



Federal Ministry for the  
Environment, Nature Conservation,  
Building and Nuclear Safety



# **MANUAL ON SUSTAINABLE PUBLIC PROCUREMENT** **-With a Focus on Cost-Benefit Analysis (CBA)-**

Document prepared by:

Environmental Information and Economics Division  
Ministry for the Environment, Chile

With contributions from:

The German Federal Ministry for the Environment, Nature Conservation  
and Nuclear Safety

**August 2014**

- Environmental Information and Economics Division  
Ministry for the Environment, Chile
  - Dr. Alwine Woischnik
  - María Belén Sepúlveda
  - Francisco Donoso
- Federal Ministry for the Environment, Nature Conservation, Building,  
and Nuclear Safety, Germany
  - Dr. Ulf Jaeckel
- Federal Environment Agency, Germany
  - Dr. Hans-Hermann Eggers

## Contents

<b>1. INTRODUCTION.....</b>	<b>6</b>
<b>2. BACKGROUND AND INTERNATIONAL SUSTAINABLE PUBLIC PROCUREMENT INITIATIVES.....</b>	<b>8</b>
2.1 DEFINITION AND FIRST STEPS.....	8
2.2 INTERNATIONAL ORGANIZATIONS .....	9
2.2.1 National United Nations Environment Program (UNEP) .....	9
2.2.2 Organization for Economic Cooperation and Development (OECD).....	10
2.2.3 European Union .....	12
<b>3. ENVIRONMENTAL CRITERIA FOR SUSTAINABLE PUBLIC PROCUREMENT .....</b>	<b>14</b>
3.1 GENERAL PRINCIPLES .....	14
3.2 ENVIRONMENTAL CRITERIA FOR PRODUCTS AND SERVICES .....	14
3.3 THE GERMAN CASE.....	15
3.3.1 Blauer Engel (“Blue Angel”) Certification .....	16
3.3.2 Examples of environmental criteria for goods and services .....	19
3.3.3 Examples of Guidelines .....	24
3.4 EXPERIENCES FROM OTHER COUNTRIES .....	25
3.4.1 Austria .....	25
3.4.2 Canada .....	27
3.4.3 Spain.....	30
<b>4. THE BENEFITS OF SUSTAINABLE PUBLIC PROCUREMENT .....</b>	<b>32</b>
4.1 ECONOMIC BENEFITS .....	32
4.2 BENEFITS FOR GOVERNMENT AND SOCIETY .....	33
<b>5. THE CHILEAN SITUATION .....</b>	<b>34</b>
5.1 CHILE IN THE REGIONAL CONTEXT .....	34
5.2 THE CHILEAN PUBLIC PROCUREMENT SYSTEM.....	35
5.3 SOCIALLY RESPONSIBLE PUBLIC PROCUREMENT POLICY. FROM SUSTAINABILITY TO SOCIAL RESPONSIBILITY.....	35
5.4 TOOLS FOR SUSTAINABLE PUBLIC PROCUREMENT .....	37
<b>6. ANALYSIS OF PRIORITY PRODUCTS IN CHILE .....</b>	<b>40</b>
6.1 PRIORITY PRODUCTS IN CHILE .....	40
6.1.1 Sustainable heating.....	40
6.1.2 Lights .....	42
6.1.3 Vehicles.....	42
6.1.4 Printing paper .....	42
6.2 ANALYSIS METHODOLOGY .....	43
6.2.1 Life-cycle Analysis .....	43
6.2.2 Cost-Benefit Analysis.....	44
6.2.3 Impact quantification and assessment methodology.....	45
6.2.4 Product assessment and environmental scoring methodology .....	47
6.3 PRODUCTS EVALUATED .....	48
6.3.1 Lights.....	48
6.3.2 Printing paper .....	55
6.3.3 Light vehicles.....	59
6.3.4 Sustainable heating.....	64
<b>7. CONCLUSIONS .....</b>	<b>68</b>

## 8. REFERENCES.....69

### Index of Figures

Figure 1: The economic impacts of sustainable public procurement in Europe .....	321
Figure 2: Purchases and transactions in the Chilean public sector .....	365
Figure 3: Participation (%) by Chilean companies in public procurement.....	376
Figure 4: Seals for products and services recommended by ChileCompra .....	37
Figure 5: Seals implemented or recommended to suppliers by ChileCompra.....	37
Figure 6: Annual PM 2.5 concentrations at selected stations and annual standard (ug/m3).....	41
Figure 7: Winter in the city of Temuco, southern Chile .....	41
Figure 8: Stages of life-cycle analysis according to ISO 14040 .....	44
Figure 9: Harm ratios of local pollutant emissions.....	46
Figure 10: Environmental product scoring .....	47
Figure 11: Score of lights by technology.....	49
Figure 12: Quantified impacts of life-cycle analysis for lights.....	49
Figure 13: Unit analysis of lights by environmental indicators .....	53
Figure 14: Costs and mercury emission per workplace and scenario by technology .....	53
Figure 15: Agreggate impacts of public light purchases .....	54
Figure 16: Environmental criteria for analyzing printing paper .....	55
Figure 17: Recycled fiber content by type of paper.....	55
Figure 18: Quantified impacts of the life-cycle analysis for paper.....	55
Figure 19: Unit results from the assessment of printing paper .....	57
Figure 20: Unit results from the assessment of printing paper (USD/kg-year) .....	57
Figure 21: Environmental criteria in vehicle assessment .....	59
Figure 22: Score assignation by evaluated vehicle .....	59
Figure 23: Quantified impacts of vehicle life-cycle analysis.....	61
Figure 24: Quantified impacts of vehicle life-cycle analysis.....	63
Figure 25: Quantified impacts of vehicle life-cycle analysis.....	63
Figure 26: Decision diagram for heating measures .....	64

### Table Index

Table 1: Products and services with environmental criteria .....	17
Table 2: Public procurement using sustainable criteria .....	38
Table 3: Environmental criteria for analyzing lights .....	48
Table 4: Data by technology evaluated .....	51
Table 5: Input values used in analyses of lights .....	52
Table 6: State purchases by type of light (units) .....	54
Table 7: Input values used for analyzing printing paper .....	56
Table 8: Results from the unit analysis for printing paper.....	56
Table 9: Results of the aggregate analysis for printing paper.....	58
Table 10: General assumptions for economic assessment of vehicles.....	62

Table 11: Investment cost and performance by type of vehicle .....	62
Table 12: Summary of main features by fuel type.....	65

## 1. Introduction

Sustainable public procurements (SPP) aim to maximize State resources by considering criteria such as the efficiency, availability, quality and environmental performance of goods and services. Therefore, in sustainable public procurement processes, economic, social and environmental aspects must be understood, as well as potential impacts and costs associated with the procured product or service (Public Works and Government Services Canada 2006). A sustainable public procurement policy has many advantages, and its effectiveness is based on the rational use of available resources, reuse of materials and energy efficiency.

State procurement decisions affect the public and private sectors, the environment and wider society in a range of ways, as they involve production and consumption processes that create positive and negative externalities in their surroundings. Consequently, the State, as a body that seeks the wellbeing of society as a whole, should consider not only the price of the good or service it wishes to acquire but also its externalities in order to have a full overview of the total cost of the product or service it aims to procure.

In this context, one of the most effective policies applied by developed countries in recent years consists of establishing environmental criteria for products and services in public sector procurements. Once established, ecological and social standards can be applied directly to public procurements and the development of an eco-labelling system.

Along these lines, Chile has begun a process to establish environmental criteria for products and services in public procurements. International experiences, specifically those of countries at the cutting edge of this area such as Germany, will guide this process.

To analyze the real cost of procurements, the lifecycle approach can be applied. This concept proposes including not only purchase price in the analysis, but also impacts arising from the manufacture, operation and maintenance of the product or service as well as those arising in the final stage of its useful life. In this way, a product that seems cheaper in the beginning, may actually be more expensive due to higher social or environmental costs in any process of its life-cycle. Likewise, a product that may initially seem more expensive may actually be cheaper after taking lifecycle costs into account.

Including this concept in State procurement decisions can disprove the idea that sustainable products are more expensive. Therefore, training officials in charge of public purchases to use this approach when making a purchase could lead to significant savings.

In 2007, the European Commission carried out a study to evaluate the economic impacts of including environmental criteria in purchase processes. The study compared the costs and benefits of sustainable procurement with those of standard procurements, and the results show that purchase price in many cases has a minimal role in comparison with the full life-cycle of the procured product or service (Öko-Institut e. V. y ICLEI – Local Governments for Sustainability 2007).

In Hamburg, Germany, authorities decided to replace standard lights with efficient ones in 300 public buildings, thereby reducing annual electricity consumption by approximately 4.5 million KWh, equivalent to around 2,700 tons of CO<sub>2</sub> and savings of about 225,000 euros in the city's electricity costs (European Commission 2001).

Due to the likelihood that State purchases will impact on the economic, social and environmental spheres, it is essential to make the most of any opportunity to guide them towards environmentally and socially responsible production standards, to influence the Chilean market and foster competitiveness in a new area of technological innovation and sustainability-oriented research.

Therefore, this document has the following general objectives:

- To briefly introduce sustainable public procurement in light of international experience.
- To describe the domestic context of Germany and other countries.
- To outline the Chilean situation with regards to sustainable public purchases.
- To present analyses by the Chilean Ministry for the Environment and list the products prioritized in Chile for the incorporation of environmental criteria in State public procurements.

## 2. Background and international Sustainable Public Procurement initiatives

### 2.1 Definition and first steps

States are large consumers. Public procurements (purchases and contracting) represent approximately 15% of GDP in OECD countries and 25 to 30% of GDP in developing countries.<sup>1</sup> In terms of Environmental and Social Responsibility, the State has a key role in public purchases, that “reflects its power to responsibly decide what and how to buy and from whom.”<sup>2</sup>

Public sector demand for environmental goods and services fosters adaptation by existing companies and the creation of new companies (eco-businesses), widens supply in the environmental market, and leads to innovation and modernization in a country as a whole. Furthermore, it has positive effects in the creation of “green jobs.” Similarly, when the State acts as a positive role model by preferring environmentally-friendly products, this encourages consumers (citizens) to do the same.

Conceptually, sustainable public procurement means considering the three pillars of sustainable development in any procurement of goods and service. This means that when making a purchase, not only the economic aspects of products (price, quality, etc.) should be considered, but also the possible impacts they may have in the environment or people’s health, throughout their lifecycles (from manufacture to usage and distribution process), as well as associated social aspects, such as employment conditions, respect for human rights and social equity.

The United Kingdom’s definition of sustainable public purchases (SPP), included in the SPP Working Group’s report in 2006, and adopted by the United Nations Environment Program (UNEP), underlines the importance of the State’s role:

“Sustainable purchasing is a process whereby organizations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life basis in terms of generating benefits not only to the organization, but also to society and the economy, whilst minimizing damage to the environment.”<sup>3</sup>

---

<sup>1</sup> UNEP: “Sustainable Public Procurement,” Note

<sup>2</sup> Aldo Madariaga E.: “El Estado y la Responsabilidad Social. Estrategia de incorporación de criterios de responsabilidad social y ambiental en las compras públicas” (The State and Social Responsibility. A strategy for incorporating social and environmental responsibility to public procurement). Published by Red Puentes and CICE (Business Behavior Information Center). Santiago, Chile, March, 2008, p 15

<sup>3</sup> UNEP: “Capacity Building for Sustainable Public Procurement.” Original Source: “Procuring the Future – the report of the UK Sustainable Procurement Task Force”, June 2006



It should be noted that both at the European Union level and in OECD member countries, the terms “green public procurement” or “green public contracting” prevail, highlighting the emphasis on environmental criteria. On the other hand, at the UNEP and in many Latin American countries, the term “sustainable public procurement” can be observed, showing that environmental, social and economic criteria are considered.

The debate around and demand for change in public procurement are not new. By 1992, Agenda 21 had already noted the need to incorporate environmental criteria in public procurement:

“Governments themselves also play a role in consumption, particularly in countries where the public sector plays a large role in the economy and can have a considerable influence on both corporate decisions and public perceptions. They should therefore review the purchasing policies of their agencies and departments so that they may improve, where possible, the environmental content of government procurement policies, without prejudice to international trade principles.”<sup>4</sup>

In 2002, the Plan of Implementation of the World Summit on Sustainable Development in Johannesburg “encouraged relevant authorities at all levels to take sustainable development considerations into account in decision-making, including on national and local development planning, investment in infrastructure, business development and public procurement.”

To implement the aforementioned plan (specifically chapter III on patterns of consumption), the Marrakech Process began in 2003, to promote more sustainable consumption and production, and more specifically, support regional and national UNEP-led initiatives. In this framework, special emphasis was placed on encouraging sustainable public procurement.

## **2.2 International Organizations**

### ***2.2.1 National United Nations Environment Program (UNEP)***

Under the framework of the Marrakech Task Force on Sustainable Public Procurement (created in 2005), UNEP began the “Capacity Building for Sustainable Public Procurement” program in 2009, with the participation of 7 pilot countries including Chile. UNEP’s support, in addition to that of the European Commission, Switzerland and the Organization of the Francophone Countries, led to the creation of Steering Committees for implementing sustainable public procurement policies and led to studies on each country’s legal framework and on the supply of environmentally-friendly products on domestic markets to name just two examples.

---

<sup>4</sup> Point 4.23, Agenda 21. <http://www.un.org/spanish/esa/sustdev/agenda21/agenda21spchapter4.htm>

The results of these and other experiences in later years were included in the document “*Sustainable Public Procurement Implementation. Introducing UNEP’s approach*”, which was published in 2012. This document was an important step in the growth of sustainable public procurement as it identifies the key factors and the main guidelines for successful implementation. It also provides a starting point and guidelines for those organizations interested in implementing sustainable public procurement.

In the *Ten Year Framework of Programs on Sustainable Consumption and Production Patterns* (10YFP), emerging from the plan of implementation of the World Summit in Johannesburg (2002), and confirmed and reinforced at the Rio+20 Summit, sustainable public procurement acquires special importance. More specifically, UNEP is developing a Global SPPEL Project on “Sustainable Public Procurement and Eco-Labeling.”

For Latin America, SPPEL has three components: a) An integrated approach to implementation at the national level in several Latin American countries; b) A regional cooperation component in Southern Cone countries; and c) A final component focused on distributing the technical tools developed for the area at the worldwide level.

The Sustainable Public Procurement Program is the most advanced of the six specific 10YFP<sup>5</sup> programs and was officially launched by the UNEP on April 1, 2014 in New York.

Through the online Sustainable Public Procurement Task Force,<sup>6</sup> which currently has more than 60 members, UNEP aims to maintain and foster communication between all countries and organizations participating in sustainable public procurement implementation.

In February 2013, the UNEP and the OECD came together to create a task force to promote best green public procurement practices (*UNEP-OECD Joint Working Group on Promoting Best GPP Practices*).

## **2.2.2 Organization for Economic Cooperation and Development (OECD)**

Since 1996, the OECD has been working on “Greener Public Procurement.” This work led to the “*Recommendation of the Council on Improving the Environmental Performance of Public Procurement*”, dated January 2002.

The recommendations include:<sup>7</sup>

---

<sup>5</sup> In principle, the 10YFP framework includes five specific programs: Consumer information; sustainable lifestyles and education; sustainable procurement; sustainable construction and buildings; sustainable tourism (including ecotourism). Recently, the 10YFP incorporated a new program aimed at sustainable food systems.

<sup>6</sup> [www.scpclearinghouse.org/working-group.html](http://www.scpclearinghouse.org/working-group.html)

<sup>7</sup> OECD: “Recommendation of the Council on Improving the Environmental Performance of Public Procurement”. Paris, January 23, 2002.

[http://webdomino1.oecd.org/horizontal/oecdacts.nsf/linkto/C\(2002\)3](http://webdomino1.oecd.org/horizontal/oecdacts.nsf/linkto/C(2002)3)

- “to ensure the incorporation of environmental criteria into public procurement of products and services including, where appropriate, environmental impacts throughout the lifecycle, while ensuring that transparency, non-discrimination and competition are preserved;”
- “to provide the appropriate policy framework to incorporate environmental criteria into public procurement of products and services, along with price and performance criteria”.

A year later, the document “*The Environmental Performance of Public Procurement. Issues of Policy Coherence*” noted, among other observations, that “institutional and management support seems essential in order to be successful.”<sup>8</sup>

Continuing its work in this area, in 2007 the OECD published “*Working Party on National Environmental Policies. Improving the Environmental Performance of Public Procurement: Report on Implementation of the Council Recommendation*”, evaluating progress by some member countries in including environmental aspects in public procurement. It includes sections on “general information,” on “instruments and measures used to implement green procurement” and “assessment of green public procurement.”

It also ranks 12 barriers (from most to least cited) to implementing green procurement:<sup>9</sup>

1. Lack of training for procurement officers.
2. Lack of information on the financial benefits.
3. Lack of information on the environmental benefits.
4. Procurement decisions do not account for life-cycle costs
5. Procurement officers do not know interpret the legal framework with confidence.
6. A lack of practical tools, for example, manuals, databases.
7. Decentralized procurement practices discourage use of environment criteria.
8. Lack of support from public administration.
9. Lack of political support.
10. Lack of financial resources.
11. The present legal framework does not allow for the use of environmental criteria in procurement decisions.
12. Centralized public procurement practices discourage use of environmental criteria (1 country).

In 2012, the “*Public Governance Committee*” of the OECD “*Public Governance and Territorial Development Directorate*” proposed the publication of a “*Compendium of*

---

<sup>8</sup> OECD: Summary “Environmental behavior of the public market: matters of political coherence”. Paris, 2003

<sup>9</sup> OECD, Environment Directorate, Environment Policy Committee: “Working Party on National Environmental Policies. Improving the Environmental Performance of Public Procurement: Report on Implementation of the Council Recommendation”, Paris, March 22, 2007, p. 6

*Green Procurement Good Practices*”, based on the experiences of member and non-member countries and focusing on 6 areas:<sup>10</sup>

1. Green Public Procurement (GPP) legal and policy framework.
2. GPP Planning: assessing life-cycle costs and understanding market solutions and capacity
3. Environmental standards in the design, selection and award of projects and in contract performance.
4. Professionalization: multidisciplinary procurement teams and GPP training.
5. Raising awareness of buyers, market & citizens about GPP solutions and benefits.
6. Mechanisms to monitor green projects

The compendium (and case studies), drafted in conjunction with the UNEP, was published in 2014 as “*Smart Procurement. Going Green: Best Practices for Green Procurement.*”

### **2.2.3 European Union**

The European Union (EU) has extensive experience in environmental criteria for public procurement, both in terms of the policies it has developed and their practical applications.

In 1996, the “*Green Paper – Public Procurement in the European Union: exploring the way forward*” noted that “public procurement policy has a positive impact on other community policies,” such as “social and environmental policy”. Significant progress has been made since then. Due to the EC’s focus on this issue, its member countries have prepared national action plans<sup>11</sup> to implement “green criteria” for public procurement.

This was accompanied by the publication of “*Buying green! A handbook on environmental public procurement*,” with chapters on “green purchasing strategies”, “organizing public procurement”, “defining the requirements of the contract”, “selecting suppliers, service providers or contractors”, “awarding the contract” and “contract performance clauses.”

In the legal framework for public procurement, two important principles in the EC regulatory area; “free circulation of goods and services” and the “non-discrimination principle in the community market” may have impeded incorporation of environmental parameters in public sector procurements and contracts. However, in 2001, the EC published the “Interpretative Communication” on community law applicable to contract awards to allow the incorporation of environmental criteria.<sup>12</sup>

---

<sup>10</sup> Despina Pachnou: “UNEP-OECD Joint Working Group on Promoting Best GPP Practices: Progress in Collecting GPP Case Studies”. November 16, 2013

<sup>11</sup> See document “National Action Plans (NAPs) – the status quo”, 30<sup>th</sup> June 2009:

[http://ec.europa.eu/environment/gpp/pdf/national\\_gpp\\_strategies\\_eu.pdf](http://ec.europa.eu/environment/gpp/pdf/national_gpp_strategies_eu.pdf)

<sup>12</sup> Manuel Fernández González: “*Contratación pública con criterios de sostenibilidad. Situación actual y perspectivas*”. ICE Economic Bulletin, No. 2830, Madrid, January 10-16 2005, p. 38

In 2006, one of the main goals in the Review of the EU Sustainable Development Strategy was to achieve a medium level of green public procurement throughout the EU by 2010 similar to the level of the most outstanding member countries at the time. To move toward this goal, the European Commission implemented the *Green Public Procurement (GPP) Training Toolkit* ([ec.europa.eu/environment/gpp/toolkit\\_en.htm](http://ec.europa.eu/environment/gpp/toolkit_en.htm)) in 2008, divided into three independent modules: 1. Action plan; 2. Legal module; 3. Practical module.

The EU has established environmental criteria for products and services groups, subject to regular review and update. In 2011, the groups of products and services covered:<sup>13</sup>

1. Copying and graphic paper
2. Cleaning products and services
3. Office IT equipment
4. Construction
5. Transport
6. Furniture
7. Electricity
8. Food and catering services
9. Textiles
10. Gardening products and services
11. Windows, glazed doors and skylights
12. Thermal insulation
13. Hard floor-coverings
14. Wall panels
15. Combined heat and power
16. Road construction and traffic signs
17. Street lighting and traffic signs
18. Mobile phones
19. Indoor lighting (added in 2011)
20. Paper tissue (added in 2011)
21. Products that use water (developed in 2012)
22. Image printing equipment (developed in 2012)
23. Heating systems (developed in 2012)
24. Office construction (developed in 2012)
25. Electronic medical equipment (developed in 2012)

In each sector or product and service sector, the EU considers two types of environmental criteria: First, “core criteria”, the application of which does not require exhaustive verification and increased costs. Second, “comprehensive criteria,” when “buyers wish to purchase the best environmental products available on the market,” requiring additional verification effort and can also mean an increase in cost.<sup>14</sup>

---

<sup>13</sup> European Commission: “Buying Green. A handbook on environmental public procurement”. 2 edition, Brussels 2011, p. 17

<sup>14</sup> European Commission: “Buying Green. A handbook on green public procurement”. 2 edition, Brussels 2011, p. 18

### 3. Environmental Criteria for Sustainable Public Procurement

#### 3.1 General principles

Generally speaking, the administrative procurement processes established in the public sector procurement laws of different countries include the following general principles:

- Awarding the contract to the most economically attractive bid
- The best relationship between price-quality
- Freedom of access to tender processes
- Open and transparent procedures
- Non-discrimination and equality among suppliers
- Free competition

However, depending on each country's legal framework, public procurement may include environmental and social criteria, and therefore may have positive and significant impacts on environmental or social objectives.

These additional criteria apply as long as they do not contradict the general principles of administrative procurement. A concrete example of the aforementioned is that sustainable public procurement could exclude SMEs from the market if the environmental and social criteria applied are overly strict. Therefore, gradual implementation of a suitable public procurement policy and applicable environmental and social criteria is recommendable in order to ensure the incorporation and inclusion of as many SMEs as possible.

#### 3.2 Environmental criteria for products and services

In countries with wide experience in green procurement, “green guidelines” exist with a large amount of information on technical specifications, which in turn are mainly based on eco-labeling criteria (in effect at nationally or internationally), as well as information from industry and civil society. Furthermore, the data base handles scientific data oriented towards lifecycle analysis.

Environmental requirements for products and services that some advanced countries in green public procurement consider include “horizontal requirements” for all products, with regards to their durability and the possibility of repairs; possible dismantling and reuse; the minimization, treatment and disposal of waste among other aspects. An illustration could be when a supplier must dispose of the wrapping of the product it delivers, and in some cases, even the product itself once it has ended its useful lifetime has ended.



Furthermore, green public procurement is itself a gradual process which must observe the following guidelines, among others:<sup>15</sup>

- “Consider which products, services or works are the most suitable on the basis both of their environmental impact and of other factors, such as the information you have, what is on the market, the technologies available, costs and visibility”
- “Identify your needs and express them appropriately. Choose a green title to communicate your policy to the outside world, ensuring optimum transparency for potential suppliers or service providers, and for the citizens you are serving”

The example set by the countries below could be useful to Chile as reference points in its search to define and establish environmental criteria for products and services procured by the State, while bearing in mind that Chile began this process only a few years ago.

### 3.3 The German case

Germany applies the applicable OECD recommendations and EU policies in green public procurement. However, since the 90s, the *Federal Environment Agency* has also carried out a number of activities to incorporate environmental aspects into State procurements, which it considers one of its main environmental policy tools.

Specifically, in 1999 the Agency published the “Green Public Procurement Guideline,” with more than 800 pages and expert recommendations on more than 100 different product and service groups for offices; equipment and materials; vehicles; construction materials; road construction; electricity heating and water supply; cleaning products; green public spaces and landscaping; public dining areas; waste disposal; and safety-related issues.<sup>16</sup>

Setting aside the issue of “green criteria for public procurement”, the manual is widely considered a compendium on cleaner production, and deals with legal aspects, certifications and eco-labeling, German and foreign experiences, among other aspects. When it was published, the Federal Environment Agency noted that some productive sectors were accepting the challenge of being “responsible for their products” (*Produktverantwortung*), which in turn would have positive effects on public procurement.

The focus in Germany lies firmly on “energy efficient public procurement” (*energieeffiziente Beschaffung*). In December 2007, the German government adopted the “Integrated Energy and Climate Program” (*Integriertes Energie- und Klimaprogramm / IEKP*),<sup>17</sup> approving administrative regulations/guidelines for public procurements of energy efficient products and services (measure 24, IEKP).

<sup>15</sup> EC: “Buying green! A handbook on environmental public procurement”. Brussels, 2004, p. 4

<sup>16</sup> Umweltbundesamt: “Handbuch umweltfreundliche Beschaffung. Empfehlungen zur Berücksichtigung des Umweltschutzes in der öffentlichen Verwaltung und im Einkauf”. München, 1999.

<sup>17</sup> Website [www.iekp.de](http://www.iekp.de)

Germany takes climate change seriously, as demonstrated by the growing demand for new production and consumption models and energy and environmental criteria in public procurement. A 2010 investigation carried out by the *Germanwatch* ecological institute on “climate-compatible public procurement”<sup>18</sup> is an illustrative example of this movement.

Ulf Jaeckel from the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety reports that German public expenditure in this area was between 260 and 300 billion euros and estimates that 20% (50-60 billion euros) could be used for improving the environment and sustainability areas and the fight against climate change.<sup>19</sup>

The green criteria applied at all levels of German public procurement (federal, regional and district) are recommendations and voluntary, except for energy efficiency-related criteria.

Most of green criteria are based on the German eco-label “Blauer Engel” (Blue Angel”) and the European eco-label (the European flower), the European energy consumption label and the *Energy Star* label, created by the United States Environmental Protection Agency (EPA), and applied throughout the European Union since 2001.

### **3.3.1 *Blauer Engel* (“Blue Angel”) Certification**

This certification was created in 1978 to identify products with a low environmental impact and is granted by the German Quality Assurance and Certification Institute<sup>20</sup> on the mandate of the Federal Environment Agency. The seal belongs to the Federal Ministry for the Environment, Nature Conservation, Construction and Nuclear Safety.

According to Hans-Hermann Eggers of the Federal Environment Agency, more than 120 product groups, 12,000 products and services are currently qualified for this eco-seal, including furniture, electronic equipment, computers, varnishes, paper-based hygienic and sanitary products, construction materials, in addition to around 1,400 companies.<sup>21</sup>

The Federal Environment Agency maintains an online database on the full spectrum of green procurement providing criteria for more than 60 product and service groups. An eco-label verifying environmental criteria is indicated for each product, byproduct and service, and a detailed manual and recommendations are also published. The product and service groups are listed below, followed by examples of the aforementioned criteria:<sup>22</sup>

---

<sup>18</sup> Germanwatch: “Klimaverträgliche öffentliche Beschaffung. Deutschland auf dem Weg zur fast treibhausgasfreien Gesellschaft“. Bonn, March 2010.

<sup>19</sup> Ulf Jaeckel: “Workshop on Sustainable Public Procurement and Ecolabelling in Germany and Chile”. Santiago, April 3 and 4, 2014

<sup>20</sup> Deutsches Institut für Gütesicherung und Kennzeichnung e.V. (RAL)

<sup>21</sup> Hans-Hermann Eggers: “Workshop on Sustainable Public Procurement and Ecolabelling in Germany and Chile“. Santiago, April 3 and 4, 2014

<sup>22</sup> <http://www.umweltbundesamt.de/themen/wirtschaft-konsum/umweltfreundliche-beschaffung/datenbank-umweltkriterien>



Table 1: Products and services using environmental criteria

<b>Construction</b>
General requirements for new buildings and renovating existing buildings
Insulation materials
Other construction materials
<b>Office equipment: computers, printers and accessories</b>
Keyboards
Computer monitors
Thin Clients
Multifunctional equipment, including photocopiers and printers
Ink printers
Laser printers
Portable computers (laptops)
Desktop computers
<b>Office equipment: other types of technologies</b>
Plugs with automatic switch-off
Data elimination devices
Products that run on solar energy
Digital projectors
<b>Office equipment: telecommunications technology</b>
Videoconferencing equipment
Telephone systems
<b>Office supplies</b>
Toner
Recycled cardboard products (for example: folders)
Paper products
Writing implements
<b>Contracting</b>
<b>Vehicles</b>
Garbage trucks and street-cleaning trucks
Buses
Tires
Light automobiles

<b>Gardening and landscaping</b>
Machines
Tools
<b>Interior decorating</b>
Paint
Wallpaper
Cladding
Floors (wooden, textile, etc.)
<b>Food and catering</b>
<b>Office furniture</b>
Office furniture (for example: desks, cabinets, etc.)
Office chairs
<b>Sustainable events</b>
<b>Cleanliness / Hygiene</b>
Cleaning products and services
Pest control
Toilet paper
Hand towels
<b>Electricity supply</b>
Green electricity
<b>Technical equipment for buildings</b>
Indoor and outdoor lighting
<b>Textiles</b>
Cushions
Other products
<b>Electronic products</b>
DVD players
Televisions
Others
<b>Heating supply</b>
Cogeneration
Fossil fuels
Renewable energy

Appliances
Microwaves
Vacuum cleaners
Washing machines
Refrigerators
Dishwashers
Electric ovens

Source: German Federal Environment Agency. <http://www.umweltbundesamt.de/>

### 3.3.2 Examples of environmental criteria for goods and services

#### Construction

- a) General requirements for new buildings and renovating existing buildings:  
Obligatory EU labelling (2010/31/EU) for total energy efficiency in buildings. The 2009 German Energy Conservation regulation also applies (*Energieeinsparverordnung/EnEV*).
- b) Insulation materials:  
The German “Blue Angel” RAL-UZ 132 eco-label certifies insulation materials, which –beyond the requirements of the legislation– have been produced with low levels of harmful substances and do not create health hazards in living spaces. Furthermore, the certification ensures energy savings, protection against noises and leads to the reduction of emissions associated with product manufacturing. The 2013 “Sustainable Construction Manual” addresses these recommendations.

#### Office equipment: computers, printers and accessories

- a) Keyboards:  
Keyboards are certifiable under “Blue Angel” RAL-UZ 78b. The specific manual recommendations are based on the criteria of the eco-label. Keyboards must be manufactured so that their parts may be easily separated (manually) and used for recycling or reuse. Furthermore, keyboards with this certification are ergonomic.
- b) Computer monitors:  
Monitors certified under “Blue Angel” RAL-UZ 78c have optimum energy consumption, low contaminant emissions and are ergonomic. Material manufacturing must allow repair and reuse to ensure an efficient use of resources.
- c) Multifunctional equipment, including photocopiers and printers:  
Equipment certifiable under “Blue Angel” RAL-UZ 171 must be manufactured so that it can be recycled. For plastic parts, materials with low toxic substance content

must be used. Furthermore, the certification highlights that low energy consumption helps protect the climate.

d) Desktop computers:

These can be certified under European green label 2011/337/EU. Monitor energy consumption at maximum brightness is set at  $\leq 100$  W.

The criteria for desktop computers aims to significantly reduce environmental damage and hazards, and in particular, means lower energy consumption, efficient use of natural resources, and lower levels of polluting substances. Aside from energy savings, these criteria respect the prohibition of using mercury to light screens, reduce plastic material use and noise, use recyclable material, allow for repairs, and extend useful life and packaging.

Office equipment: other types of technology

a) Products that operate with solar energy:

These products are certifiable under “Blue Angel” RAL-UZ 116. Electricity obtained from solar cells is stored in rechargeable batteries to guarantee proper operation of products, including clocks, lighting of building numbers, etc.

Office equipment: communications technology

a) Videoconferencing systems:

These protect the climate by reducing trips because of a greater use of videoconferencing. Systems of this type are certifiable under “Blue Angel” eco-label RAL-UZ 191 for low energy consumption. Furthermore, they must be recyclable and show reductions in chemical substances.

Office supplies

a) Toner:

Toner cartridges are certifiable under “Blue Angel” RAL-UZ 55. They must be recyclable and contain low amounts of polluting substances. To request certification, a supplier declaration and a verification ruling on hazardous substances must be presented (among other requirements). Material for recycled cartridges (that is, without toner) must consist of a minimum of 75% recycled parts. Furthermore, cartridges must be able to be reused five times (depending on technical feasibility).

b) Paper products:

Paper products for photocopies and graphic paper are certifiable under European eco-label 2011/332/EU which covers the following aspects: emissions into the water and air; energy consumption; fibers from sustainably managed forests; hazardous chemical substances; waste management; usage functionality; the corresponding information on the packaging and green labeling.

## Contracting

Energy supply services with contracts that guarantee energy savings. (See the German Energy Agency Guide on “*Energiespar-Contracting*” below).

## Vehicles

- a) Garbage and cleaning trucks:  
Municipal vehicles for collecting garbage and for cleaning, which are certifiable under “Blue Angel” RAL-UZ 59, must be quiet and not produce polluting substances. Toxic substance emission requirements call for cutting-edge exhaust reduction technologies. Particle reduction systems are also required
- b) Tires:  
Certifiable under “Blue Angel” RAL-UZ 89 for vehicle tires that produce low noise levels and reduce fuel consumption.
- c) Light vehicles:  
The European Commission “Clean Vehicle Portal” is recommended.  
( <http://www.cleanvehicle.eu/> )

## Interior decorating

- a) Paint:  
Certifiable under European green label (2009/544/EU) for paint and varnishes. The criteria aim to ensure efficient product use and waste reduction; reduction of environment hazards by reducing solvent emissions; reduction of toxic substance discharges into water.

## Food and catering

For food and catering, the European Union criteria for green public procurements (09/2009) are recommended. The basic criteria for food covers green production and packaging methods. Other criteria include purchasing food produced under integrated production standards,<sup>23</sup> and the protection of animals. The basic criteria for catering refer to green food production, and waste reduction and separation

## Office Furniture

Low emission wooden products (furniture, floors, panels, etc.) are certifiable under “Blue Angel” label RAL-UZ 38. The requirements cover the whole life cycle: production, use and disposal of used products and of packaging for transporting new products.

---

<sup>23</sup> Integrated crop management systems in the EU

## Sustainable events

These are certifiable under Austrian green label UZ 62. The “Sustainable Events Guide”, jointly published by the Ministry for the Environment and the German Federal Environment Agency, includes the following “**energy and climate**” criteria (among other aspects):<sup>24</sup>

The financial participation of event organizers or participants in compensation projects regarding climate neutrality in event organization.

Selecting buildings and hotels where events are to be held, including aspects related to energy supply (renewable energies, green electricity and cogeneration) and demand for energy. The EMAS registry<sup>25</sup>, the European eco-label or the Viabono license may be used for these purposes.<sup>26</sup>

It is recommended to limit heating in all event spaces to 20°C, and to use air conditioning at no more than 6°C below the outdoor temperature.

Where possible, use of energy efficient devices certified under the European Union label ([http://ec.europa.eu/environment/ecolabel/index\\_en.htm](http://ec.europa.eu/environment/ecolabel/index_en.htm)) o con el “Ángel Azul” o, las recomendaciones de Suiza Top Ten ([www.topten.ch](http://www.topten.ch)).

## Cleanliness / Hygiene

### a) Cleaning products and services:

These are certifiable under the European green label for all-purpose cleaners and sanitary cleaners (2011/383/EU). The following criteria are listed: Toxicity for water-dwelling organisms; surfactant biodegradability; prohibited or restricted substances; aromatic substances; volatile organic compounds; phosphorous; packaging standards; ease of use; usage manuals; information placed on the green label; training of commercial users.

## Electricity supply

### a) Green electric energy:

Certifiable under Austrian green label UZ 46. In 2013, the German Federal Environment Agency published the “Calling a European energy supply tender” Guide.

---

<sup>24</sup> Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit / Umweltbundesamt: “Leitfaden für die nachhaltige Organisation von Veranstaltungen“. Berlin 2010, p. 11

<sup>25</sup> EMAS is the Community Eco-Management and Audit Scheme.

<sup>26</sup> Viabono is a German certification for environment and climate friendly sightseeing and lodging.

## Technical equipment for buildings

### a) Indoor and outdoor lighting

Compulsory energy labelling under 2010/30/EU. Article 4 of the Guide refers to the obligations of suppliers to provide technical information (general product description; construction calculations [where applicable]; reports on tests carried out; data from similar models and identification of these models).

## Appliances

### a) Televisions:

Televisions are subject to compulsory certification under the European Union energy label (2010/30/EU). The most important information on the label is the classification from A to G. The differences between letters indicate higher or lower energy consumption, and cost savings for consumers. Depending on technological developments, the classification incorporates A+, A++, or A+++ (the last classification has the highest energy efficiency levels).

## Heating supply

### a) Fossil fuels:

For example, low emission and low energy consumption gas apparatuses are certifiable under “Blue Angel” label RAL-UZ 61. Devices emitting significantly lower amounts of nitrogen oxide and carbon monoxide are certified, as are fuel-efficient devices.

## Appliances

Compulsory European Union energy labelling applies to all electronic devices under 2010/30/EU.

- a) Microwaves
- b) Vacuum cleaners
- c) Washing machines
- d) Refrigerators
- e) Dishwashers
- f) Electric ovens

On the initiative of the German government, the “Alliance for Sustainable Public Procurement” (*Allianz für eine nachhaltige Beschaffung*) was created in 2010 to foster permanent cooperation between the federal/national level, Federated States (“*Länder*”) and municipalities. It aims to increase the percentage of environmental products and services bought and contracted by the public sector, and to encourage more intensive use of German and international sustainability standards. Different groups of experts prepare reports, recommendations and manuals on issues such as “Green IT,” “environmentally-friendly

electricity,” “public transport,” “sustainable construction,” “electric transport,” “resource efficiency,” “statistics and monitoring”, etc. The Ministry for the Economy and Technology presented the third annual report prepared by the alliance in 2013.

### 3.3.3 *Examples of Guidelines*

#### a) Bids by the German Energy Agency<sup>27</sup> to purchase energy efficient IT equipment

- The “*Green IT: Potenzial für die Zukunft*” (“*Green IT: Potential for the future*”) brochure for public and private sectors reports on IT equipment to reduce energy consumption (increased energy efficiency) and operational costs.
- The “*Energieeffiziente Bürogeräte professionell beschaffen*” (“Purchasing energy efficient office equipment”) Guide answers questions such as: what criteria should be used in tendering computers, printers, etc., purchases; how is the best bid chosen, etc.
- “*Energieeffizienz im Rechenzentrum*” (Energy efficiency in data or calculation centers) Guide.

#### b) Berlin Energy Agency guide on public procurement

The agency prepared the “*Beschaffung und Klimaschutz*” (“Procurement and climate protection”) document to guide the public administration in its tenders according to energy efficiency criteria and for calculating product life-cycle costs. The guide covers IT and electronic equipment (refrigerators, washing machines, etc.), lighting, vehicles and green electricity.

#### c) DAT auto club guide

The “Deutsche Automobil Treuhand GmbH (DAT)” automobile club publishes an annual “*Kraftstoffverbrauch und CO<sub>2</sub>-Emissionen*” (“Fuel consumption and CO<sub>2</sub> emissions”) guide with the respective data for all (German and international) car models and brands available on the German market.

(<http://www.dat.de/en/offers/publications/guideline-for-fuel-consumption.html>)

#### d) The German Energy Agency’s “Energiespar-Contracting” (“Energy Savings Contracting”) Guide

In this case, a specialized energy supply contractor plans, funds and carries out energy saving measures, above all in federal properties under public administration. The idea is for

---

<sup>27</sup> La pág. Web en inglés de la “Deutsche Energie-Agentur” se encuentra en <http://www.dena.de/en>



investments to fully accrue within the contract period, therefore, the contractor takes on all business risks regarding the measures included.

### 3.4 Experiences from other countries

#### 3.4.1 Austria

In 1998, the Austrian government presented the *“Guidelines for greening the Federal Administration, especially in departments responsible for public procurement.”* This decision took into account the OECD’s 1996 recommendations on *“Improving the Environmental Performance of Government”*.

As a result of international growth in this area (above all, in the OECD and European Union) and domestic experiences, in 2004 – under the leadership of the Federal Ministry for Agriculture, Forestry, Environment and Water Management – Austria reformulated its guidelines on the inclusion of environmental criteria in public procurement.

Some examples the requirements for specific products are presented below:<sup>28</sup>

#### Office equipment, office materials, publications

Energy-saving office equipment must be used. Austrian UZ16 environmental certification applies for photocopiers. The German “Blue Angel” RAL UZ 114 certification applies for multifunctional equipment (printers, photocopiers, scanners). Computers and monitors require the corresponding European label is required.

Recycled paper shall be preferred. If primary fiber paper is required (for example, for archive documents), it must originate from sustainably managed forests for which there are European indicators and international criteria (since 1998).

#### Construction

Materials must consume limited resources (energy, raw materials, landscape) throughout their lifecycle. The application of “environmental scales” and the *Life-Cycle Assessment* method is recommended

Where possible, PVC products must be avoided.

The European guideline on energy efficiency in buildings applies for the reduction of energy consumption, which includes an “energy passport” for new buildings and renovations of older buildings.

---

<sup>28</sup> <http://www.ifz.tugraz.at/oekoinkauf/leitlinien-bund/M4.htm>

## Energy

Electronic product purchases must be guided by the most efficient energy category.

Energy saving lights with rechargeable batteries are required.

In new energy supply contracts, 20% shall originate from “green electricity” (renewable energy) from 2006.

Personnel shall be informed and motivated to implement simple measures to lower energy consumption.

## Cleaning

In health terms, cleaning products must meet the criteria laid down by the Austrian legislation and European certification guide for multiple use products and specific products for sanitary facilities.

Cleaning products must not contain chemical substances that may impair water quality, in accordance with the criteria established by the European Union.

## Indoor furniture

This area includes the requirements for using solid wooden products, chair ergonomics, different materials for floors and wall colors. The Austrian environmental certification system applies to each product.

## Food, kitchens and cafeterias

Where possible, food must be sourced from ecological agriculture.

When catering services are contracted, companies must use returnable bottles and reusable crockery.

## Transport and vehicle fleets

CO<sub>2</sub> emissions by new vehicles may not exceed 120-140 g/km. (Exceptions must be justified).

30% of fuels must be bio-fuels or other renewable fuels.

Where possible, bicycles must be used for administrative tasks.

### Maintenance of landscapes and parks

The requirements make reference to gardening equipment with engines, saw chain oil, and the use of phytosanitary products and fertilizers. The Austrian Environmental certification system applies to each particular case.

### Waste collection and treatment

Infrastructure for selective waste collection (paper, cardboard, glass, metal, plastic) must be available.

Recipients for gathering hazardous waste, such as batteries, must be available, and proper treatment/disposal must be guaranteed.

Personnel and cleaning staff must ensure separation of waste into the corresponding recipients.

Furthermore, a manager qualified in these matters must be chosen.

The “public procurement criteria” catalog, published in 2001 with European Union LIFE Program support, should also be mentioned. Eleven modules (and a total of more than 1,100 pages) provide information on environmental criteria for different products, services and systems:<sup>29</sup>

1. Why Public Procurement?
2. Legal framework
3. Paper products
4. Office materials
5. Electronic office equipment
6. Electronic appliance
7. Indoor furniture
8. Cleaning
9. Public works
10. Technical installations for buildings
11. Water usage

### **3.4.2 Canada**

In 2006, the Canadian government launched its *Policy on Green Procurement* to incorporate environmental aspects into the public sector decision making process, with the same importance as price, quality and availability. The *Office of Greening Government Operations (OGGO)* is the body in charge of putting these objectives into practice.

---

<sup>29</sup> <http://www.ifz.tugraz.at/oekoinkauf/>

This process is supported by training and outreach programs. In this context, the *Environmental Awareness Tool Kit* (Environmental Awareness toolbox) should also be mentioned, which contains the following contents:<sup>30</sup>

1. Key environmental and green procurement issues (climate change, resource efficiency, ozone layer, hazardous domestic and industrial waste, renewable energy, etc.).
2. Green procurement principles: the four stages of green procurement (planning and identifying requirements, procurement, use/maintenance and waste disposal), price-quality ratio, complete life cycle analysis, total life cycle costs.
3. Creation of specifications for green procurement.
4. A green procurement checklist.
5. Environmental product terminology.
6. Green product certification programs and standards.

The Canadian government has prepared the “Guideline for Integration of Environmental Performance Considerations in Federal Government Procurement” in order to apply these tools to the public sector.

Additionally, in 2009, the “Green Service Procurement Guide” was published, establishing specific environmental criteria for 8 services, and some examples for each service are highlighted below:<sup>31</sup>

#### Printing and publishing services

The supplier is required to hold ISO 14001 certification.

Used paper requires certification proving that it was sourced from sustainably managed forests: *Forestry Stewardship Council (FSC)*, *Sustainable Forestry Initiative (SFI)*, *Canadian Standards Association Sustainable Forest Management Standard (CAN/CSA-Z809)* or equivalent.

Furthermore, (at least) 30% of paper content shall be recycled.

#### Vehicles used for personnel transport and/or providing services

Providers are requested to “use lower emission fuels, such as biodiesel, ethanol, propane or natural gas” and “the use of hybrid and fully electrical vehicles is recommended.”

---

<sup>30</sup> Canadian Government: “Greening Government. Environmental Awareness Tool Kit”.  
<http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achats-procurement/trousse-toolk>.

<sup>31</sup> Canadian Government: “Guideline for Greening Services Procurement”. June 8, 2009

### Event management services (meetings, workshops, conferences)

“Best environmental practices” must be followed, including, for example, electronic distribution of document and electronic seminar presentations. The “*Environment Canada Green Meeting Guide*” recommendations for accommodation services must be followed when selecting event venues.

### Cleaning services

Efficiency measures for water and energy use are incorporated. Cleaning products must be biodegradable, concentrated (to reduce volume and weight), and packaging must be recyclable and reusable. Cleaning products must bear the *Global Eco-labelling Network (GEN)* label in order to meet these and other requirements.

### Telephone and IT support services

The specifications include requiring all electronic equipment to meet ENERGY STAR certification<sup>32</sup> or its equivalent.

### Building and service good administration

This covers aspects such as energy efficiency, efficient water use, air quality inside buildings and reducing and treating waste in dumps. Building management practices must comply with programs such as *Building Owners and Managers Association (BOMA)*, *Go Green and/or Go Green Plus* and *Leadership in Energy and Environmental Design (LEED)*<sup>33</sup> or the *Green Building Rating System*.

### Laboratory services

Laboratory services require ISO 14001 certification, correct hazardous materials handling, waste collection systems, minimization of disposable material use, etc. Along these lines, the government is preparing a *Green Procurement Plan on Laboratory Services*.

### Professional/temporary assistance services

This includes reducing trips, using video/teleconferencing instead of having professionals participate in meetings, minimizing printed documents, etc.

---

<sup>32</sup> ENERGY STAR is well-known internationally, and was created by the US Environmental Protection Agency (EPA) to encourage energy efficiency in electronic and IT equipment.

<sup>33</sup> LEED is a certification system for “sustainable buildings.” It was developed by *US Green Building Council* and is applied in a number of countries.

### 3.4.3 Spain

In May 2006, the Council of Ministers created the Inter-ministerial Commission for incorporating Environmental Criteria into Public Procurement in order to create a Green Public Procurement Plan, which was approved in January 2008 by the Council of Ministers.<sup>34</sup> The Plan takes into account European Union objectives and goals in this area, as established in a range of documents.

The annex of the Plan establishes the objectives and measures for 7 product groups:

#### Construction and maintenance

- a) 9% energy savings before December 31, 2010 and 20% before December 31, 2016, as per PAEE-AGE goals<sup>35</sup>.
- b) 20% water savings before December 31, 2010.
- c) Ensuring general environmental improvements in buildings in cases of large-scale renovation.
- d) Ensuring environmental improvements in building maintenance.

#### Transport

- a) Reduction of atmospheric pollution by vehicles.
- b) 38% of all fuel consumed by SMEs to be biofuel by December 31, 2012
- c) 20% reduction in total fossil fuel consumption compared to 2006.

The measures include purchasing hybrid motor vehicles from January 2008.

#### Office Equipment

- a) Reducing energy and paper consumption and using recycled paper.
- b) Improving the environmental quality of office equipment.

The measures include the *Energy Star* label energy efficiency criteria. For printers, the option of double-face printing and compatibility with recycled paper are incorporated.

#### Paper/Publications

- a) Cutting paper consumption by 50% by December 31, 2010 and 90% by December 31, 2015.
- b) Stabilizing office paper consumption from 2006 in the 2008-2010 period and reducing total consumption by 20% in the 2010-2015 period.

---

<sup>34</sup> Ministry of the Presidency: ORDER PRE/116/2008, of January 21, publishing the Agreement of the Council of Ministers to approve the Green Public Procurement Plan of the General Administration of the State and its Public Bodies and Social Security Administration Bodies.

<sup>35</sup> The PAEE-AGE are the initials in Spanish of the Energy Savings and Efficiency Plan of the General Administration of the Spanish State.

- c) 50% of all paper used in AGE and Public Bodies to be recycled by December 31, 2010 total and 90% by December 31, 2015.
- d) Reducing paper publications to 40% of 2006 levels by December 31, 2015.

### Furniture

- a) Purchasing legal wood from sustainably managed exploitations, and ensuring the absence of toxic substances in furniture purchases of products with a wood content greater than 10%.
- b) 25% of office furniture and wooden furniture wood to be purchased under guarantee and with the possibility of exchange for 5 years by December 31, 2010 and 50% by December 31, 2015.

### Cleaning

- a) 100% of paper products to be recycled by December 31, 2010.
- b) 100% of small containers to be recycled by December 31, 2015.

### Events

- a) Increasing the use of public or collective transport to workplaces.
- b) Minimizing and correctly handling waste.

An key point of the Plan is that the incorporation environmental criteria into public procurement shall “in no way lead to higher budgetary expenses.”<sup>36</sup>

---

<sup>36</sup> Ministry for the Environment: “*El Gobierno pone en marcha el Plan de Contratación Pública Verde*” (Government implements Green Public Procurement Plan). Press Release. Madrid, January 11, 2008

## 4. The Benefits of Sustainable Public Procurement

Generally speaking, the benefits of applying a sustainable procurement policy reach all agents involved: the State and its public bodies, companies and society. In the environment, it is expected that by launching this policy the environmental impact of the life-cycle of purchased products or services will be lowered by reducing greenhouse gases and local pollutants, optimizing energy efficiency levels and water use, reducing emissions of substances harmful to the ozone layer and waste volumes, encouraging reuse and recycling of materials, reducing toxic substance production, among other goals.

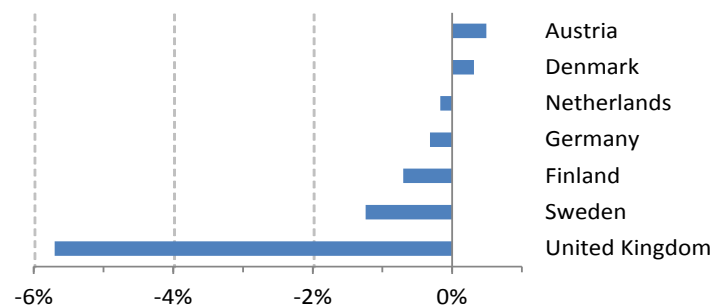
### 4.1 Economic Benefits

Both companies and government, as clients, increase their economic efficiency by purchasing more profitable products, which may be more durable (greater useful life), requiring lower maintenance and operation costs, meeting high energy efficiency standards, or which may be easily recycled, reducing final waste disposal costs.

When buying energy efficient products water and energy consumption savings are considerable. Companies and governments that adopt sustainable procurement measures report efficiency improvements between 8% and 30% (New Zealand Business Council for Sustainable Development 2009).

The European Commission carried out a study in 2009 evaluating seven European countries were evaluated, determining that five of seven countries showed savings when buying more sustainable products or services (European Union 2012).

Figure 1: The economic impacts of sustainable public procurement in Europe



Source: European Union (2012)

Therefore, by adopting a sustainable public procurement policy, it is expected that the State will use its purchasing power to achieve economies of scale by procuring goods and



services with better environmental performance, reducing the costs for government and strengthening the environmental market.

From another perspective, SPPs shape the market towards more sustainable production. A sustainable public procurement policy, because of larger public sector purchase volumes can help develop the market, and create business and capital development opportunities.

The influence of public procurements can also help stimulate competition between the companies that supply the State by encouraging them to incorporate sustainability into their production processes and by facilitating the entry of new environmentally friendly companies into the market.

Likewise, government stimulus also leads to the incorporation of more sustainable technology, growing the market towards innovative solutions and fostering scientific research and innovation. As the market for sustainable products and services grows and develops, the quantity and quality of goods supplied increases.

## **4.2 Benefits for government and society**

A sustainable procurement policy can help government meet its environmental goals, such as reducing waste, contaminant gas emissions, deforestation, while also participating in the fight against climate change.

Similarly, employment conditions can be improved by encouraging socially responsible practices among businesses. This can be achieved by providing support for making workplaces more respectful and healthy for employees and citizens in general, by purchasing products and services from companies with good employment practices and that are considerate towards the environment. A sustainability-based approach also shows government leadership and boosts its image (Korkmaz 2012), by demonstrating its concern and the actions it has taken in social and environmental responsibility.

Finally, these policies are an opportunity for international collaboration. Many countries and international organizations are currently working on implementing sustainable procurement systems; and many are interested in sharing their experiences and information.

## 5. The Chilean Situation

### 5.1 Chile in the regional context

In 2012, the UNEP concluded a project named “Enabling developing countries to take advantage of eco-labelling opportunities” focused on improving the environmental efficiency of key export products in developing countries by using eco-labels based on life-cycles. The project was based in Brazil, China, India, Kenya, Ethiopia, Mexico and South Africa and also aimed to promote greater cooperation and mutual recognition among eco-labelling programs, and to include regional approaches. Within this framework the UNEP, in conjunction with the Nordic Council of Ministers, launched the “Maximizing Eco-labelling and Sustainable Public Procurement opportunities in the Southern Cone Region” project, which aims to analyze and promote strategies among Southern Cone countries (Argentina, Brazil, Chile, Paraguay and Uruguay), to foster regional cooperation in eco-labelling and promote the role of SPP.

To stimulate debate on creating regional cooperation in eco-labelling for Sustainable Consumption, in November 2011 a consultation workshop was held in Santiago, Chile. Interested parties from the Chilean, regional and international levels, including representatives from trade, industries and environment ministries; industrial associations, standards agencies and other technical and civil society institutions from Chile, Argentina, Brazil, Paraguay and Uruguay were invited to discuss, share information and reach an agreement on the relevance of the said initiative. With the aim of developing regional eco-labelling in the long term, the workshop’s most important result was the agreement that a deeper exchange of information on current practices and the lessons learnt in each country was required (Amphos21, 2011).

In recent years, public support for SPP in Southern Cone countries has increased thanks to a number of initiatives to include sustainability in the public purchase and procurement system. These initiatives are currently in different stages, as some countries already have SPP legislation and an SPP system, such as Decree 7746/2012 on SPP legislation in Brazil, while others have only recently begun to explore this possibility (Paraguay and Uruguay).

The common sectors for public procurement in the five countries are energy efficiency in electronic devices and office supplies such as paper (forest products) and ink cartridges, as well as in cleaning and construction materials. The work on SPP in Chile and Argentina includes developing online catalogs to deliver information on sustainable products and the certification of sustainable suppliers. Paraguay and Uruguay are beginning to apply SPP policies through different pilot sectors within the procurement system, with a strong focus on the energy efficiency achieved in electronic devices (Fundación Chile, 2012).

## 5.2 The Chilean public procurement system

The Chilean public procurement system operates under the sole and direct administration of *ChileCompra*, a Ministry of Finance body that seeks to give greater transparency, accessibility and value to the public market. Its mission is to coordinate public demand and the supply of products and services by acting as a mediator and advising the parties involved.

The operation of the Chilean Public Procurement Marketplace, *ChileCompra*, is based on a transparent and efficient system that operates under a solid regulatory framework, based on free, universal access and non-discrimination. This set of laws and procedures is regulated by Law No. 19,886 or the Public Procurement Act, its Regulations, and its policies (the platform's conditions of use and procurement guidelines).<sup>37</sup>

In practical terms, its basic framework establishes:

- An Open Market: the sole market for State tenders (except for works<sup>38</sup>), with equal opportunities and no restrictions to access.
- Public Tender: This is the general rule for procurement.
- Tenders under Framework Agreements: First option to purchase.
- Electronic market: Compulsory participation by public buyers. As this is an online contractual system, State demand can be matched with private bids without access costs.
- An oversight and complaints system: Autonomous checks and balances.
- Autonomy and responsibility: Agents –public bodies and suppliers- are autonomous and responsible for their actions and decisions.

## 5.3 Socially Responsible Public Procurement Policy. From sustainability to social responsibility.

In Chile, the State is one of the largest buyers on the domestic market. Its purchasing power is US\$8 billion annually, equivalent to 3.5% of Chilean GDP, so it has a large impact on the economy and can make a huge contribution to sustainable development in Chile by implementing a sustainable procurement policy, while also reducing environmental impacts. In terms of transactions, every year 350 thousand tenders take place and 2 million purchase orders are made from more than 100,000 suppliers and 845 public procurement agencies, involving around 13,000 officials in the process (*ChileCompra* 2012).

When discussing State bodies, the differences in purchase volumes by different public buyers are noteworthy. According to the *ChileCompra* analysis website ([www.analiza.cl](http://www.analiza.cl)), bodies associated with the central government, universities and the health sector are the

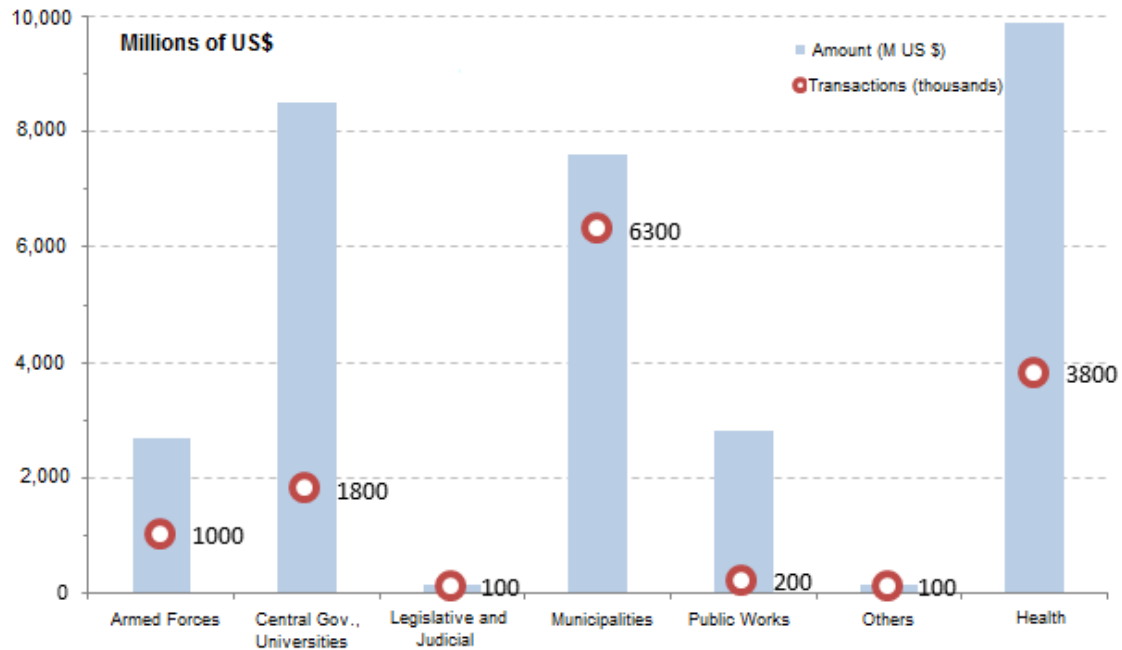
---

<sup>37</sup> [www.chilecompra.cl](http://www.chilecompra.cl)

<sup>38</sup> El gasto en la construcción de obras de infraestructura (edificios, carreteras, etc.) no está integrado como compras Públicas del Estado. Estas compras representan un gasto significativo y sería conveniente avanzar en la inclusión de criterios ambientales en este tipo de compras

main buyers in the system in terms of money invested. In terms of transactions, the most active sectors are municipalities and the public health sector.<sup>39</sup>

Figure 2: Purchases and transactions in the Chilean public sector

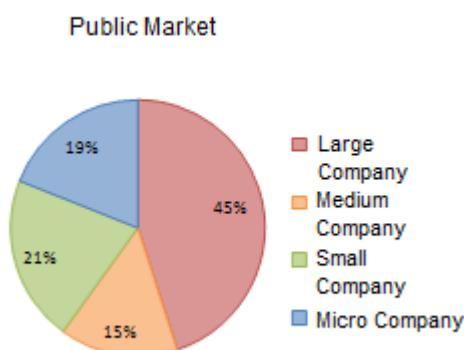


Source: [www.analiza.cl](http://www.analiza.cl)

<sup>39</sup> The public works sector does not include purchases related with road infrastructure construction.

The State supplier sector consists mainly of micro, small and medium enterprises, which is an important factor to bear in mind when designing and implementing public policy in this area, as this is the most vulnerable industrial sector.

Figure 3: Participation (%) by Chilean companies in public procurement



Source: *Fundación Ciudadano Responsable*, October 2012, Sustainable Public Procurement in Chile.

ChileCompra has been implementing a sustainable procurement policy for the last two years, in which the work to be done was given a conceptual framework and framework for action. The policy's implementation strategy covers the different bodies and platforms that form part of the procurement process transversally.

## 5.4 Tools for Sustainable Public Procurement

ChileCompra has put in place a number of websites<sup>40</sup> to facilitate access to information on suppliers and purchasing agencies and to formalize the tender process. A platform has also been created for all procurement processes by putting in place a virtual catalog where State bodies that do not tender out their requirements make purchases. Finally, a record of completed transactions and of suppliers participating in transactions is kept. The supplier registry registers and accredits background information, procurement history with different bodies, legal and financial details, technical suitability, and the existence of disqualifications from contracting with State bodies (Ministry of Finance 2004).

Suppliers are evaluated according to environmental and social criteria, and the virtual catalog for framework agreements (covering 25% of purchase orders on the system) now has 432 suppliers that obtained the maximum score for social and/or environmental criteria (ChileCompra 2012). More than 10,000 officials in charge of public procurement were trained on the basic concepts of the policy.

<sup>40</sup> [www.mercadopublico.cl](http://www.mercadopublico.cl) / [www.chileproveedores.cl](http://www.chileproveedores.cl) / [www.analiza.cl](http://www.analiza.cl) / [www.comprassustentables.cl](http://www.comprassustentables.cl)




On the other hand, changes were made to the electronic public procurement marketplace in order for ChileCompra management to introduce optional evaluation criteria; and highlight socially responsible products and suppliers with its seals, as well as suppliers with independent certifications. Currently, products can be granted eight different seals and State suppliers can apply for recognition three seals.

Figure 4: Seals for products and services recommended by ChileCompra

<b>Green Product</b>	
<b>Reusable product</b>	
<b>Recyclable Product</b>	
<b>Energy Efficiency</b>	
<b>PEFC</b>	
<b>FSC</b>	
<b>Energy Star</b>	
<b>Blue Angel (Der Blauer Engel)</b>	

Source: Loyola (2012)

Figure 5: Seals implemented or recommended to suppliers by ChileCompra

<b>Micro and small business</b>	
<b>Positive Supplier</b>	
<b>Clean Production Agreement</b>	

Source: Loyola (2012)

Similarly, the [www.comprassustentables.cl](http://www.comprassustentables.cl) website was created, bringing together and presenting the available information on the area, to facilitate its distribution and discussion.

Finally, amendments were made to the Procurement Act, and currently public bodies may assign scores in tender processes based environmental impact and employment policies, among others.

In addition to the above, ChileCompra has been able to quantify how the public procurement market has changed since 2009, observing the emergence of sustainable criteria among the State's suppliers. Generally, the criteria included are (Fundación Ciudadano Responsable 2012):

- Use of biodegradable products
- Including a waste recycling policy
- Including a criterion on handling toxic waste
- Including energy efficiency criteria in operations
- Using products that do not damage the ozone layer
- Low or zero CO<sub>2</sub> emissions in production processes

Therefore, transactions carried out with suppliers meeting one or more of these criteria are considered sustainable purchases. Accordingly, sustainable public procurement has increased significantly since 2009:

Table 2: Public procurement using sustainable criteria

April 2009	April 2010	April 2011	April 2012	April 2014
2.7 %	5.2 %	10.5 %	28.5 %	43.3 %

Source: Claudio Loyola Castro (ChileCompra), 2011, *Compras sustentables en el Mercado Público* (Sustainable procurement in the Public Market); Trinidad Inostroza (ChileCompra), *Hacia un Mercado de Compras Públicas Inclusivas y Sustentables* (Towards an Inclusive and Sustainable Public Procurement Market), 2014.

However, the environmental component remains pending in the implementation of State public procurements, which is why the Chilean Ministry for the Environment is working on a definition of environmental criteria for priority products which will become an additional variable in the procurement of goods and services by the State. This means that it is not only necessary to encourage good sustainable practices in companies, but that the challenge is also to establish environmental and social criteria for products and services (electronic equipment and devices, vehicles, paper, lights, event organization, etc.), following in the footsteps of developed countries.

## 6. Analysis of priority products in Chile

The following chapter addresses the issue of priority products in Chile for the incorporation of environmental criteria in State procurement, as well carrying out economic and social analysis to find the total comparative impact of purchasing a standard product versus that of purchasing a product with better environmental performance.

### 6.1 Priority products in Chile

As of the present, four priority products for State procurements have been established in Chile: Sustainable heating, lights, vehicles, and printing paper. This selection resulted from analyzing three criteria: i) the amount of information available on each product, process or impact, ii) environmental considerations and iii) national issues. Below, each is justified in greater detail.

#### 6.1.1 Sustainable heating

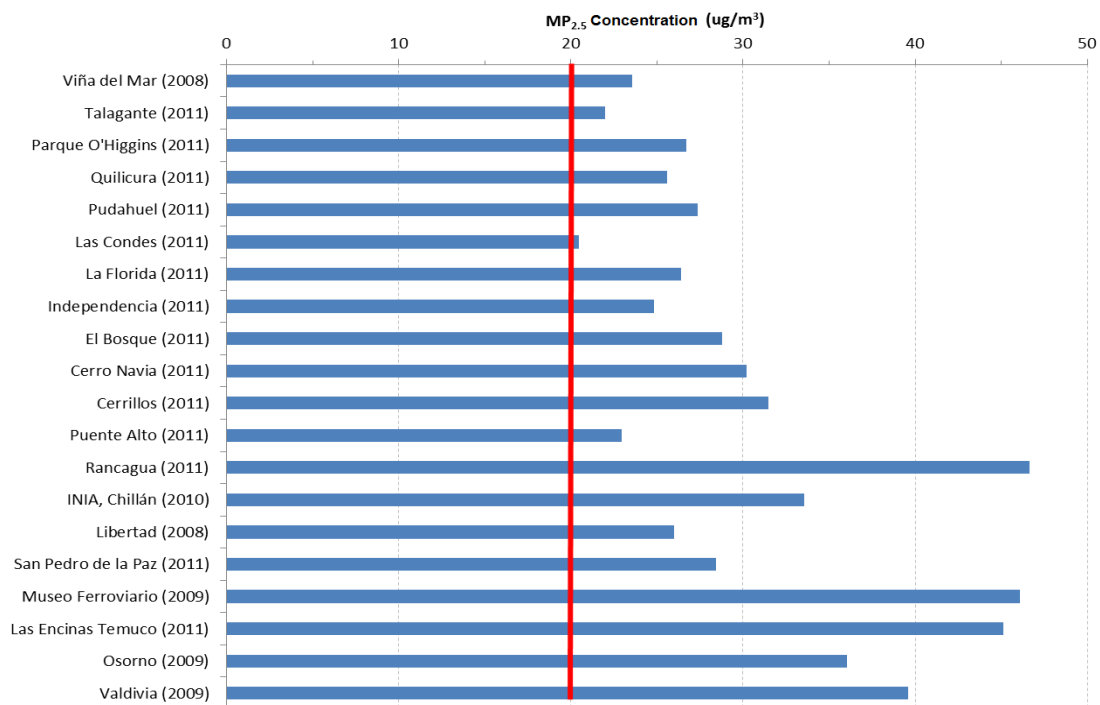
Atmospheric contamination is one of Chile's most serious environmental problems, as a large number of settlements suffer from high concentrations of Particulate Material (PM), a pollutant that causes serious human health and environmental problems. Its effects are reflected in cardiorespiratory diseases, damage to water and land ecosystems, visibility problems, among others (MMA 2012). The quality norm for this contaminant is widely exceeded in many cities, and estimates indicate that approximately 4,000 people die prematurely every year in Chile due to particulate material pollution (MMA 2012; MMA 2013).<sup>41</sup> This has meant that environmental public policy in recent decades has largely focused on solving this problem.

---

<sup>41</sup> More specifically, studies show that the fraction of particulate material below 2.5 microns (MP<sub>2.5</sub>), leads to more serious greater problems, therefore all analyses are carried out for this contaminant.



Figure 6: Average annual PM 2.5 concentrations at selected stations and annual standard (ug/m3)



Source: MMA (2013)

The use of firewood as an energy source for heating is the main contributor to poor air quality due to MP<sub>2.5</sub> contamination in most cities in central and southern Chile. High emissions may be explained by a number of factors, including a high demand for energy, heaters that use deficient technology, poor operation of equipment by users, use of moist firewood and insufficient insulation of housing and buildings.

Figure 7: Winter in the city of Temuco, southern Chile



Source: Photographs taken from [www.soychile.cl](http://www.soychile.cl)

The impacts of firewood consumption and of the generation of pollutant atmospheric agents are economic (purchase of heating equipment, fuel, maintenance), social (effects on the population's health due to pollutant emissions) and environmental (air contamination, impacts on native forest, among others), therefore the solution to this problem requires integrated measures with the participation by the State, the private sector and citizens. In this regard, incorporating "Sustainable heating" into SPP may lead to valuable incentives in several aspects of the problem.

### **6.1.2 Lights**

The importance of evaluating lights lies mainly in the fact that the public sector is a large consumer of electric energy (3% nationally), where lighting corresponds to 60% of consumption. Due to the fact that electric generation comes mainly from thermoelectric power stations (50%), this consumption has a range of effects on the environment, which are mainly related with pollutant gas and particulate material emissions, which negatively affect air quality. For these reasons, it is considered important to assess the environmental impacts of producing and consuming different types of lights and assess the costs and benefits of the State purchasing more technological products.

### **6.1.3 Vehicles**

The agents responsible for the atmospheric pollution suffered by most Chilean cities vary, however, one of the main emitters are mobile sources, mainly affecting populous cities and those with a large vehicle fleet. The main feature of these sources is that besides contributing to poor air quality, they directly impact the population due to emissions occurring at ground level, therefore the pollutants emitted have limited dispersion.

Despite the fact that the State is not a large vehicle buyer, it is interesting to assess the environmental effects that vehicle purchases and operations cause, and to analyze, in costs and benefits terms, a possible change in these purchases by preferring vehicles with better environmental performance.

### **6.1.4 Printing paper**

Demand and consumption of paper internationally has increased considerably in recent years. This has also been true in Chile, with an estimated per capita consumption of 50kg/ha, and apparent consumption<sup>42</sup> of 830 thousand tons per year (Sector Diagnosis, Paper Industry Clean Production Sector). This includes the public sector, which is an important agent due to the large amount of writing and printing paper consumed in offices and public bodies.

The environmental impacts of paper production are mainly associated with water, energy and raw material (virgin fiber or recycled fiber) consumption, which are basically related

---

<sup>42</sup> Paper consumption is measured in "Apparent consumption," or (Local production + imports) – (Exports).

with the consumption of forestry resources and pollutant discharge into the atmosphere and bodies of water. For these reasons, and given the environmental consequences that this industrial sector creates, it is essential to move forward in reducing and minimizing the environmental impacts associated with paper manufacture and promote strategies to reduce consumption and increase the environmental requirements in procurement.

For these reasons, it was considered important to compare the benefits created by buying paper with environmental criteria in its production versus its costs, when purchased through State procurement.

## 6.2 Analysis Methodology

This chapter refers to methodology used by the Ministry through its Department of Environmental Economics to evaluate priority products. Life-cycle Analysis and Cost-Benefit Analysis are described, after which the methodology is analyzed for the types of impact included in the study and the study cases. In the case of sustainable heating, a guideline was created for State procurement managers to include and assess economic, social and environmental variables when purchasing heating devices and products.

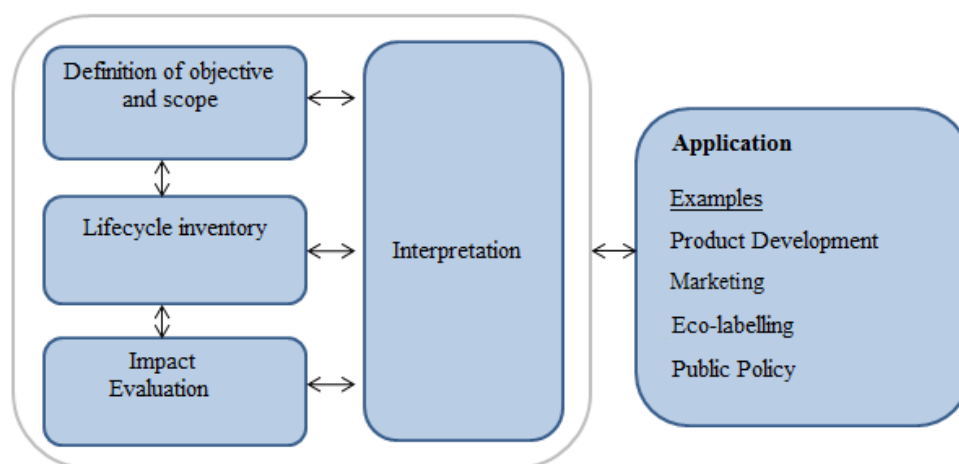
### 6.2.1 Life-cycle Analysis

Life-cycle Analysis (LCA) is an “objective process for assessing the environmental effects associated with a product, process or activity, by identifying and quantifying both material and energy use and emissions into the environment,” in order to propose and incentivize practices that improve the environmental performance of products.

Although LCA is flexible in terms of the scope of the analysis, its final objective is to incorporate all impacts, from raw material extraction to product disposal or servicing, including all stages of preparation and use. The general stages of an LCA are listed below, which are iterative, allowing the analysis to be intensified if required by the results.

- **Definition of objective and scope:** define scope (products/services, spatial and temporal scope, detail) according to the intended objective of the LCA.
- **Life-cycle inventory:** identify and quantify inputs (energy and material flows, changes in land use, etc.) and outputs (waste, emissions and products) of the system defined in the previous step.
- **Impact evaluation:** quantify a limited number of impacts by category able to be weighed by importance.
- **Interpretation:** communication of the results of the analysis and analyses of improvements to the system to reduce the said impacts.

Figure 8: Stages of life-cycle analysis according to ISO 14040



Source: *Fundación Chile* based on UNEP (2003)

Considering LCA objectives and in the context of Sustainable Public Procurements, the State, as part of its duty to ensure the welfare of the whole population, must consider the effects of all stages of products/services, and shall prioritize those with fewer environmental impacts. The Ministry for the Environment (MFE) is currently undertaking work to actively incorporate knowledge from LCA into public policy.

### 6.2.2 Cost-Benefit Analysis

In some cases, products with better environmental performance have higher purchase costs, whether because they are made with better quality materials or more advanced technology. This is a clear disincentive to purchasing them, especially in the public sector, where procurement laws are largely focused on reducing State expenditure.

Cost Benefit Analysis (CBA), applied throughout a LCA, is a specific tool that aims to price the impacts that have been identified and quantified into a single measurement unit such as money. The main objective is to answer the following question: **Is the purchase of a more environmentally friendly product worthwhile, bearing in mind economic, social and environmental variables?** If the answer is yes, there is an added justification to purchase the product or contract service. It should be noted that CBA incorporates an additional variable to impact evaluation, namely the price of products/services, which is relevant when choosing a product, due to the budget limitations faced by public bodies.

In summary, cost-benefit analysis was chosen over other methodologies for the following reasons:

- The unit of measurement is money, which has the advantage of familiarity.

- It incorporates the price of the product/service into the analysis, which from the buyer's point of view (in this case the State) is essential, due to its generally tight budgets.
- The Environmental Economics Department of the Chilean Ministry for the Environment (MFE) has experience applying similar methodologies, as it has done so on many occasions to analyze Chilean regulations.

This methodology also has some drawbacks, including the following:

- Not all impacts can be priced to complete the CBA due to information and/or methodological limits, therefore the results are biased from this point of view.
- The values used for pricing are arguable due to the different assumptions they make.

Considering these limits, the MFE, through its Environmental Economics Department, works to continually improve the methodologies that it currently applies, which may directly affect the evaluations of services and products purchased in public procurements.

### ***6.2.3 Impact quantification and assessment methodology***

The methodologies for pricing are varied, and depend mainly on whether or not the good is traded on the market. In the first case, pricing is direct, given that the unit's market price is used directly and multiplied by the corresponding number of units to price its impact. Examples may be electricity consumption, raw material used, among others.

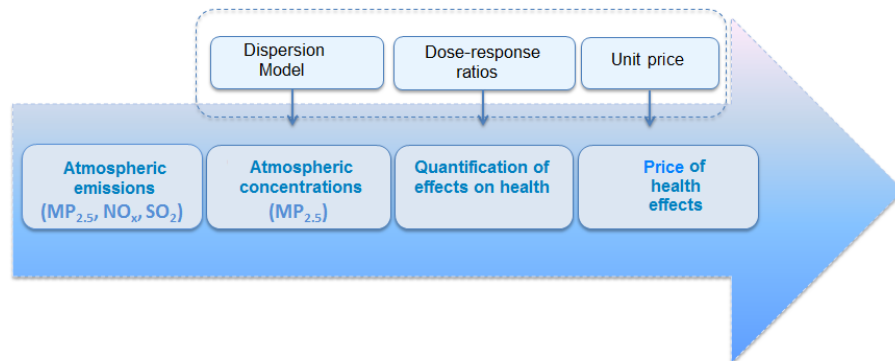
The methodology becomes more difficult when the intention is to price impacts or effects not traded on a market, when the knowledge developed by the Environmental Economics area over a number of decades becomes highly relevant. Many environmental impacts fall within this group of non-traded items, for which significant extra effort must be expended if it a conventional CBA is intended. Impacts are priced considering future flows within a determined evaluation horizon, both for benefits (savings) and costs, using the social discount rate provided by the Chilean Ministry of Social Development, which is 6%. The final indicator for establishing comparisons between goods is annual cost or its equivalent, net present worth.

The methodologies used for impact assessment and presently applied by the MFE for product evaluation are listed below.

#### **a) Local pollutant emissions**

The assessment methodology for the impact of emissions focuses on effects on human health, through harm ratios, as this explains the causal relationship between emissions and their harm which is priced in society in terms of human health. (MMA 2013)

Figure 9: Harm ratios of local pollutant emissions



Source: Own preparation

The methodology used by the MFE for pricing atmospheric emissions of local pollutants is explained in detail in MMA (2013), but here we will briefly review the steps included in the harm ratio. Several such steps can be quantified in a conventional LCA.

- Atmospheric emissions: emissions (generally ton/year) of pollutants that form MP<sub>2.5</sub> must be estimated. For this purpose, one needs to know the different stages of the processes that create emissions and the physical place where they are discharged.
- Atmospheric concentrations: harm to health is due to exposure to concentrations of atmospheric pollutants, therefore it is necessary to determine, by using emission-concentration models, the increase in environmental MP<sub>2.5</sub> concentrations.
- Quantification of health effects: Health effects are measured by additional mortality in the population<sup>43</sup>, effects on morbidity and limitations to daily activities. For this purpose, dose-response ratios are used, which relate MP<sub>2.5</sub> concentrations in the atmosphere with increases in case number of the assessed effect.
- Pricing health effects: each of the above effects can be priced. Mortality cases are evaluated by the risk of death pricing methodology, while morbidity and restricted activity days consider market prices of treatment inputs (days of hospitalization, medications, etc.) and social effects of whole or partial lost work days.

#### b) Greenhouse gas emissions (GHG)

Greenhouse gas (GHG) emissions are calculated using the market price of carbon bonds. At the time of the evaluation, a value of 7 USD per ton was assumed, which may vary depending on the price in existence at the time of evaluation.

#### c) Electricity consumption

Electricity consumption has two dimensions. The first reflects the cost of energy, which must be paid by the users of products/services. Second, emissions created by electricity

<sup>43</sup> Cases of premature mortality are quantified at around 4,000 for all Chile.

consumption were evaluated, as a significant part of the Chilean electricity grid's installed capacity is in thermoelectric carbon or diesel plants. Impact was evaluated as per a) and b).

d) Tree consumption

Consumption of different types of raw wood can be priced based on market wood prices. Assuming that approximately 50% of the wood price corresponds to production and transport costs, and based on usage factors (tree consumption/product unit created), tree consumption for a particular activity can be priced.

e) Water consumption

Liters of water used in a productive process can be priced using prices from the Chilean water market, which trades this resource as merely another good on the market. The price mainly depends on where in the country the transaction takes place and climate processes that may lead to periods of drought.

f) Economic impacts: investment, operation and maintenance costs

The purchase and use of goods and services by the State has costs associated with investing in or purchasing the product as well as operation and maintenance costs, which may be incorporated into a conventional CBA. This item is highly relevant given that generally a good/service with a smaller environmental impact has a higher price due to its use of better technology, leading to better performance in product operation.

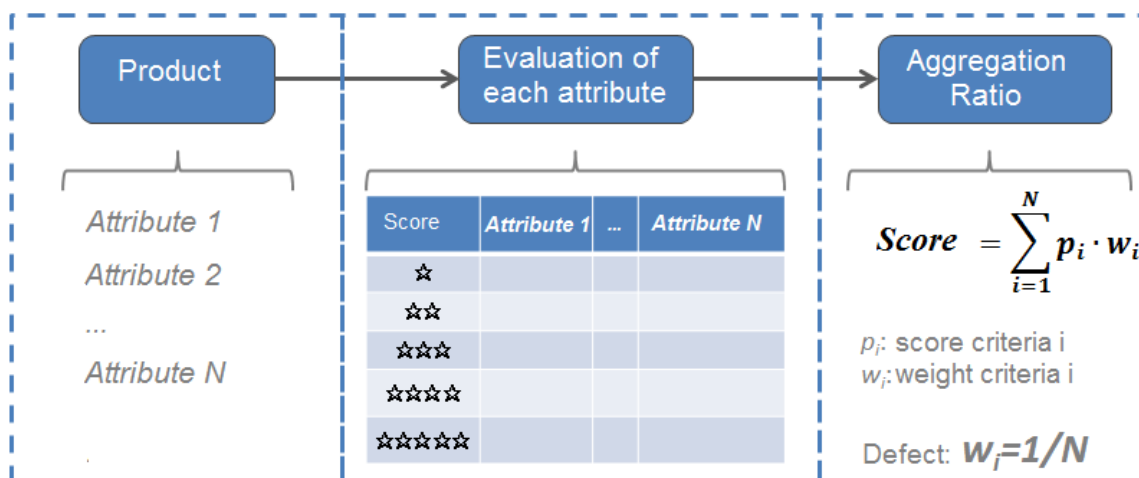
#### **6.2.4 *Product assessment and environmental scoring methodology***

Product assessment includes four products: Lights, vehicles, printing paper and sustainable heating. Please note that sustainable heating is not a specific product, but rather a process where different types of products related with heating equipment, and fuel and heat insulation articles for offices and housing intervene.

As mentioned above, product analysis was carried out considering the environmental impacts of different stages of the life-cycle, which were evaluated in a cost-benefit analysis. To simplify the expression of different product characteristics and allow their assessment by State procurement managers, environmental scoring was also proposed, which describes each product's environmental performance. Scoring was done by assigning stars, awarding more stars to products whose different characteristics have a smaller environmental impact, and less stars to those that cause a greater environmental impact.



Figure 10: Environmental Product Scoring



Source: Own preparation

For each product, two types of analysis took place allowing the costs and benefits of different environmental impacts to be identified. The first analysis took place by unit, that is, analyzing the impacts of purchasing of a single product; and the second took place using an analysis that added the State's total purchase of each product over a certain period of time. The aggregate analysis allowed the total impact of a change in State purchases to purchasing more environmentally friendly products to be assessed.

## 6.3 Products evaluated

The analysis carried out for the products evaluated by the MFE is described below.

### 6.3.1 Lights

Lights were analyzed to evaluate the environmental impacts of producing and consuming different types of lights, and the costs and benefits of the State purchasing more technological products.

#### a) Evaluated criteria and weighting

The following were considered as environmental criteria for evaluating each type of light: energy efficiency<sup>44</sup>, useful life, mercury content and the producer's extended liability (PER).<sup>45</sup> Using this information and the "star method" product sheets were prepared

<sup>44</sup> Although this criteria is not strictly environmental, its incorporation is justified as a proxy to emissions due to electricity generation.

<sup>45</sup> The EPL corresponds to a special waste management regime by which producers are responsible for organizing and funding waste management for the priority products they sell in a country.



allowing these characteristics to be expressed simply and the different types of lamps to be assessed. Table 3 shows how these sheets were classified products using four evaluation criteria, each item's weighting and the verification documents used.

Table 3: Environmental criteria for analyzing lights

Score	Useful life (hours)	Energy efficiency (class)	Mercury content	Extended producer's liability
☆	< 2000	G, F, E	Yes	
☆☆	≥ 2000	D	-	
☆☆☆	≥ 4000	C	-	
☆☆☆☆	≥ 8000	B	-	
☆☆☆☆☆	≥ 15000	A	No	Yes
<b>Item weighting</b>	30%	40%	15%	15%
<b>Verification document</b>	Manufacturer's fact sheet, Affidavit, Chilean energy efficiency label.	Manufacturer's technical fact sheet, Affidavit, Chilean energy efficiency label	Energy Star Seal	Registration on the emissions and contaminant transfer registry

Source: Own preparation

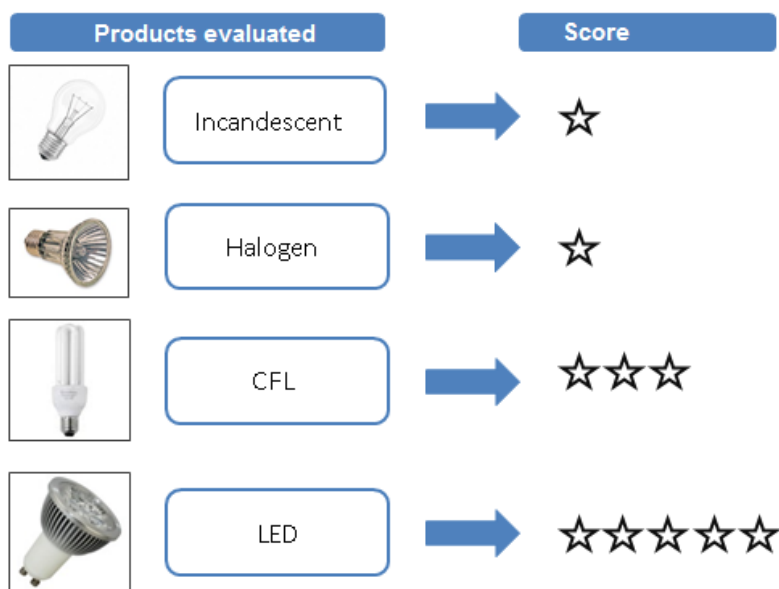
For energy efficiency, the Chilean light energy efficiency label was used, which includes information on energy consumption and qualifies A+ lights as the most efficient and G lights as the least efficient. Mercury content and useful life criteria were evaluated depending on the characteristics of each light detailed on the manufacturer's technical sheets. For the Extended Producer's Liability criteria, the requirements established in the Waste Management and Extended Producer's Liability Framework Law were evaluated.<sup>46</sup>

The impact analysis is based on the assumption that the demand for light at a typical workstation must be met, thereby simulating the behavior of a public office. From MINSAL (2000), a demand for light of 800 lumen and 2052 hours of operation per year were used.<sup>47</sup> Subsequently, the quantified impacts were calculated for four typical scenarios or technologies: incandescent, halogen, compact fluorescent lights (CFL and Light Emitting Diode (LED)), which were scored using the criteria established on the information sheets. Figure 11 shows the four light technologies evaluated and the score assigned.

<sup>46</sup> The Waste Management and Extended Producer's Liability Framework Law is currently awaiting approval in Congress.

<sup>47</sup> Assumption: 9 h/light day; 5 working days/week; 12 vacations/year

Figure 11: Score of lights by technology

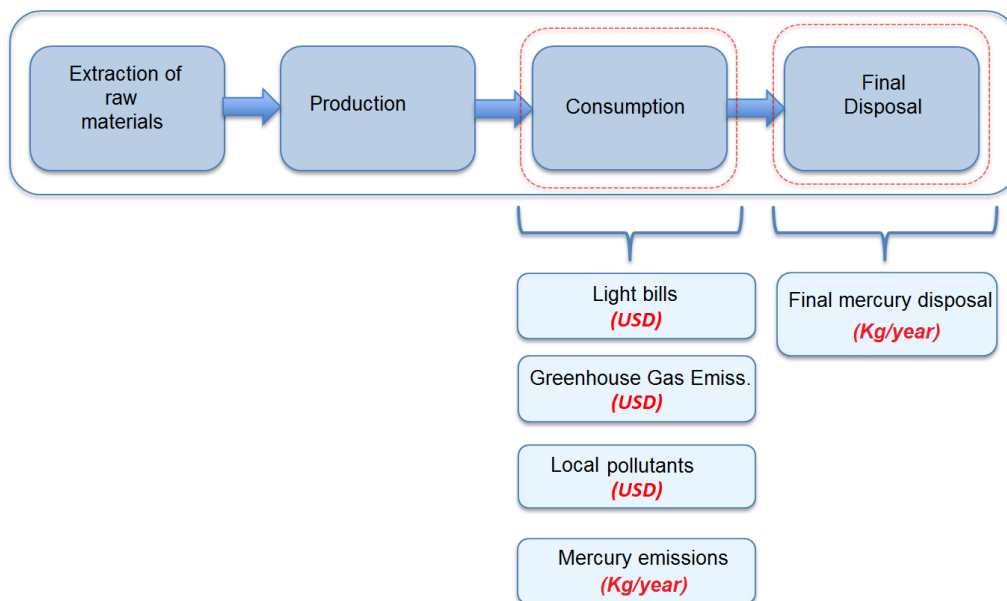


Source: Own preparation

## b) Unit analysis

The impacts evaluated were investment and electricity consumption costs (operation costs in this case), mercury content and local and global pollutant emission.

Figure 12: Quantified impacts of life-cycle analyses for lights



Source: Own preparation

The energy consumption associated with different technologies has both economic impacts (operation costs) and impacts due to the externalities produced by consumption (emissions). Annual consumption by technology is detailed by using the following equation:

$$Consumption_i = \frac{D}{Ef_i} \cdot LA \cdot Conv$$

Where:

- $D$ : is the assumed demand for light energy for a work station at 800 [lumen], obtained from MINSAL (2000).
- $Ef_i$ : technology efficiency  $i$ , expressed in [lumen/W].
- $LA$ : level of activity, expressed in hours of light usage, equivalent to 2052 [h/year].
- $Conv$ : conversion from W to kW, equal to  $10^{-3}$ .

Table 4 shows the data used for analysis by evaluated technology and Table 5 shows the input values used in the analysis.

Table 4: Data by technology evaluated

Stars	Type of tech.	Useful life (hours)	Hg Content (mg/unit)	Investment cost (CLP)	Efficiency (lumen/W)
☆	Incandescent	1000	0	\$ 490	11.7
☆	Halogen	2000	5	\$ 3,578	13.5
☆☆☆	CFL	6500	5	\$ 7,862	49.7
☆☆☆☆☆	LED	20000	0	\$ 22,294	110.5

Source: Chilean trading houses

Table 5: Input values used in analyses of lights

Impact	Parameter	Unit	Value	Source
General	Discount rate	%	6	MIDEPLAN (2011)
	Exchange rate	CLP/USD	500	<a href="http://www.df.cl">www.df.cl</a>
	Evaluation horizon	years	7	-
Electricity bill	Energy price	CLP/kWh	120	CHILECTRA, 2013
Local content	DMg contamination	CLP/kWh	9.3	MMA, 2011. Energy policy
Mercury	FE Hg	mg/kWh	0.00439	Calculated from KAS Ingeniería and GeoAire. (2009)
Global content	FE CO <sub>2</sub>	ton/kWh	0.00045	KAS Ingeniería (2012)
	CO <sub>2</sub> value	USD/ton	7	MMA, 2011. Energy policy

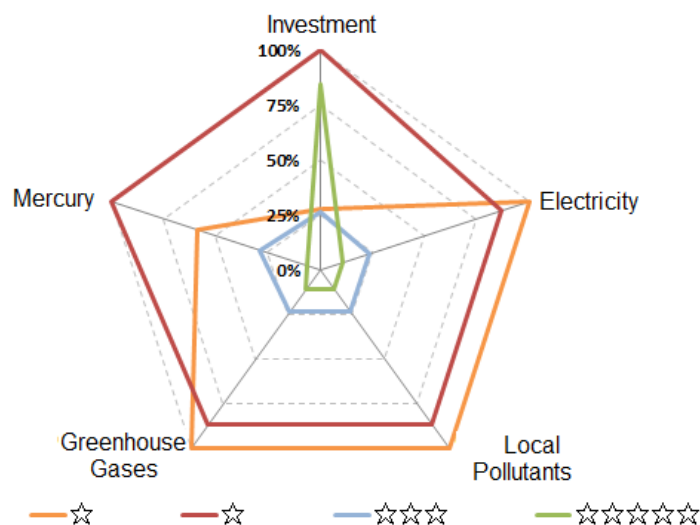
Source: Own preparation from cited sources.

The results of the unit analysis are shown in two phases. The first shows a radial graph (Figure 13) comparing each product according to the 5 impacts analyzed, where 100% is the highest value reached by any of the products. This leads to the conclusion that increasing purchases of products with more stars leads to a significant reduction in the impacts that were analyzed, except for the cost of investing in the 5☆ product. The 3☆ product is the standard, and is, according to the impacts that were assessed, more balanced.

Second, the unit price by product is analyzed (Figure 14; **Error! No se encuentra el origen de la referencia.**), where 1☆ has costs of around 40 USD/year per workstation, while the product with the best environmental performance costs 10 USD/year. This means that the State could save 30 USD annually per workstation by changing to the best performing technology.

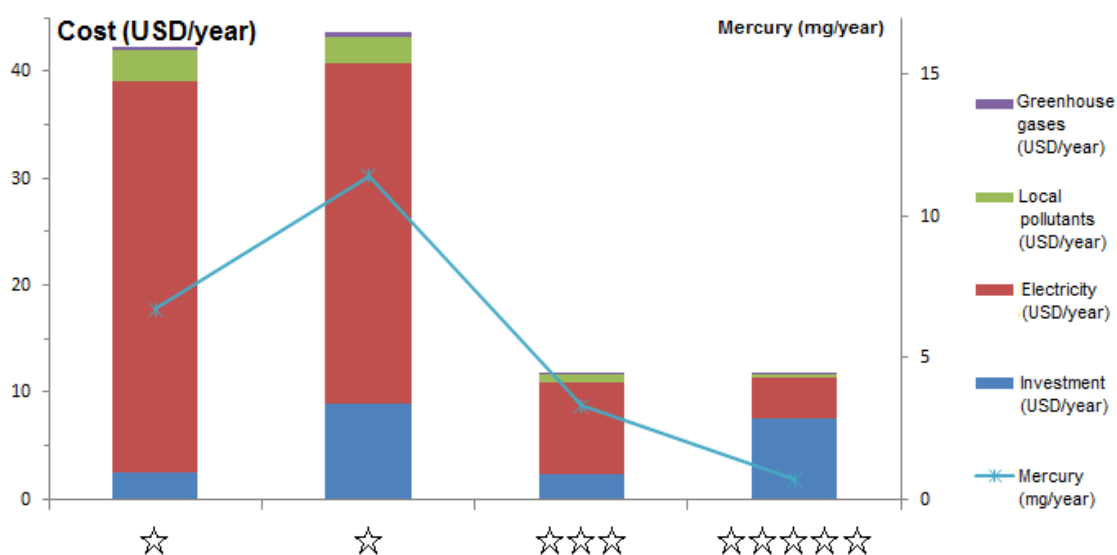
Figure 13: Unit analysis of lights by environmental indicators

Incandescent	☆
Halogen	☆
CFL	☆☆☆
LED	☆☆☆☆☆



Source: Own preparation

Figure 14: Costs and mercury emission per workplace and scenario by technology



Source: Own preparation

### c) Aggregate analysis

The 2012 State public procurement volume was obtained for each technology that was evaluated (Table 6). All purchases for supplying workstations, or otherwise, are assumed to

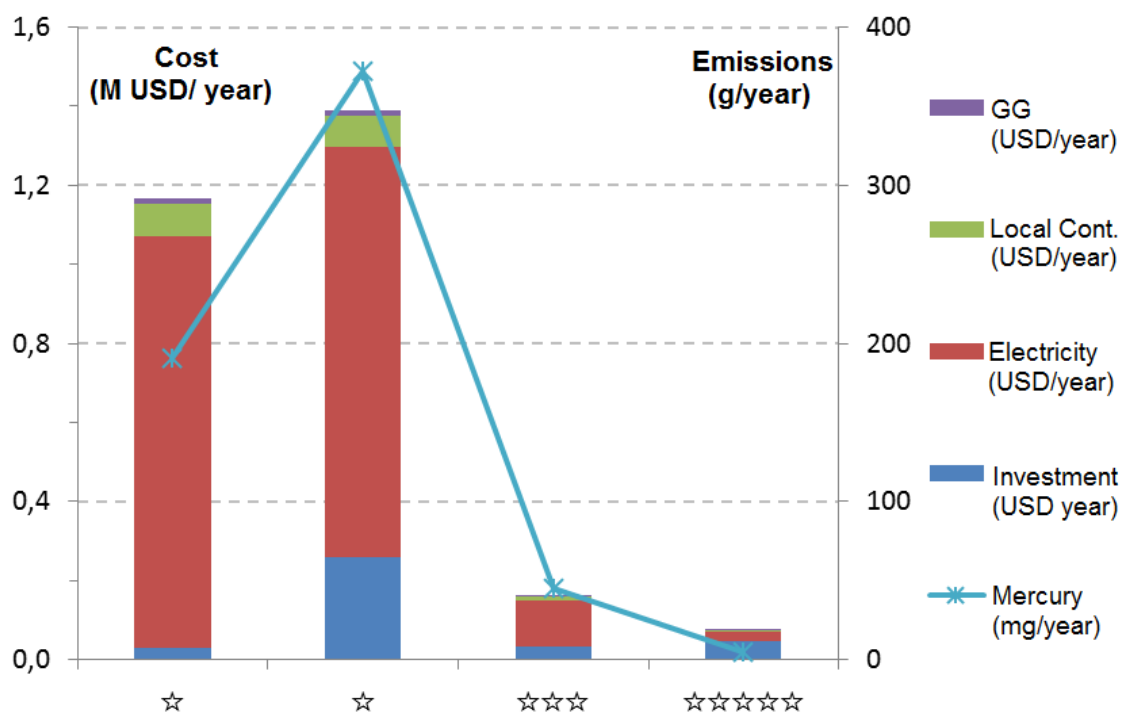
reflect the same demand for light, therefore, the aggregate results are calculated by extending the unit impact to the volume of purchases that were made.

Table 6: State purchases by type of light (units)

Annual purchases (2012)	Stars	Type
28,400	☆	Incandescent
32,500	☆	Halogen
13,600	☆☆☆	CFL
6,200	☆☆☆☆☆	LED

Source: ChileCompra (2012).

Figure 15: Aggregate impacts of public light purchases



Source: Own preparation

Figure 15 displays the main results of the analysis, which show that in the scenario of full replacement of 1☆ products with 3 or 5☆ products, social savings of ~2 M USD annually would arise, mainly due to lower operation costs (energy consumption).

### 6.3.2 *Printing paper*

This analysis aimed to compare the benefits created vs. the costs incurred by the State purchasing environmentally-friendly paper. In this analysis, only office paper was included, that is, paper used for writing, printing and photocopying.

#### a) Evaluated criteria and weighting

The significant environmental criteria or impacts were considered to be the origin of the raw material for manufacturing the paper, namely, whether or not it came from sustainably managed forests. The product's recycled fiber and chlorine contents were also considered.

Using the star method, fact sheets were prepared for each evaluated criteria, which were then weighted. Figure 16 shows how classification took place, how criteria were weighted, and the verification documents to be used.

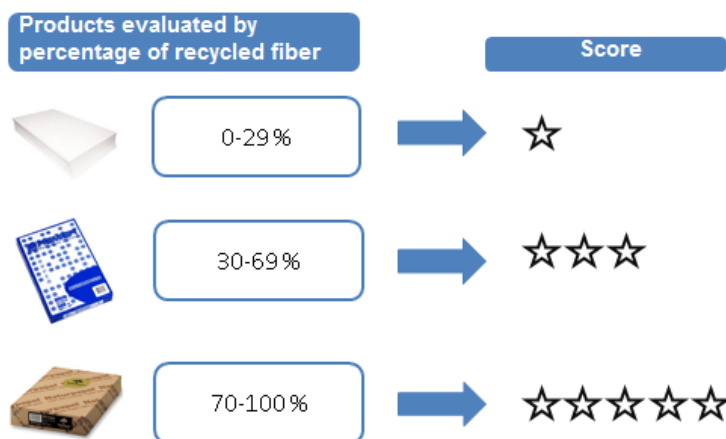
Figure 16: Environmental criteria for analyzing printing paper

Score	Sustainable forest management	Recycled fiber content (%)	Bleaching method
☆	No	0-29	Elemental chlorine
☆☆	-	-	-
☆☆☆	-	30-69	Elemental chlorine free
☆☆☆☆	-	-	-
☆☆☆☆☆	Sí	70-100	Chlorine free
<b>Item weighting*</b>	33.33%	33.33%	33.33%
<b>Verification document</b>	FSC, PEFC, CERTFOR or equivalent	FSC Recycled Label or equivalent certifications	Manufacturer's technical fact sheet and affidavit

Source: Own preparation

Three scenarios or product types were evaluated depending on the amount of recycled fiber that the different types of paper can contain. The star score obtained for this attribute may be seen in Figure 17.

Figure 17: Recycled fiber content by type of paper

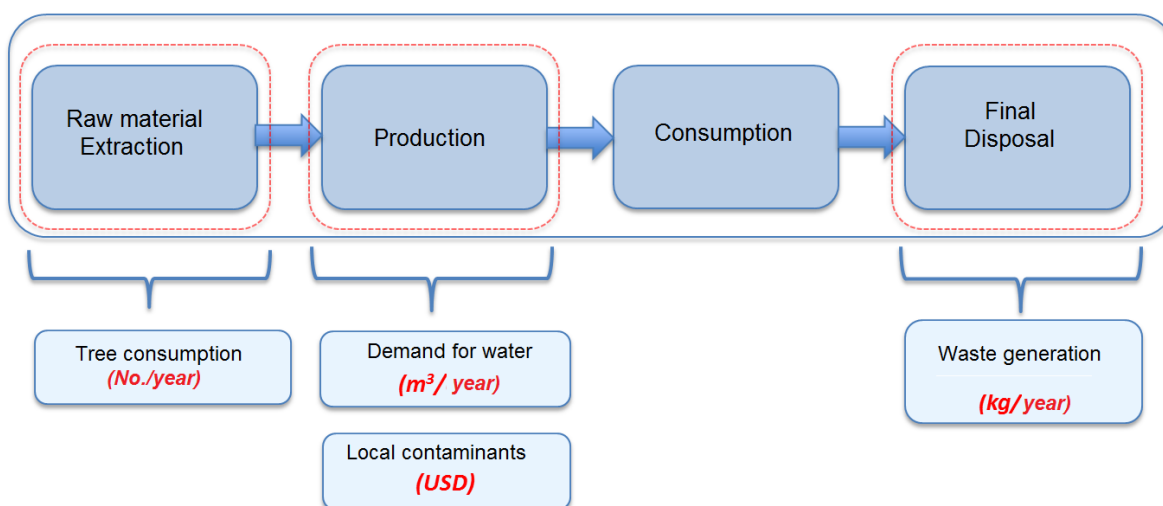


Source: Own preparation

## b) Unit analysis

The quantified and evaluated impacts were: investment, raw material, water and energy consumption, local and global pollutants and waste generation. These impacts are considered significant in the product's life-cycle in the extraction, production and final disposal stages. Figure 18 shows the main values used for each impact that was analyzed.

Figure 18: Quantified impacts of the life-cycle analysis for paper



Source: Own preparation

The information used and assessment results are summarized in the following tables:



Table 7: Input values used for analyzing printing paper

Indicator	Non-recycled paper	Recycled paper	Source
<b>Raw material consumption</b> (trees/ton paper)	24	17	Conservatree, 2012
<b>Water consumption</b> (m <sup>3</sup> /ton paper)	115	49	Ihobe, 2009
<b>Energy consumption</b> (kwh/ton paper)	10.7	6.15	Ihobe, 2010
<b>Ream cost</b> (CLP/unit)	2000	3300	Sale price on the Chilean market
<b>Waste generation</b> (kg residue/kg paper)	1.5	-0.4	

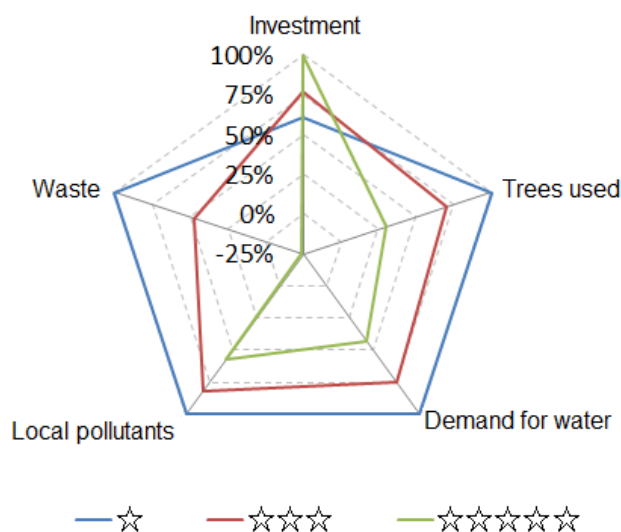
Source: Own preparation

Table 8: Results from the unit analysis of printing paper

Product	Investment (CLP/kg)	Trees used (No./kg)	Demand for water (m3/kg)	Damage due to local pollutants (CLP/kg)	Residues (kg/kg)
☆	898	0.024	0.115	100	1.5
☆☆☆	1148	0.017	0.087	82	0.7
☆☆☆☆☆	1481	0.007	0.049	58	-0.4

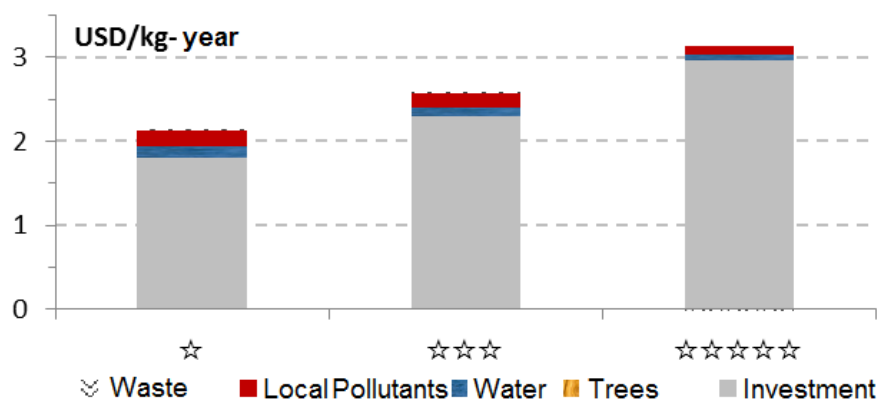
Source: Own preparation

Figure 19: Unit results from the assessment of printing paper



Source: Own preparation

Figure 20: Unit results from the assessment of printing paper (USD/kg-year)



Source: Own preparation

The unit results show that consuming recycled paper (5☆) causes less environmental impacts than consuming virgin paper (1☆) due to fewer trees being used as raw material. It also creates fewer local pollutants, consumes less water, and has a negative waste generation value (as it consumes waste as raw material), however, it requires higher economic investment due to its price. 3 star paper has fewer environmental impacts than virgin paper, but does not achieve the score of recycled paper.

### c) Aggregate analysis

Aggregate analysis was carried out based on total printing paper consumption in the public sector for 2012, acquired from ChileCompra. Annual consumption was estimated at 450 tons. However, information on the division between recycled and virgin paper was not available, therefore analyses are for the total sales volume for the three product types.

Using this information, and based on the environmental criteria that were evaluated, the effects of a possible change in State purchases leading to consumption of paper with higher recycled fiber content were estimated.

Table 9: Results of the aggregate analysis for printing paper

Product	Investment (M USD/year)	Local Pollutants (USD/year)	Waste (kg/year)	Trees (No./year)	Demand for water (thousands of m <sup>3</sup> /year)	Total (M USD/year)
☆	0.8	0.1	0.0	0.5	0.001	1,35
☆☆☆	1.0	0.1	0.0	0.3	0.001	1,43
☆☆☆☆☆	1.3	0.1	0.0	0.1	0.000	1,52

Source: Own preparation

In summary, the difference between 5☆ and 1☆ products taking only the cost of the product into account is 65%. However, by incorporating the price of additional impacts, the gap drops considerably to only 12%.

### 6.3.3 Light vehicles

The aim of evaluating light vehicles was to analyze the incorporation of environmental variables into the vehicle procurement process, in order to contribute to the reduction of CO<sub>2</sub> and local pollutant generation by State bodies.

#### a) Criteria evaluated and weighting

In the environmental assessment, the main impacts on the consumption process were analyzed and priced, and an environmental score was assigned to each product based on its characteristics and environmental standard.

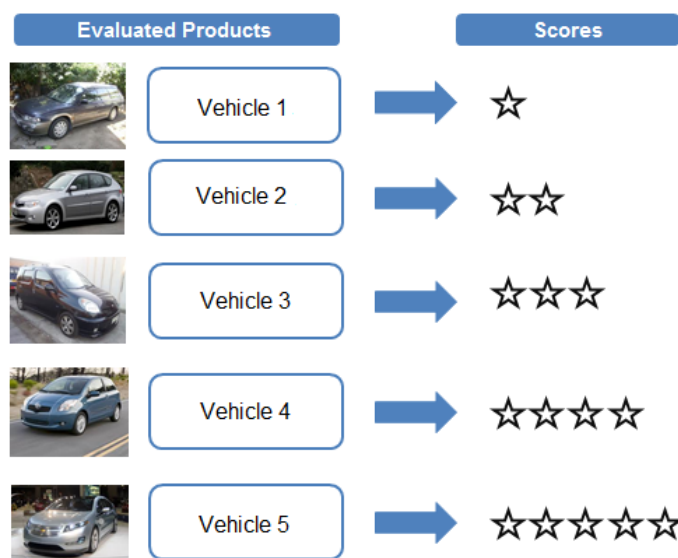
Figure 21: Environmental criteria in vehicle assessment

Score	Local pollutant emission	Emission of Greenhouse Gases (g of CO <sub>2</sub> /Km)
☆	Complies with the standard in effect	>430
☆☆	-	290-430
☆☆☆	Meets the strictest standard	230-290
☆☆☆☆	-	140-230
☆☆☆☆☆	Zero emission	<140
<b>Item weighting</b>	50%	50%
<b>Verification document</b>	Approval of vehicles through the Vehicle Control and Certification Center	Approval of vehicles through the Vehicle Control and Certification Center

Source: Own preparation

Due to the wide range of vehicles available on the Chilean market, where brands and models imported from around the world are available, all classifications of vehicles are able to be evaluated, as shown.

Figure 22: Score assignment by evaluated vehicle



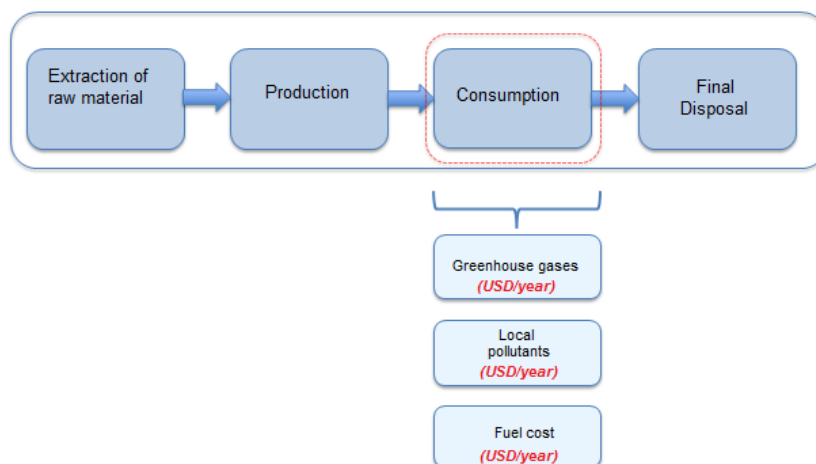
Source: Own preparation

## b) Unit analysis

Economic analysis of vehicle purchases took place using the present value of all costs involved (investment, operation and maintenance) over a certain period of time.

Two types of impacts were identified for environmental assessment. First, CO<sub>2</sub> emission levels represented by the emission factor (EF), measured in grams of CO<sub>2</sub> per km covered (gCO<sub>2</sub>/km) and second, the level of local pollutant emissions represented by the emission standard under which the vehicle was approved. 5 scenarios were evaluated according to the characteristics of 5 types of vehicle and a score was assigned using the “star method.”

Figure 23: Quantified impacts of vehicle life-cycle analysis



Source: Own preparation

The criteria assessed using the Life-cycle methodology were investment, operations in terms of fuel consumption, maintenance and greenhouse gas and local pollutant emission pricing.

Table 10 shows the main assumptions used in assessing vehicles. The general assumptions may be modified by the person assessing the purchases depending on specific circumstances, while data per vehicle (Table 11) is obtained using the attributes reported by suppliers.

Table 10: General assumptions for the economic assessment of vehicles

Fuel price (\$/l)	<b>Fp</b>	800
Activity level (km/year)	<b>LAct</b>	30.000
Evaluation horizon (years)	<b>T</b>	5
Useful life <sup>48</sup>	<b>UI</b>	7

Source: Own preparation

Table 11: Investment cost and performance by type of vehicle

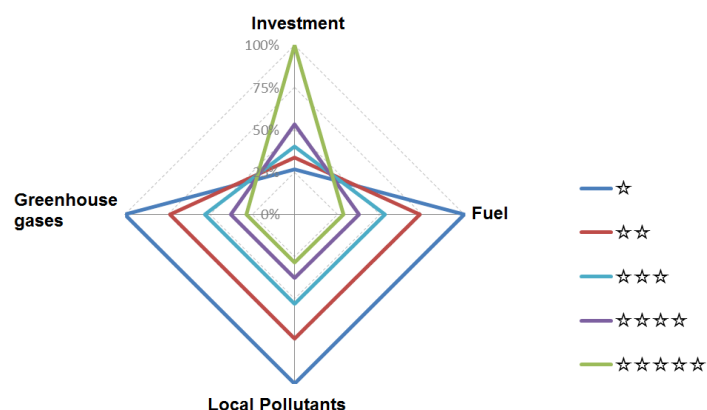
Vehicle type	Investment cost (CLP)	Maintenance cost* (CLP)	City performance (km/l)
Vehicle 1	4,000,000	480,000	5.0
Vehicle 2	5,000,000	510,000	6.8
Vehicle 3	6,000,000	540,000	9.4
Vehicle 4	8,000,000	570,000	13.2
Vehicle 5	15,000,000	600,000	17.5

\*Total cost for all compulsory revisions until 100,000 km

Source: Own preparation from ChileCompra data and Chilean automobile vendors

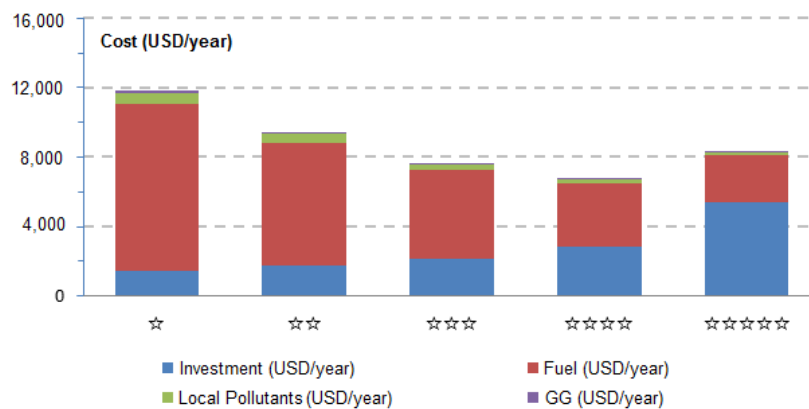
<sup>48</sup> Useful life is assumed to be the same among vehicles even when generally more expensive models last longer. This analysis could be carried out in order to improve the results in this part of the study.

Figure 24: Quantified impacts of vehicle life-cycle analysis



Source: Own preparation

Figure 25: Quantified impacts of vehicle life-cycle analysis



Source: Own preparation

The above figure shows that the total costs analyzed reduce in each vehicle as environmental performance improves (higher star rating). However, this trend does not apply the 5☆ vehicle, where low operation costs do not compensate the investment costs.

Currently, information held by ChileCompra states that 17 light and medium vehicles have been purchased by the State for 2012, however, information to categorize vehicles by environmental criteria and simulate the effect that buying vehicles with better environmental performance would have for the Chilean state is presently unavailable.

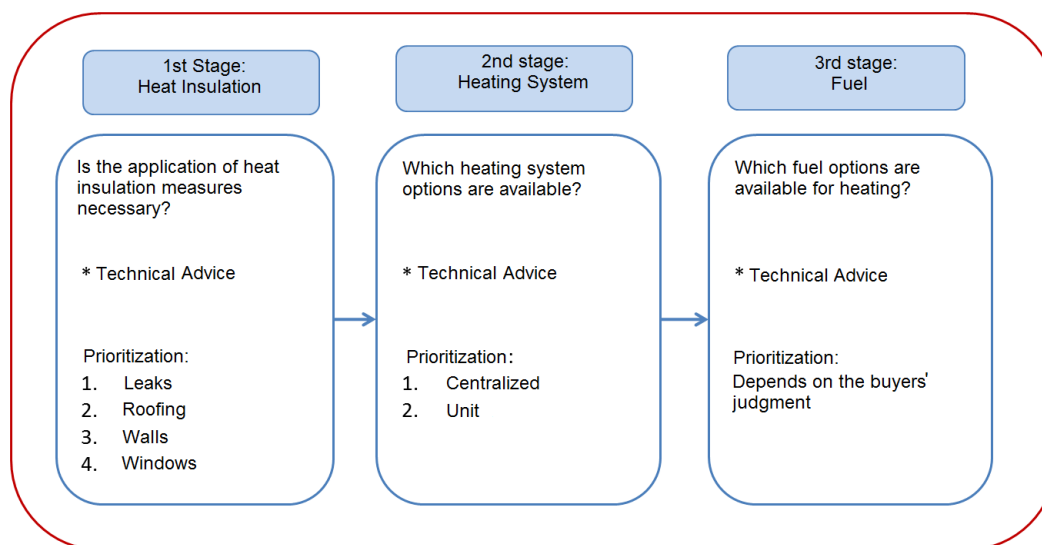
A pending analysis that may have interesting results would be to assess renting vehicles instead of purchasing them, which would be a significantly larger procurement. In this scenario, investment costs would reflect the rental amount (by day, generally), therefore cost-benefit analysis may show that the 5☆ product could be more profitable in terms of the analyzed variables.

### 6.3.4 Sustainable heating

In contrast to the analysis carried out for lights, printing paper and vehicles, for sustainable heating, a board was created to allow State public procurement managers to identify the variables to be included when acquiring products to improve comfort in terms of the temperature in offices and departments.

The proposal is for public bodies requiring more comfortable office temperatures or that need to change old or defective heating systems follow the stages below, which were prioritized to minimize the economic, social and environmental costs associated with heating and to promote sustainable procurement.

Figure 26: Decision diagram for heating measures



Source: Own preparation

The advice of an expert in energy efficiency, heat insulation and heating issues is recommended to incorporate the particular circumstances of each building into the stages outlined below. This allows the heating problem to be addressed using the proper measures for each specific site, increasing the efficiency of State resources.



a) Insulation

A number of studies indicate that heat insulation is the most cost-effective measure for improving heating in buildings, allowing fuel consumption to be reduced by reducing heat leakages. Merely by improving heat insulation, the demand for energy in a building can be reduced by more than 40%<sup>49</sup>, leading to direct savings in heating operation expenses.

Taking into account both economic criteria and insulation efficiency, insulation measures in the following order are recommended:

- Leakages: seal door and window leakages to avoid air entering from outside and heat escaping from inside.
- Roofing: improvement of heat insulation in roofing. This is where most heat is lost from a building.
- Walls: placing heat insulation in outer walls of buildings
- Floors: improving floor insulation.
- Windows: changing regular windows for windows to reduce heat loss.

The advisory contracted for the insulation process could determine the number of insulation measures necessary for the building depending on its particular circumstances.

b) Heating system

If it coincides with buyers' needs, a centralized heating system rather than a unitary one is recommended. Generally, these heating systems (boilers) have an efficiency up to 30% greater than conventional units. This results economic benefits for the user and environmental benefits for citizens, as fewer emissions are created, which are reduced using a particle abatement system. Furthermore, this system has higher heat distribution as it can heat several spaces simultaneously.

Where only the installation of a unitary equipment is possible (heater), please prefer:

- High heat efficiency and low pollutant emission equipment, avoiding open flames.
- Forced draught heating systems (fuel gas vent leading outside the building) in order to prevent inter-domicile pollution that has greater health impacts than atmospheric contamination.

Seeking advice on selecting the proper heating system allows the buyer to decide which system (unit or centralized) is more suitable, depending on the results of a technical and economic assessment of the buyer's needs and the benefits of each system.

---

<sup>49</sup> Estimated reduction arising from the "Public investment program to encourage renewal of heating systems in public housing stock" MINVU (2007).

### c) Fuel

The choice of fuel is left to the buyer's judgment, as it depends on available supply, on the priorities arising from the above economic, social and environmental variables and the regulations that may be in effect for each area in particular that may limit the use of some options (for example Decontamination Plans).

Regardless of the regulations in effect, it is recommended not to use wood-fueled unit heaters in areas saturated by PM<sub>10</sub> or PM<sub>5</sub> or where this pollutant is latent or in cities with more than 10,000 inhabitants between the O'Higgins and Magallanes regions.

Selection must be made on an informed basis, considering the advantages and disadvantages of each fuel over the other, as summarized in Table 12, in terms of fuel price, particulate material (PM) emissions and greenhouse gas (GHG) emissions.

Table 12: Summary of main features by fuel type

Fuel	Price	PM Emissions	GHG Emissions
Electricity	High	Low	Medium
Gas	High	Low	Medium
Petrol/diesel	Medium	Medium	High
Paraffin	Medium	Medium	High
Biomass - Pellets	Low	Medium	Low
Biomass - Wood	Low	High	Low

Note: the ranges on the table are for reference purposes and attempt to reflect the impact of the full fuel life-cycle.

Source: Own preparation

Some specific recommendations are detailed below:

- If the selected option is biomass, pellets are recommended due to their high efficiency and efficient combustion which minimizes environmental emissions.
- If the only viable alternative is wood, it is recommended to:
- Buy dry wood, with moisture lower than 25% to ensure efficient combustion and to ensure that it has been sourced from a sustainably managed forest.
- Additionally, a humidity meter for firewood is recommended to verify that the purchased product has the intended characteristics.

A range of seals are currently granted to identify firewood meeting the above criteria, which may help the buyer decide, such as the National Firewood Certification System seal (SNCL, in Spanish)<sup>50</sup>, the Ministry of Energy seal and the Clean Production Agreement (APL) seal, all of which are equivalent in terms of quality and fuel origin criteria.

<sup>50</sup> <http://www.lena.cl/certificacion-de-lena/>

An expert may advise on carrying out an economic feasibility assessment about whether purchasing a more expensive equipment is recommendable depending on hours of use per day.

## 7. Conclusions

This report aims to move forward in the analysis sustainable public procurement and its implementation in Chile.

The work and progress made by international bodies underlines the importance of this issue in countries' paths towards development, and the need to promote policies that incentivize sustainable development. Undoubtedly, the work done by the UNEP, OECD and EU underlines Sustainable Public Procurement as a strategic axis and tool for positioning States as role models in procurement processes and optimal resource use.

On the other hand, international experience, and specifically the German case, provides a positive example of how environmental criteria can be used to analyze products and services, and demonstrates the positive impacts created by applying a Sustainable Public Procurement policy.

These international role models also ensure that the path towards implementing a sustainable public procurement policy in Chile will be a more dynamic one. One of the most important challenges our country faces is to make progress in selecting environmental criteria to identify the main impacts of State procurement in order to put in place efficient and effective environmental protection measures. These criteria should take into account economic, social and environmental impacts and reflect the country's main environmental problems, as well as its specific circumstances (for example, atmospheric contamination due to the use of firewood as fuel).

Within this discipline, tools such as Life-cycle Analysis and Cost-Benefit Analysis offer greater clarity on the possible impacts of products and services, and enable delivery of concrete results to those responsible for procurement processes in different public bodies, who, after all, are the main decision-makers in the implementation of Sustainable Public Procurement.

## 8. References

Asia - Pacific Economic Cooperation (2013). Green Public Procurement in the Asia Pacific Region: Challenges and Opportunities for Green Growth and Trade. APEC Project: CTI 39/2011A. Chile, Elaborado por AMPHOS 21 para APEC Secretariat.

ChileCompra (2012). "Política de Compras Públicas Socialmente Responsables: De la Sustentabilidad a la Responsabilidad Social."

European Commission (2001). EU-Research Project Relief Status Report. Status Report Hamburg. Documento preparado por Stephan FaBbender y Kai Fabig, Disponible en [http://www.sustainable-procurement.org/fileadmin/files/Other\\_publications/Hamburg\\_Status\\_Report.pdf](http://www.sustainable-procurement.org/fileadmin/files/Other_publications/Hamburg_Status_Report.pdf).

European Union (2012). "The uptake of Green Public Procurement in the EU27. Prepared by the Centre for European Policy Studies (CEPS) and College of Europe for the European Commission, DG Environment." from <http://ec.europa.eu/environment/gpp/pdf/CEPS-CoE-GPP%20MAIN%20REPORT.pdf>.

Fundación Ciudadano Responsable (2012). Compras Públicas Sustentables en Chile. Disponible en <http://www.ciudadanoresponsable.cl/wp-content/uploads/2012/09/Reporte-Compras-p%C3%BAblicas-en-Chile.pdf>.

KAS Ingeniería (2012). Efectos en los precios de la electricidad e impactos ambientales asociados a políticas energéticas, Ministry for the Environment.

KAS Ingeniería and GeoAire. (2009). Análisis General del Impacto Económico y Social de una Norma de Emisión para Termoeléctricas. Preliminary Edition 2009, CONAMA.

Korkmaz, A. (2012). "Benefits and obstacles of environmental, social and sustainable procurement. Presentation made at the International Public Procurement Conference." from <http://www.ippa.org/IPPC4/Proceedings/07GreenProcurement/Paper7-2.pdf>.

Loyola, C. (2012). "Compras Sustentables en el Mercado Público." from [http://www.comprassustentables.cl/index.php?option=com\\_phocadownload&view=category&id=2&Itemid=2](http://www.comprassustentables.cl/index.php?option=com_phocadownload&view=category&id=2&Itemid=2).

MIDEPLAN (2011). Precios Sociales para la Evaluación Social de Proyectos, Planning Division. Santiago, Chile.

Ministry of Finance (2004). Decree 250, which Approves the Regulation of Law No. 19,886 on the Conditions for Administrative Supply and Service Provision Contracts.

MINSAL (2000). D.S. 504/2000. Regulation on Basic Sanitary and Environmental Conditions in Workplaces.

MMA (2012). Report on the State of the Environment, 2011. Statistics and Environmental Information Department. Chile, Ministry for the Environment (MMA in Spanish).

MMA (2013). Methodological guide for preparing a general economic and social impact analysis (AGIES) for air quality instruments. Environmental Economics Department. Chile, Ministry for the Environment.

MMA (2013). First Report on the State of the Environment, Ministry for the Environment.

New Zealand Business Council for Sustainable Development (2009). Sustainable Procurement in Government. Opportunities for business. First Steps to Sustainability Series. 1a Edición. Disponible en [http://www.sbc.org.nz/\\_data/assets/pdf\\_file/0003/50970/Procurement-guide.pdf](http://www.sbc.org.nz/_data/assets/pdf_file/0003/50970/Procurement-guide.pdf)

Öko-Institut e. V. and ICLEI – Local Governments for Sustainability (2007). "Cost and Benefits of Green Public Procurement in Europe." General Recommendations. from [http://ec.europa.eu/environment/gpp/pdf/eu\\_recommendations.pdf](http://ec.europa.eu/environment/gpp/pdf/eu_recommendations.pdf).

Public Works and Government Services Canada (2006). "Policy on Green Procurement." from <http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/documents/achats-procurement/politique-policy-eng.pdf>.

UNEP (2003). Evaluation of Environmental Impacts in Life Cycle Assessment., UNEP/Earthprint. Division of Technology Economics. Production Consumption Unit.

United Nations (2008). "Sustainable Development. Innovation Briefs." Issue 5. from [http://esa.un.org/marrakechprocess/pdf/InnovationBriefs\\_no5.pdf](http://esa.un.org/marrakechprocess/pdf/InnovationBriefs_no5.pdf).

United Nations Environment Programme (2012). "Success Stories." from <http://www.unep.org/greeneconomy/SuccessStories/tabid/29863/language/en-US/Default.aspx>.