 they demanded that NOx levels would have to be below 5 g/kWh and particulates below 0,11 g/kWh. This reflected the EURO 3 standards, which are valid in all Europe from 2001. While these standards were demanded, some flexibility was left on how to achieve them. The same specifications demanded that by 2000 10% of fuels would have to come from renewable resources and that busses should not be older than 10 years, with the fleet average being no higher than 5 years old.
What were the selection criteria?	Fuel consumption, recycling, delivery time etc.

Was there any award criteria, if so what?	In the award phase of the tendering process a bonus was given to those, who would achieve even stricter emission standards. Furthermore, incentives for good service quality were set by leaving 25% of transport charges to the operator. Also, contracts containing specific targets were used which set certain performance goals and procedures of monitoring their achievement. For example, the quality of service is assessed by an independent market research institute. Through competition, the price paid for bus traffic in the western part of Göteborg has been reduced by 45% from 1989-93 and a further 5 % in the following year. The initial set up costs of the transport authority were insignificant as this involved a transfer and restructuring of existing staff from Göteborgs Spårvägar AB. Due to rising fuel and labour costs, the price level on new contracts increased to about 20 % the last two years, a new index, in addition to the regular consumer index, now also takes into account fuel and labour costs.
What were the contract performance clauses?	Contract performance clauses are an important part of the system – incentives, not penalties, encourage the suppliers and operator to provide better services. For the purchaser, this creates efficiency. For the operator, it ensures successful and low-cost work, and for the supplier, market-leading product development and delivery. For all parties, the principle is that success breeds success. Contract performance clauses are a mechanism through which the sustainable development focus in policy statements can be realised. As already mentioned, the targets demanded by the City are bold, and suppliers often fail to meet these in the early stages of the tender. With time and commitment, products are developed that meet and/or surpass the expectations of the tenderer.
Was there any reference to eco-labels, if so what?	N/a
Were there any post-award criteria, if so what?	s.a.
What forms of evidence/proof were required from the supplier to demonstrate	Self-declarations, EMS certificates or similar

compliance?	

Assessing the tender

Which were the dates of the tendering process?	Starting date: Several tenders, each appr. 6 month period from start to awarding the contract
How many bidders were there?	Depending: mostly 5
How much time were potential bidders given to react and/or modify their approach?	They got about 60 days fore calculations but they are not allowed too modify the tender after that.
Has a similar approach been used when preparing other tenders of a different subject matter, i.e. has this purchase influenced other purchases?	Yes, it has influenced the implementation of Environmental zones for heavy duty vehicles as well as environmental demands in the tendering process for building and construction contracts (regarding construction equipment).
Has the approach used for preparation of this tender been used in preparation of subsequent tenders? Or has the focus or approach been modified?	Similar environmental demands have been part of the tendering process for bus operations in Gothenburg since 1992.

Contract management

Were there any problems with compliance with the criteria?	no
How was the monitoring/enforcement handled?	The bus operators' present annual written reports to document how al the environmental demands have been fulfilled. Some random testing of a few vehicles has also been done, but not every year. The City maintains a testing team that certifies new products, such as buses. The system is designed so that the producer is encouraged to create innovative and effective solutions. Initial non-compliance does not necessarily mean failure is likely, and nor is non-compliance penalised. However, producers realise that it is in their interest to meet agreed targets if their business is to continue growing. Successful participation in a world-leading partnership is a tremendous asset.

Potential of triggering the market

What changes in supply/offering resulted that can be directly attributed to the tender, including those not explicitly required?	Increased R&D activities, esp. for alternative fuels
What has been the impact on the market supply following the tender? Has there been any impacts on the supply chain, if so what? Have there been any impacts on wider	Supply chain: Volvo increased recycability quote with changing sub-suppliers

market demand? Have there been any impacts on other sectors?	
Did the supplier maintain changes after the end of the contract period, or revert to old practices?	Maintained and expanded
Did costs increase, and if so then by how much?	Costs increased and where allocated by 50% to the price of the product
Did this increase in costs amortise over the time? If yes, how long did it take?	Slow amortisation e.g. less fuel consumption
If there was an increase in costs, were these passed onto the procurer?	s.a.
How far down the supply chain can the impacts of the tender/ contract been detected?	Different sub-suppliers from Volvo made out profit from this tenders (e.g. engine construction)
What did the procurer do, and what did the supplier see?	Göteborgs Stad sets ambitious targets for its operator and suppliers. By doing so, producers have been forced to innovate, and this has resulted in successful economic and environmental product development.
Have there been any unintended consequences as a result of the call for tender/ initiative?	no

Barriers and difficulties

What were the difficulties with developing and implementing this tender?	One legal case but not referred to the implementation of new technologies
Have there been any problems with compliance with criteria?	no

Lessons learned

What can you recommend to other public authorities?	Having strong environmental laws, even stricter than EU regulations helps to push forward environmental considerations in public procurement
What could be repeated elsewhere?	Negotiations with suppliers

Additional information

Contacts

Please, insert your full contact details as you wish that it will appear in the final cas study.	s.a.

Sources

Please, indicate any used and helpful sources (e.g web sources, publications).	Newsletters from Vasttrafik

Questionnaire supplier

General information

Name of person responsible for the bid	Peter Danielsson
Name of the service provider	Volvo Sweden
Contact details	N/a
In order to foster exchange of best practises in Europe, may ICLEI use your contact details in the case study?	☒ yes Y

Background information

Can you provide a short description of your company?	Volvo Sweden is one of the main suppliers of low-emission buses in Sweden.
Can you provide figures about your green service (Sales percentage, volume etc)?	N/a
Do you have any experience with green public procurement or public authorities doing GPP?	Yes, with several bids for low-emission buses

Information on the product

Can you provide a short description of the specific product supplied?	Several types of buses using alternative fuels and meeting emission level EURO III/IV/V standards
How many sub-suppliers are involved in the production process? What for?	N/a
Has there been any life cycle (cost) assessment involved?	Yes, Volvo works with LCC since years.
Are there significant differences in costs between your standard and green services?	Costs increase was for 50% covered by R&D and for 50% put on the end price of the buses
How much was delivered – in general and to the specific authority? (*Number of units and total costs in EURO*)	Several hundred units

The drivers responsible for procurement

Why do you offer green products in principle?	To meet the requirements of the tender; to get a market advantage
Do you pursue a specific policy? Any specific targets? Do you have a particular strategy? Was there any political support? Any other drivers?	N/a

The tendering process – criteria

Were there any problems with compliance with criteria? If yes, at what tendering stage?	No

Potential of triggering the market

Do you think that the green procurement tender triggered the offer of the green	Together with similar demands from other cities in primarily Sweden has resulted in a

product? If yes, how?	critical mass that can support a business case for a unique low emission buses.
What changes in supply/offering resulted that can be directly attributed to the tender, including those not explicitly required?	N/a

Duration and sustainability of those changes

Did you maintain changes after the end of the contract period, or quickly revert to old practices?	The supplier not only maintained this practice but also made is even more aggressive
Were the changes implemented in other supply contracts?	Yes, in numerous examples.

Impact of the policy or contracts on costs throughout the supply chain, including those borne by the contracting authority

Did costs increase (i.e. any costs), and if so then by how much? Were these increases over the short term and in the medium-longer term? Where did the cost increases occur in the supply chain? Were these passed on to the procurer?	The costs increased by 10% of the total bus cost. This cost where sustained until the next generation of the technology was implemented. The cost where to 50% in the development of the technology and to 50% in new components. The full cost increased where passed on to the procurer.
What was the impact of those changes on the overall competitiveness of the supplier and its supply chain? (Positive impacts would include e.g. first-mover advantage, raising of standards, supportive home market providing a platform for export. Negatives might include the need to source from foreign suppliers.)	Yes, first mover advantage, export opportunities, and strengthening of the brand. Positive impacts would include e.g. first-mover advantage, rising of standards, supportive home market providing a platform for export. Negatives might include the need to source from foreign suppliers

Impacts on other sectors

Have sustainable purchasing initiatives in this area been adopted more widely? *(For example, have 'sustainable' specifications been adopted by procurers in the private sector?)*	In a sense this is valid. The bus operations are carried out by private enterprises but the public transport authority sets the demands. The bus producers sell the buses to the operators.
Has this been influenced by the activity of the government?	No, only by the public transport authorities.

Impacts on the supply chain

How far down the supply chain can the impacts of the policy or contract be detected?	The supply of the components and sub systems for emissions control are affected in the sense that the main suppliers have sub-suppliers. No possible to say how far down the line.
Crucially, what requirements are suppliers passing onto their own suppliers? How are these communicated and what is the result?	Within the Volvo Group we have a set of environment requirements on all our suppliers. There is a questioneer that have

	to be filled in and a scoring system in place to evaluate the environmental performance. The outcome is very positive since both Volvo and the suppliers have a better control and follow up of the environmental performance. We can secure that the Volvo list of forbidden or restricted chemicals/materials is implemented and that environmental management systems are is in operation. Information on recycling and data supporting LCA can be secured.

Unintended consequences

Have there been any unintended positive or negative consequences as a result of the call for tender / initiative? (Unintended consequences could include impacts on market supply and subsequent price swings e.g. not enough renewable energy, organic produce or recycled paper to satisfy demand.)	No

Impact on market supply

Has this approach succeeded or failed in its attempt to influence market supply, and why? (Please, identify reasons for success/failure e.g. has a long contract position taken by a public-sector buyer given increased certainty to the supplier of demand being sustained)	There has been a certainty that this policy of procurement practises will be sustained
Has concerted and consistent action by numerous public-sector buyers, across the wider EU, influenced the market?	Yes, in the case of the Swedish market.
Has inconsistency or lack of communication by the procurer led to confusion and a lack of influence on the suppliers?	No
Have you had any difficulties with EU public procurement rules / directives? Please explain.	No

Impact on wider market demands

Has this activity influenced wider market demand?	It has started to change and now cities in several EU countries have similar practices.
What changes have been seen regarding the purchasing behaviour of customers, suppliers, and/ or other organisations?	More focus on environmental features in general and a willingness to pay a premium for these features.

Eco-Technology / Eco-solution used

Do you think that the product is based on a	Yes, new eco-technologies have been

new or recent eco-technology? If yes, please explain in more detail.	inserted continously iin the offered buses, e.g. particle filters, CRT-filters, alternative fuel systems

Barriers and difficulties

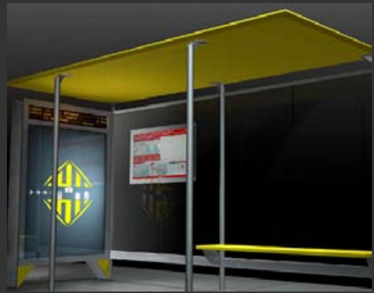
Have there been any problems with compliance with the criteria in the tender?	No

Additional information

Contacts

Please, insert your full contact details as you wish that it will appear in the final cas study.	Volvo Peter Danielsson Environmental Manager Sweden E-mail: peter.j.danielsson@volvo.com

15 Summary of all case studies

Case study	1: Sustainable Procurement of Public Railcars with the Eco-Technology 'particle filters' for the Taunusbahn, GERMANY	2: Sustainable Procurement of Bus shelters in Barcelona, SPAIN	3: "The better floorlamps" of the City of Zurich, SWITZERLAND	4: Sustainable Procurement of the Public Lighting Service of the City of Lille, FRANCE	5 : Sustainable Procurement of Low Emission Buses for Göteborg, SWEDEN
					
Purchasing authority	Fahrzeugmanagement Region Frankfurt RheinMain GmbH (fahma)	City of Barcelona, Urban Department	Building Construction Department of Zurich (Amt für Hochbauten der Stadt Zürich)	City of Lille, Public Lighting Department	Västtrafik Göteborgsområdet, for the Greater Göteborg Area
Subject matter	Tender for the production and delivery of ten two-part railcars	Tender for the purchase of 500 new bus shelters and adaptation of all 1200 old existing bus shelters.	Tender for the delivery of MINERGIE® conforming floorlamps	Tender for the general maintenance of the municipal street lighting services	Delivery of low emission buses partly with alternative fuel technologies
Environmental criteria required	Minimum environmental requirements • Noise levels referring to ISO 3095 (LAmax = 90 dBA) • Avoidance of specific toxic materials – comprehensive list including e.g. arsenic, chrome • Lowest fuel consumption possible • Emission standards based on the Directive 97/68/EG Stage IIIa Technical specifications • The diesel engines have to be equipped with particle filters. If this is not possible, the offer of the bidder must deliver adequate information on future technical solutions to be developed, time of realisation and preliminary cost calculations for the retrofitting.	Minimum environmental requirements • Use of: Glass laminate and/or tempered glass of high resistance, Smelting Aluminium type AG-3, Stainless steel – quality AISI 316 L, Stainless steel microfusion, Composites exempt of chlorine, Recycled materials • Exclusion of PVC and non-sustainable timber • Life Cycle Analysis (LCA) for each element of the bus shelter in order to justify its compatibility with sustainable development. Selection criteria • Use of recycled materials and recyclable materials (5 points) • Use of non pollutant manufacture procedures (5 points)	The 'General Ecological Building Conditions' as minimum environmental requirements include: • Environmental Product Declarations (EPDs) according to the recommendation SIA 493 ("Declaration of ecological characteristics of building products") • List of ecological requirements for building material, such as, concrete, timber products ('sustainable origin') and insulation material Technical specifications • The Stand-by performance must not exceed 2 watt: the use of a regulator or control system depending on daylight is mandatory. • With sufficient daylight the floorlamp must automatically switch off or turn on the stand-by mode. Continued operation at minimum light power (e.g. 10%) is not permitted.	The intention of the City was to give indications rather than defining specific quantitative specifications. The green criteria included in the tender were : • Optimal use of renewable energies • Waste management policy during the reconstruction phase and use of recycled materials • Environmental impacts of the equipment implemented (life cycle costs, reduction of light pollution) • Development of new and innovative eco-technologies • Reduction in energy consumption (commitments in terms of kWh/year, duration to achieve commitments, power reduction and power control) • Suggestions for handling sustainable development • General integration of environmental considerations	Two strategies have been followed. The first targeted environmental emissions: • Strict emission standards were achieved by including the requirements as part of the technical specifications of the call for tender. • Between 2006 and 2008 the requirements will adjust to incorporate the EURO 4 and 5 standards respectively; • Previous specifications required that by 2000, 10% of fuels would have to come from renewable resources and that the maximum age of the bus fleet should not be more than 10 years, with the average age being no higher than 5 years old. • Contracts prescribe that all new buses shall be equipped with diesel particulate filters. • Older diesel buses that enter the "environmental zone" of the inner city of Göteborg must be retrofitted with particulate filters.

Environmental criteria required	• It must be technically possible to retrofit the railcar engines with particle filters. The supplier is obliged to retrofit the engines with particle filters when the required technical solution is available. The costs have to be included in the offer. Award criteria • Fuel consumption (10%)	• Use of no pollutant maintenance products (5 points) Quality and effectiveness of the best proposed technologies on any of the elements of the bus shelter (5 points)	• The electrical output must not exceed the standard output of the floorlamp • The floorlamp has to be constructed in a way to reduce electromagnetic radiation to a minimum (≤ 2V/m) Contract performance clauses • All packaging material has to be taken back by the suppliers. • The costs for environmentally friendly disposal have to be included in the unit price. • The working tools and containers have to be cleaned in an ecological manner by avoiding chemicals that could enter the water system. Upon request, the suppliers have to provide a disposal certificate for disposal and recycling of material. Zurich reserves the right to carry out indoor air quality checks	• Communication, training and awareness raising The bidders were invited to bring their offers in line with these general objectives, and to present their commitments (i.e. energy savings achieved by the end of the contract period, percentage of renewable energy to be used, etc.) and suggestions (ideas on how to integrate sustainable development to the service) during the interview stage. The main tender document also referred to a number of related documents the offers had to comply with, such as Lille's charter for clean construction, the local urban planning documents and road regulations, etc.	In the second approach, incentives to strive for better results than demanded were set: In the award phase of such tendering processes, companies who could deliver emissions reductions higher than the targeted amount (i.e. specified in the technical specifications) were rewarded with bonuses.
The new eco-**technology**	In the CORADIA LINT series, a catalytic coated filter is used consisting of two functional filter units in parallel connection. It is based on the wall flow principle that uses a holed and coated wall through which the exhaust emissions flow, reaching a filtration efficiency of 95% of the particulate matters. The passive regeneration is achieved by the catalytic elements (coated wall).	The "***Barcelona bus shelter model***" is a unique bus shelter prototype in the market. Three main elements distinguish this prototype from the rest: • The roof: the inside consists of a beehive-shaped fibreglass material. This strengthens the roof, and makes it easier to disassemble at the end of its life cycle, enabling it to be recycled. • The advertising panel is unique for using 3 highly efficient T5 lamps of 35W each instead of 4 inefficient lamps. Additionally, side panel reflectors improve the light dispersion, and only one electric balast supplies the energy to all lights. New cleaning system developed exclusively for the maintenance of the bus shelter using osmosed water instead of conventional water, avoiding the need to use soap/detergents.	• Focus on energy-efficiency, sustainable material and reduced electromagnetic radiation (≤ 2V/m). • Apart from using an environmentally friendly production process, all floorlamps use sustainable, long-lasting material and guarantee that the floorlamp is assembled without the use of harmful adhesives. • Winning floorlamp Level/MDT® reduced the stand-by mode by a factor of 10, meaning from 4 watt to 0.4 watt. • With sufficient daylight, the floorlamp switches off automatically by virtue of a special sensor. New type of anti-glare used (MDT®) which allows an optimal surrounding anti-glare of the working space.	The management of Lille's street lighting services represented an "eco-solution" including many components (maintenance, reconstruction, operation of the systems, energy management). Lille was the first city in France to hand over control of its lighting system to a private company and at the same time requested that this company provide an eco-solution. Lille's eco-solution comprised the following innovative aspects: • Integration of green criteria throughout the implementation of the tender • Continuous improvement through a 'Virtuous circle scheme' of energy savings and reinvestment into eco-efficient equipment • New environmental technology tested and applied Continuous auditing and monitoring system of the strategy and management of the lighting system	One of the effects of the procurement practises in the Göteborg region is that companies were encouraged to develop vehicles using recent Eco-Technologies. The development of particle filters, engines adapted to high blends of agro-fuels, natural gas, LPG (liquefied petroleum gas), hydrogen, electric motors and hybrid vehicles combining combustion engines with electric motors was stimulated. Göteborg is seen as a forerunner with regards to starting to implement the clean vehicle procurement obligations of the European Commission.
Key drivers for triggering market	• National discussion about the high emission levels of particulate matter in the air of cities like Munich and Frankfurt/ Main (2005) • Awareness of local politicians about the role of urban transport regarding particulate matters	• It was specified in the tender for the bidders to develop proposals on how to improve the quality of the service. • More points were given when presenting better technologies to improve the quality and the effectiveness of the product.	• Zurich's political commitment to sustainability • 2010 target of the "7 Milestones for Ecological and Energy-Efficient Construction" • Lack of MINERGIE® conforming floorlamps on the market • Involvement of 27 floorlamp manufacturers in the pre-tendering phase	• Lille's political commitment to sustainable development in the framework of its Agenda 21 activities, as well as its charter for sustainable construction. • The City's integrated approach of sustainable procurement to all public tenders (public lighting being the first tender of a substantial size).	• The continuos competitive tendering of Västtrafik secured that the bidding suppliers were encouraged to achieve low emission levels earlier than the respective Directives for emission standards of heavy vehicles came into force. • The tendering procedure fostered the development of new Eco-Technologies but at the same time was not prescriptive on the way on how these should be achieved.

Key drivers for triggering market	• Rhein-Main Transport Network (RMV) climate protection strategy setting ambitious targets • The demand of the particle filter was based on recent R&D activities that only needed a business case. A key result of the procurement process was the demand created for the particle filter.	• The introduction of new elements and the new cleaning system appear as improvements in relation to the old tender also awarded to JCDecaux in 1998. • JCDecaux's major source of income for the company: advertising on the bus shelters. JCDecaux are world leaders in outdoor communication, and bus shelters become strategic elements for advertising and to receive revenue • Regarding the maintenance, it is specified in the contract that the bidder has to take care of the maintenance and the costs involved during the whole duration of the contract (10 years). This clause in the contract was another key factor that pushed them in the development of a new Eco-Solution with better lights that would hardly need to be changed, as well as to invest in the implementation of the new technology with a cleaning system that does not need soap. • As leaders in outdoor communication, JCDecaux want to showcase their improvements to the world, and show their innovative capacity.	• 3-year-contract periods • Zurich signalised that it was planning to expand the MINERGIE® conforming lighting to all its public buildings.	• Motivation of the supplier, ETDE, to be awarded the contract involving a budget of 35,2 million EUR and a long commitment over 8 years. • ETDE has a long history of experience in the management of public lighting management in general and seized the opportunity to create a cost-efficient eco-solution by investing from the start into energy-efficient equipment. • General context of the progressive liberalisation of the energy market and the ability for French local governments, since July 2004, to choose their electricity supplier and also the origin of the energy they consume. • France's commitments to achieve a part of the 21% target of electricity produced from renewable sources (RES-E) by 2010. • Perspective of the energy certificates scheme, which was to be implemented in 2006 in France.	• The inclusion of environmental criteria in the tendering process contributed to getting buses on the road meeting Euro 3, Euro 4 and Euro 5 standards earlier than the legal requirements. • The aim of increasing the share of renewable resources, hence decreasing the reliance of fossil fuels, was achieved two years earlier than required by the environmental tender specifications used in Göteborg. • These specific tenders together with similar demands from other Swedish cities have resulted in achieving a critical mass that strongly supports a business case for the use of low emission buses.
Impact on supply side	• Alstom Transport offered the CORADIA LINT series with particle filter in other competitive tender processes • The green procurement of fahma resulted in a business case for the Engine producer MTU and related sub-suppliers for particle filters in railcar engines. • The filter solution provider Hug Engineering AG sees big development and market potentials all across Europe.	• The new technology to clean street furniture was implemented on a large scale for the first time, entailing a big investment from the bidder's side, both to adapt the new system into their cleaning vehicles and facilities, as well as to train employees. • JCDecaux marketed this technology on a much wider basis in all other European subsidiaries of JCDecaux. • At the local level, neighbour cities Badalona and Sabadell have already set up contracts with JCDecaux. Elsewhere in the country, the city of Vigo awarded the contract to JCDecaux for the same product in May 2007.	• Zurich's procurement action resulted in the production of 18 new high-quality floorlamps, which were subsequently put on the market. • The production process for floorlamps did involve a considerable number of subsuppliers on the market, more specifically the producers of the various floorlamp components, such as the electronics, the aluminium, the directional light components and the light tubes. • The bidders, and in particular the successful bidder Regent Lighting, applied the advanced criteria to other products as well and, hence, developed a new series of products in compliance with the tender criteria. • Approximately 2500 of these floorlamps have been sold so far, mainly to the city of Zurich. Currently, further MINERGIE® conforming floorlamps are in process of being developed • Especially in the electronics sector the impact of the tender was significant as it resulted in the development of a new. technology (stand-by mode; new Micro Downlight Technology® (MDT®).	• Lille's public lighting system is increasingly attracting interest at the national and international level. Several other French cities have replicated Lille's tender, while others are planning or considering it. • The first mover advantage the supplier (ETDE) benefited from did not last very long, since its strategy was soon replicated by many of its competitors, which have since made efforts to adapt and "green" their offers as well. • According to ETDE, the tender also had impacts on other sectors. For example, the virtuous circle of energy-efficiency and reinvestment at the heart of ETDE's offer expanded in the Bouygues group. • The contract includes a continuous investment in new ecotechnologies and an improvement of the new technology in use (i.e. electronic power reducer; digital lighting system). • They are regularly discussing with the City the opportunities and the availability of new eco-efficient	• Following the Göteborg tender, the winning service supplier - Volvo Group - developed a set of stringent environment requirements which was applied to all their suppliers. • Volvo stated that once a critical mass has been reached, with similar demands coming from similar cities, the business case for low emissions buses becomes sound. • Supporting this claim, figures from another company Scania AB show that the company sold 283 buses to Swedish cities in the first two months of 2005, 123 of which were ethanol-fuelled products for the Stockholm transport authority. • Following Göteborg's tenders other public-sector buyers across Sweden have also influenced the market in Sweden

			• Apart from the difficulty to quantify the direct impact on the supply chain, in particular on the sub-supplier, an indirect impact is evident as the number of orders for these specific floorlamps is growing.	• products on the market, and continuously testing new green products and services.	
Cost implications	• The additional costs for the environmental friendly version for each filter are €45,000, resulting in approximately 3% additional costs of the total product costs of approximately €2.7 million. • With current testing, fuel consumption is the same as those railcars that do not use a particle filter. There are negligible costs for the maintenance of the filter system.	• The new cleaning system involved an initial investment (placing of a reverse osmosis system to treat the water, staff training, adaptation of the cleaning vehicles to the new system, etc.). These costs were not passed on to the procurer, since they were entirely assumed by the winning bidder.	• From the supplier's perspective, overall, the cost of the Level/MDT® floorlamps did not increase as the initial investment in research led to new expertise, which was used for the development and design of several new lighting products (mostly floorlamps), and a reduction of costs was possible for the electronic components. • Zurich calculated for approximately 800 lamps significant economic savings amounting to approximately €485,000.00 over a period of two years.	• The supplier had to bear some additional costs concerning the purchase of electricity from renewable energy sources (on average 25% more expensive) and of materials (energy efficient lamps with prices 10 to 20% higher). However, this increase was not passed on to the procurer since the contract budget was blocked by 4,4 million EUR annually, and since these additional costs were balanced with greater savings in energy. • For the City of Lille, global costs went down by 5% in comparison with their last contract, mostly thanks to the savings achieved in running costs (42% savings in energy consumption).	The full cost increase was passed on to the procurer. The costs increased by 10% of the total bus cost. This cost was sustained until the next generation of technology was implemented. The increase in costs is attributed as follows: • 50% were incurred in the development of the technology; and • the other 50% in new components. Competition in Göteborg has shown to bring major cost savings in traffic operation whilst improving social and environmental standards and increasing the number of passenger by 7.5%. Financial savings were used to increase the service level and to reduce ticket prices.
Barriers and difficulties	• Lack of European standards for recent technological developments • Some difficulties about how to verify the fulfilment of the green criteria other than by self-declarations by the supplier (e.g. used materials)	• Sub-suppliers needed to search for a much broader market in order to comply with the new requirements imposed by the main supplier. • The fact that PVC and Chlorine materials were excluded in the tender affected the supply chain, requiring alternative materials to introduce in the design of the new bus shelter. • It was difficult to select specific criteria to satisfy all the different departments involved in developing the tender.	• Technical difficulty to obtain maximum light output with minimum energy in order to reach a clearly defined light level. • Legal disputes with other manufacturers that promoted themselves as successful bidders delayed delivery of product	• No major barriers or difficulties have been mentioned neither by the supplier nor by the public service provider. • As a minor difficulty, ETDE spoke from the energy market in Europe: the French national producer EDF has now lost his monopoly and the energy supply has opened to concurrence. Therefore, it is hard for electricity operators to identify their suppliers, to manage the prices etc	• No specific barriers or difficulties related to the implementation of green criteria into the tendering process. • Some difficulties were found regarding the availability of the desired products • Some time was needed to adapt the environmental policies to the daily work of the procurement departments.
Lessons learned	• Political support resulting from recent discussion about particulate matters and air quality in the region secured the green tender • Good external knowledge provided by consultants on how to include green criteria • Choosing a negotiated procedure gave good results • Detailed tables and figures in the technical requirements allowed the supplier to easily fulfil the green criteria.	• The purchaser selected bidder with a higher innovative capacity, leading to a successful cleaning system that in the mid- to longer term implies a smaller environmental impact and a reduction in the maintenance costs. • Importance of analysing the status of each city, as it is not always possible to implement certain elements even if they are more attractive (Eg. in one of the offers, JCDecaux offered the implementation of solar panels on top of the roofs of the bus shelter, but due to the local conditions it was not possible). • Using the knowledge of other departments in the selection of green criteria was also valuable for a successful result.	• To split the tender procedure into two phases, i.e. inviting interested suppliers to assist in discussing the tender criteria gave a strong signal to the market and triggered the production process.	• Tenders on performance-based specifications allows more scope to push the market to its full potential, and encourages bidders to be more creative. • Handing over the entire street lighting services to one supplier is a challenge for a City, but proves to be a good way to implement an efficient eco-solution which integrates the City's environmental objectives throughout all aspects of the service package.	• It is recommended to set specific emission levels as a criterion (target) when tendering and not demand a specific technology, for example, demanding diesel fuelled buses. Subsequently, it is then up to the suppliers to provide the adequate technology to achieve the level of emissions specified. • Competitive tendering has also enabled modernisation of the bus fleet

Costs and Benefits of Green Public Procurement in Europe

Service contract number: DG ENV.G.2/SER/2006/0097r

- General Recommendations -

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Overall conclusion and recommendations

The recommendations in brief

- To communicate the good results regarding costs and LCC in many product groups of this study and to deepen knowledge in further product groups.
- To use LCC in GPP where appropriate.
- To strengthen function oriented approach to reveal further potentials for environmental and economic benefits.
- To create demand and help develop a market through tendering for innovative green products.
- To strengthen GPP through high-level political commitment.
- To motivate procurers and facilitate GPP through, e.g., networking activities
- To provide practical assistance and best practice examples next to clear information and easy to use tools and examples.
- To send clear signals that the price is not the only criterion in public procurement and that this attitude will maintain in the long term, giving suppliers planning reliability
- To think of innovative procurement procedures, e.g. to invite suppliers and/or manufacturers to obtain input on the definition of the tender criteria, to assess the availability of the product on the market and, hence, to see whether the 'green' criteria are realistic.
- To foster implementation of monitoring and environmental management tools for GPP.

Costs and benefits

Below the line, the results of the LCC analyses regarding price differences between green and non-green products lead to a tie: It cannot be said that green products are generally less expensive; yet, they are not basically more expensive, either.

Environmental qualities of a product are only one aspect determining the price of products. Other, partly more important aspects are the brand (or make), quality, technical merit, aesthetic or functional characteristics as well as the price deduction schemes related to different purchase volumes.

Regarding the latter, joint procurement initiatives have a positive impact on the purchase price and to some extent also on LCC related costs (e.g. maintenance, energy consumption) of the analysed products and services.

Higher purchasing prices are in many cases compensated for by lower operating costs. This is an important result that should be communicated by the European Commission as widely as possible. The results of the study should be used to stress that LCC aspects should be included and emphasised more in public procurement in order to ensure that public authorities will save expenses effectively.

Also, experiences regarding other product groups, which were not part of this study, show that rational decisions in public procurement should be based on the LCC approach. An example is high efficient pumps in heating installations: During the whole life cycle, approx. 95% of the total costs are determined by operating costs. Thus, public procurement decisions solely based on the purchase price are likely to cause misinvestment. Therefore, it is necessary to investigate further product groups to broaden the knowledge with regard to LCC.

Function oriented approach

In some product groups, the function oriented approach could not be fully applied, either due to financial and time restrictions (in case of food, e.g., it has not been possible to calculate all costs producing a certain drink or dish, including personnel or energy costs for preparation), or due to given definitions of the eleven product groups. For example, it has been possible to include results of product group 11 (‘Paper’) into the calculations of product group 8 (‘Printers and copiers’) in order to give a complete picture of all costs related to the printing or copying function to be delivered. In other cases, however, such an overlapping approach has not been possible. A comparison of different hand drying systems (cotton vs. paper towels[1], for instance) might have been interesting. However, the two versions belonged to two different product groups (‘Clothing’ and ‘Paper’). A selection of this product type in both product groups did not make sense, as in case of paper other product types were more important, and in case of clothing a green version for cotton towels did not exist. Concluding, a stronger focus on the function to be delivered might reveal further environmental and economic benefits.

Creating demand for green products

In the course of the study it was revealed that the market access to the green version of some products can be difficult for procurement units (e.g. in the case of clothing, where only few green products are available on the market). At present, this can be seen as a handicap for GPP. However, procurers can help to ‘green’ the market by creating a demand for ecological products. As an after-effect, this can also have an influence on the private demand. For example, the Zurich case study (Part 3) clearly shows that successful GPP can give strong signals to private procurers as well as to the competitors on the market.

Political commitment; Motivation and knowledge dissemination through networks

All case studies in Part 3 of the study once again stress the importance of political commitment in the city or region concerned; a finding which is also supported by consumer research, conducted in another project on green (private and public) purchasing[2]. In the Swedish case study, e.g., longtime overarching national, regional and local political goals to achieve a sustainable society and a sustainable public transport system could be observed. This also shows the need for the European Commission to continue convincing national governments to put GPP on their agenda, and supporting it actively. In order to secure political backing, dissemination activities should always highlight the benefits when implementing sustainability (procurement) policies. Irrespective of financial implications, GPP drives innovation, achieves both global and local environmental and health goals, improves the public image, increases the legitimacy of political representatives, and meets the responsibilities towards today’s and tomorrow’s society.

Also, the individual commitment of different departments of the purchasing organisation is highly important. Being part of a network, to support, share and show costs and benefits of GPP is a valuable asset that many local authorities use. It is therefore strongly recommended to disseminate the findings of this report regarding the cost-effectiveness of most green products and services through channels offering a high credibility for municipal decision makers, such as ICLEI, CEMR (Council of European Municipalities and Regions) and its counterparts on national and European level.

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1 For an environmental comparison of these two systems see: Eberle, U.; Möller, M.: Life Cycle Analysis on two hand drying systems. A comparison of cotton towels and paper towels. Öko-Institut, Freiburg 2006. (commissioned by: European Textile Service Association – ETSA Brussels, Belgium)

2 Consumer research, amongst others, on green electricity procurement in Germany was carried out within the Öko-Institut’s ‘EcoTopTen’ project, funded by the German Federal Ministry for Research (www.ecotopten.de).

Both political commitment and motivation and knowledge dissemination through networks do not necessarily require high investments, as Part 2 of this report shows.

Practical help and tools

The study revealed a number of other aspects that can help to further GPP. For the daily work of the purchasing authorities, GPP should be practical and easy-to-use. During the study it was observed that for successful GPP it is most relevant to provide practical assistance and best practice examples from other public procurement bodies, e.g. model tender documents. On the EU level, a GPP toolkit is currently being produced and will be available at the beginning of 2008. It will give clear advice on how to overcome key barriers to foster cost-effective implementation of GPP. The tool will contain information and good practices, showing that green products do not necessarily cost more, particularly when Life Cycle Costs (LCC) are incorporated. Therefore, this guidance will be complementary to the results of this study.

Even more convincing than figures to prove the cost-effectiveness of green purchasing is to show that other public procurement bodies are already successful in GPP. In the example of green electricity this was observed during the study, but it is also true for other product groups. Good practice examples and especially tender documents, that show how products and services can be procured environmentally friendly and legally sound, are a major contribution to furthering GPP. Especially Part 3 of this report includes cases of successful procurement of products using eco-technologies.

Reliablility

In line with the need of political commitment and will, and to have a good outcome in terms of tendered products, public authorities should send a clear signal that the price is not the only criterion, and that they will maintain this attitude in the long term. This is certainly another convincing argument for many suppliers to participate in the tendering process and to invest in the development of the relevant product.

Tendering process

The case studies in Part 3 also showed that there are procedural steps in the tendering process that can be helpful to the procurement. For instance, to split the complex tender procedure into two phases was seen as a very effective approach to obtain the best offer on the market of the relevant product. Inviting suppliers and/or manufacturers can help to obtain input on the definition of the tender criteria, to assess the availability of the product on the market and, hence, to see whether the 'green' criteria are in fact realistic. This can give a strong signal to the market and trigger the production process. In the Zurich case study, e.g., the approach added to the transparency of the tendering process and further opened it up towards fair competition.

Management and Monitoring

One of the results of Part 2 of the study is that it should be considered creating a simple and easy-to-use European-wide monitoring system, including benchmarking possibilities and tools to measure the outcomes, e.g. by cost-benefit-analysis and impact analysis tools. Local authorities often – like in this survey, too – lack statistical data on their activities.

Environmental management systems like EMAS give a good basis to develop straightforward and practical GPP implementation and monitoring tools. It would therefore be beneficial to promote and highlight the links between EMS and GPP and how they support each other's goals. One tool that could be further adapted is the ICLEI Scorecard used in the Procura$^+$ Milestone project. This tool can currently be used to measure the share / amount of green products and services procured by the organisations.