European Commission Green Public Procurement (GPP) Training Toolkit

- Module 3: Purchasing Recommendations

Construction

Background Product Report

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Contents

Introduction

This background product report forms part of the European Commission's **GPP Training Toolkit Module 3,** which includes recommended GPP purchasing criteria for 11 priority product and service groups.

This document complements the **Product Sheet on Construction**, by providing more in-depth information on why the purchasing recommendations included within the Product Sheet have been set. The Product Sheets themselves contain only the information that is strictly necessary for contracting authorities to incorporate environmental considerations in their tender procedures.

Where possible, the criteria presented in Module 3 will mirror the criteria underlying the **European Ecolabel**. Where the European Ecolabel does not cover a product/service group, other criteria sources (such as further ecolabels or national guidance) may be used.

For each product/service group two sets of criteria are presented:

- **Core criteria** – these are designed to be used by any European contracting authority. They address the most significant environmental impacts, and are designed to be used with minimum additional verification effort or cost increases.
- **Comprehensive criteria** – these are intended for use by authorities who wish to purchase the best environmental products available on the market, and may require additional administrative effort or imply a slight cost increase as compared to the purchase of other products fulfilling the same function.

Abbreviations

AP	Acidification Potential
CAD	Computer Aided Design (Software)
CEN	European Standardisation Committee
CHP	Combined Heat and Power
EMS	Environmental Management System
EMAS	Environmental Management and Auditing System
EPBD	European Energy Performance of Buildings Directive
EPD	Environmental Product Declaration
GPP	Green Public Procurement
GWP	Global Warming Potential
HVACR	Heating, Ventilation, Air Conditioning and Refrigeration
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
l-RES	Localised Renewable Energy Sources
MEAT	Most Economically Advantageous Tender
RES	Renewable Energy Sources
SPP	Sustainable Public Procurement
TC	Technical Committee
VIP	Vacuum Isolation Panel

1 Scope

For most public authorities, the construction of new and renovation of existing buildings represents a major share of annual expenditure – in some cases over 50%. Additionally, the running costs of publicly owned buildings, including heating/cooling, electricity, waste, hot and cold water, are significant drains on public finances. Furthermore a large proportion of all construction works are publicly financed, with contracting authorities therefore able to exert considerable influence on the market as a whole.

"Environmental construction" means that one aims to minimise the environmental impact of construction works in all phases of the lifecycle of a building, including planning/design, construction, renovation, use and disposal/deconstruction. This Product Background Report provides comprehensive background information for contracting authorities on including environmental criteria in tender documents for construction works, addressing the different stages of the lifecycle of a building.

Environmental criteria relate to energy consumption, the use of renewable energy sources (RES), construction materials and products, waste and water management as well as other aspects influencing the environmental impacts of construction: architects' experience, and monitoring and user aspects.

Green Public Procurement (GPP) should consider the overall environmental profile of the entire building. This implies the need to take into account many different issues, ranging from types of building materials used to various approaches to achieve high energy efficiency. The Report focuses on buildings as systems instead of just an accumulation of components. It highlights certain aspects of construction works and addresses the relationship between those aspects.

The following figure illustrates the relevant content categories and the systemic approach.

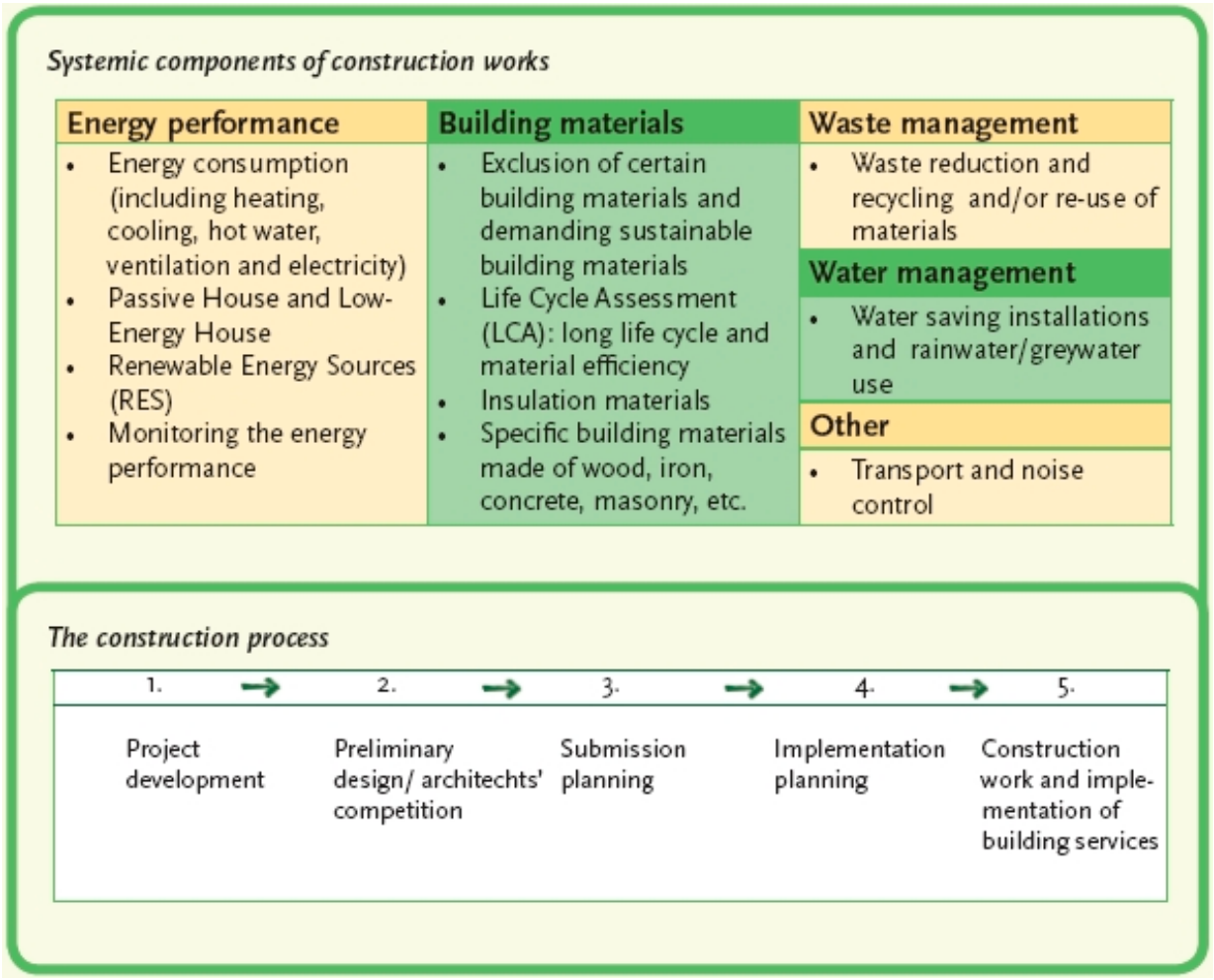

Figure 1: The construction project as a system

2 Key environmental impacts

A major share (40-50%) of globally used raw material is annually transformed into construction materials and products. Buildings also account for a major share of energy consumption and greenhouse gas emissions in the European Union (RELIEF 2003)[1].

Furthermore, 40% of the total amount of waste generated in Europe annually derives from construction and demolition prior to recovery. Most of this waste can be recycled or re-used principally in the form of embankments, for example for roads or railways. Construction work can have significant impacts on local water reserves due to high wastewater generation during construction.

The construction process itself has considerable impacts on energy and water resources as well as on acidification and land use. Transport and waste streams are other important environmental issues to consider during the construction process.

During the use phase, the energy consumption of a building represents the most significant environmental element, accounting for about 40% of total European energy consumption, split into space heating (52-57%, depending on the sector), water heating (25%) and electrical appliances (11-16%, depending on the sector)[2].

Buildings are of critical importance for sustainable development in Europe. The environmental impacts of construction works are many and complicated. The following sections explain the main environmental impacts.

2.1. Energy

The left section in Figure 2 below indicates the proportion of final energy consumed in the EU for which buildings are partly responsible ("households & services, etc."). The right section compares the financial costs of the construction of a building to the costs accrued during its use and deconstruction. This highlights the importance of considering more than just initial investment costs when dealing with construction works.

[1] See: http://www.iclei-europe.org/fileadmin/user_upload/Procurement/RELIEF/Publications/Background_Document_building_2003_final.pdf.

[2] ibid.

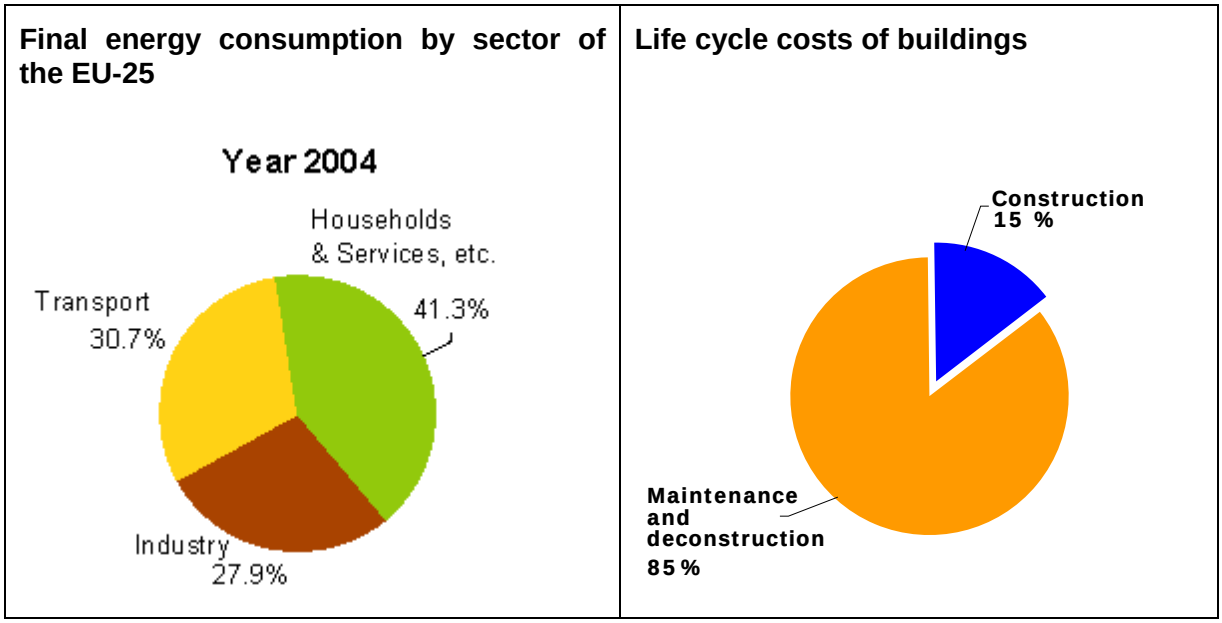

Figure 2: Final energy consumption by sector of the EU-25, l. (Source: Energy & Transport in figures, European Commission, Directorate-General for Energy and Transport, 2006) and life cycle costs of buildings, r. (Source: IFZ 2006)

The largest material and energy streams are to be found in the building sector. Buildings are the biggest consumers of energy in Europe. Around 40% of final energy consumption in the European Community takes place in the building sector, including the energy used for the extraction, processing, transport and disposal of building materials, the energy used on construction sites and for deconstruction, and the energy consumed during the use of buildings.
The main areas of energy consumption are heating, cooling, ventilation, hot water supply and electricity. Research has indicated that by improving energy efficiency, carbon emissions from buildings and related energy costs could be reduced by 42% (RELIEF 2003[3]). An enormous potential for energy savings exists in the renewal of the existing building stock, so the main focus for energy relevant measures should be on renovation work.

2.2. Natural resources and waste

The choice of materials used in construction also has a substantial environmental impact – especially on the use of natural resources and the generation of waste and waste streams (during the construction process itself and at the demolition phase).

[3] See: http://www.iclei-europe.org/fileadmin/user_upload/Procurement/RELIEF/Publications/Background_Document_building_2003_final.pdf.

2.3. Transport

Construction materials and products used need to be transported – from extraction, through processing, to the building site, and then finally for disposal. Considering the quantities involved this has an influence on fossil fuel consumption and on emissions of CO_2 that both contribute to climate change.

2.4. Harmful substances and health related issues

The construction sector uses certain products/substances (e.g. flame retardants, heavy metals) which may release emissions harmful to human health and/or the environment either during manufacturing, use or final disposal.

2.5. Water

During the construction process fresh water is used for several purposes such as cleaning materials and preparing construction products on the spot. Decisions about which water installations will be used have a significant influence on water consumption during the use of the building. Used water generates waste streams which may contain hazardous substances. Freshwater resources across Europe are scarce and should be used reasonably.[4]

[4] More information on the measurements to preserve freshwater resources in Europe can be found in the Groundwater Directive 2006/118/EC that has been developed in response to the requirements of Article 17 of the Water Framework Directive (Directive 2000/60/EC, 23 October 2000).

2.6. Reducing the key impacts

The table below summarises the main environmental impacts related to construction works as described above, and indicates which measures are suitable for addressing these impacts.

Table 1. Key environmental impacts – Construction

Impact		GPP Approach
• The consumption of energy for heating, cooling, ventilation, hot water, and electricity, and resulting CO_2 emissions	→	• Maximise the energy performance of buildings • Ensure high energy efficiency standards for heating, cooling, ventilation and hot water systems, and electronic devices • Encourage the use of localised[5] renewable energy sources (l-RES)
• The consumption of natural resources	→	• Include a systematic Life Cycle Approach (LCA) for building materials • Encourage the use of sustainably harvested and produced resources
• Over-consumption of fresh water resources both during construction and during the use phase	→	• Encourage the installation of high-end water saving technologies and reduce the use of freshwater during the construction process.
• Emission of substances harmful to human health and the environment during the production or disposal of building materials leading to air and water pollution • Negative health impacts on building users due to building materials containing dangerous substances[6]	→	• Encourage the use of non-toxic building materials • Encourage the use of substitute substances/ materials for dangerous building materials[7]
• Transportation of construction materials and products generates CO_2 emissions that have an influence on climate change	→	• Use energy efficient vehicles for transportation and on the building site • Apply effective supply chain management systems

[5] "Localised RES" means RES generating capacity within the building site itself (e.g. solar panels, biomass boilers, wind turbines etc.).

[6] Defined and listed in Directive 76/796/EEC.

[7] Contracting authorities must ensure that the functionality of the building materials is not compromised (for example in terms of resistance to fungal growth) when using substitute substances/materials.

3 Relevant European environmental policy and legislation

As the construction sector is highly complex this section refers to the EU regulations which are most relevant in the area of construction in relation to the above mentioned environmental impact categories.

3.1. Energy

3.1.1 European Directive on the Energy Performance of Buildings (2002/91/EC)

The European Directive 2002/91/EC on the Energy Performance of Buildings (EPBD) requires all Member States to develop calculation procedures for determining energy performance in accordance with a number of requirements outlined by the Directive. It covers all new buildings and existing buildings with a total useful floor area of over 1000 m² that undergo major renovation. The Directive is currently in the process of revision, which will likely lead to amendments also covering buildings with a total floor area below 1000 m².

At present, there are major differences in the overall approach used in the Member States. For determining the energy performance level of a building Member States' approaches differ with regard to which energy flows are included, the calculation procedures themselves and the format of the output data (e.g. net energy or gross energy, heat energy requirement, final energy or primary energy).

Each country is free to select the method for calculating energy performance and the standards set, within the general framework laid down by the Directive. As such there will be no single methodology, no indicator and no performance benchmark for energy performance applicable in all countries. Member States, especially new Member States, partly or fully use the package of 31 EPBD CEN standards such as the EN 13790 methodology on the thermal performance of buildings and the calculation of energy use for space. Other Member States such as Germany or Austria use their own calculation methods, partly based on CEN standards. This has direct implications for the procurement process (see section 9.1).

In April 2007 the EPBD published EU-27 country reports, indicating for each Member State the current achievements in implementing the EPBD Directive[8]. This demonstrates that Member States are taking on board the challenge of implementing integrated approaches for overall energy performance and at the same time reducing "isolated solutions" such as the determination of maximum U-values for separate construction elements. But, given the big

[8] The report can be downloaded at http://www.buildingsplatform.eu/epbd_publication/doc/EPBD_BuPLa_Country%20reports_20070525_p2731.pdf. The 'buildings platform' also offers a **helpdesk** function where contracting authorities can ask questions and get answers regarding national regulations and standards useful for writing tender documents. Further information regarding the implementation of the Directive 2002/91/EC is available at http://training.eebd.org/Page.aspx?id=65&ui=en&lang=en.

differences in the applied calculation methods used across Europe and the consequent impossibility of making cross-comparisons (also for reasons of climatic differences), it is unlikely there will be harmonised European minimum energy performance standards/benchmarks for several years.

3.1.2 Mandate 343 to CEN - Comité Europeén de Normalisation[9]

CEN (Comité Europeén de Normalisation) was asked by the European Commission to work on the harmonisation of calculation procedures for the EPBD. This mandate[10] has resulted in a package of 31 EN standards that are partly finalised (2007), which include harmonised calculation methods for the energy performance of buildings as well as energy related standards for cooling, ventilation, heating and electricity. Member States will adapt these European standards into national standards in the upcoming years on a voluntary basis.

Related to the outcomes of this mandate the ENPER-EXIST project (Applying the EPBD to improve the Energy Performance Requirements to Existing Buildings) developed guidelines to measure the energy performance of existing buildings. These include recommendations on how to simplify the calculation procedures across Europe, where EN standards can be useful and how they can be improved (see ENPER-EXIST 2007).

The proposed EN standards prEN 15217[11] and prEN 15315[12] are of special interest, because they give guidance on the ways to express energy requirements as well as on how to calculate the overall energy use of a building, including primary energy and CO_2 emissions.

3.1.3 Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC)

This Directive aims at increasing the energy end-use efficiency in Member States by reducing energy consumption by 9% by 2015. In order to reach the objective several instruments and programmes for energy efficiency are published, stressing that the public sector should lead by example. Article 5 explicitly mentions the role of public procurement in achieving the envisaged reduced energy consumption by tendering for highly energy efficient technologies. This should have an influence on the selection and purchase of energy using devices in buildings such as electric pumps, lighting systems, IT equipment and white goods.

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[9] See: www.cenorm.be/cenorm/index.htm.

[10] Mandate (343) to CEN, CENELEC and ETSI for the elaboration and adoption of standards for a methodology calculating the integrated energy performance of buildings and estimating the environmental impact, in accordance with the terms set forth in Directive 2002/91/EC. The mandate is accessible in the following database: http://ec.europa.eu/enterprise/standards_policy/mandates/index.htm.

[11] Energy performance of buildings – Methods of expressing energy performance and for energy certification of buildings (prEN 15217).

[12] Energy performance of buildings – Overall energy use, primary energy and CO_2 emissions (prEN 15315).

3.2. Construction materials and products

3.2.1 Thematic Strategy on the Urban Environment[13]

The main objectives covered by this Communication are to revitalise and mainstream the environmental management of Europe's largest towns and cities and to overcome isolated policies (buildings, infrastructure, transport, energy, waste, etc.) with a general focus on sustainable urban management, sustainable urban transport, sustainable construction and sustainable urban design. Within these main objectives the development of a common methodology for evaluating the overall sustainability of buildings and the built environment is the main target of this thematic strategy. Aspects such as the life cycle assessment of buildings and the development of indicators for life-cycle costs are part of this strategy.

The Thematic Strategy on the Urban Environment was adopted on 11 January 2006. It strongly encourages Member States, regional and local authorities to develop programmes to promote sustainable construction. The document focuses not only on energy related aspects, such as increasing the renovation rate, but also on the labelling of building products and strategies for the prevention and recycling of waste.

3.2.2 Construction Products Directive 89/106/EEC[14] , its amendments (revision) and related activities

Under the scope of the Construction Products Directive (CPD) (in particular essential requirement no. 3 – "hygiene, health and the environment") methods for assessing the contents and emissions of dangerous substances in and from construction products are under development by CEN (CEN TC 351[15]). CEN TC 351 would become mandatory as it has been drafted within the framework of the CPD.

Linked to this activity under the CPD and the related energy efficiency of the production process, the Commission mandated CEN to develop methods for assessing construction products[16] and methods for assessing the environmental performance of buildings that links to the process of the implementation of the EPBD Directive (see above).

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[13] Based on the Communication from the Commission of 11 February 2004 "Towards a thematic strategy on the urban environment" [COM (2004) 60]. To download the COM (2004) 60, published in the Official Journal C 98 of 23.04.2004 visit http://europa.eu/scadplus/leg/en/lvb/l28152.htm.

[14] Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products.

[15] More information at: http://www.cen.eu/CENORM/Sectors/TechnicalCommitteesWorkshops/CENTechnicalCommittees/CENTechnicalCommittees.asp?param=510793&title=CEN%2FTC+351

[16] The technical committee TC 350 is working on the implementation. Further information can be obtained from the Website www.environdec.com.

The work of the Technical Committee (TC 350[17]) is producing a general framework document on the sustainability of construction works and the assessment of integrated building performance. The outcomes of the TC 350 are expected for 2009-2010.

Although public authorities tendering for construction products can not find limit values for the environmental performance of products in the TC 350 work and related CE marks for products, the future standardisation work will be useful as the standards will guarantee harmonised ways to verify compliance with certain requirements. Furthermore, these standards may allow the identification of the main environmental impacts to be considered when setting environmental requirements for buildings.

3.2.3 REACH regulation 1907/2006[18]

The new European Chemicals regulation (REACH) was adopted in December 2006. REACH stands for the Registration, Evaluation, Authorisation and Restriction of Chemicals. REACH Regulation (EC) No 1907/2006 and Directive 2006/121/EC amending Directive 67/548/EEC were published in the Official Journal on 30 December 2006.

REACH entered into force on 1 June 2007. Enterprises that manufacture or import more than one tonne of a chemical substance per year will be required to register it in a central database administered by the new EU Chemicals Agency. The Agency will provide IT tools and guidance and Member States will offer helpdesk assistance to the affected companies.

For construction products, improved transparency on the contents of chemicals is a clear asset to verify compliance concerning the use of dangerous substances in construction works.

3.3. Waste and water

3.3.1 Waste Framework Directive 2006/12/EC[19]

The Waste Framework Directive is aimed at setting requirements for the permitting and operation of waste disposal facilities, deals with disposal options for specific types of waste and controls the movement of waste within, into and out of the EU. It focuses on encouraging the prevention and reduction of waste and reducing its potential for harm through cleaner technologies, new disposal techniques and new, more environmentally benign products. Other

[17] More information at: http://www.cen.eu/CENORM/Sectors/TechnicalCommitteesWorkshops/CENTechnicalCommittees/CENTechnicalCommittees.asp?param=481830&title=CEN%2FTC+350

[18] Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

[19] Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste: http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=Directive&an_doc=2006&nu_doc=12

objectives have a clear influence on the efforts undertaken to foster sustainable construction in Europe:

- Encouraging waste recovery such as recycling, reuse, reclamation and energy recovery;
- Ensuring the above without endangering human health or harming any other part of the environment.

3.3.2 Water Framework Directive 2000/60/EC (WFD)[20]

The Water Framework Directive (WFD) objectives are to ensure the good quality of running water across Europe by 2015. The construction sector has a high indirect impact on running water schemes across Europe. Reduced water consumption and waste relating to construction works and products contribute significantly to the fulfilment of the aims and objectives of the WFD.

The installation of intelligent water-saving technologies in buildings as well as measures to re-use water combined with rainwater usage systems are measures to enhance the quality of European water resources by reducing the pressure on springs and surface waters, and reducing wastewater streams.

4 Ecolabels and other criteria sources

Ecolabels exist for a variety of construction materials and products. Even though contracting authorities cannot require purchased products to bear a specific ecolabel, the environmental criteria underlying an ecolabelling scheme can provide valuable assistance in developing environmental criteria and the labels themselves constitute easy ways of demonstrating compliance with those criteria.

Although no overall labelling system for environmental/sustainable construction exists, the LenSE project[21] aims at developing a methodology for the assessment of the sustainability performance of existing, new and renovated buildings that will allow for the future labelling of buildings, in accordance with the Energy Performance in Buildings Directive (EPBD).[22] In

[20] Directive 2000/60/EC establishing a framework for Community action in the field of water policy.

[21] The LenSE project developed case studies using the LenSE assessment methodology that are available at www.lensebuildings.com.

[22] An example: In Germany about 50 Environmental Product Declarations have been provided by the AUB (Arbeitsgemeinschaft Umweltverträgliches Bauprodukt e.V., Königswinter, Germany).

2008 the European Ecolabelling scheme started an Ad-hoc Working Group on a European Ecolabel for buildings.[23]

[23] For more information on the European Eco-label on buildings please visit the website http://ec.europa.eu/environment/ecolabel.

4.1. International and national ecolabels

The following analysis assesses and compares key eco-labelling schemes that may be relevant for addressing the most important environmental aspects identified in section 2.

Table 2. Examples of European and International ecolabels relevant for construction	
European Ecolabel	**http://ec.europa.eu/environment/ecolabel/index_en.htm** • Hard floor coverings • Indoor paints and varnishes* • Criteria for heat pumps * European Ecolabel criteria concerning *outdoor* Paints & Varnishes are currently under development (11/2007)
Nature Plus	**www.natureplus.org** • Building materials based on at least 85 mass percent renewable or mineral resources: • Insulation materials • Floor coverings (wood, linoleum) • Paints and varnishes • Mortar, adhesives, plasters • Roofing tiles • Wood based products and boards • Boards for dry building

Table 3. Examples of National Ecolabels relevant for construction	
Nordic swan	**www.svanen.nu** • Small houses • Adhesives • Floorings primarily made of renewable materials • Wall coverings/ windows • Solid biofuel boilers • Light sources • Chipboard, fibre board and gypsum board
German ecolabel: Blue Angel	**www.blauer-engel.de** • Low emission composite wood panels • Low emission wall paints • Low emission wood products and wood-based products • Low pollutant varnishes • Floor-covering adhesive • Building materials made of waste glass and waste paper • ... and many other construction materials and appliances

Austrian ecolabel	**www.umweltzeichen.at** • Hydraulic bonded bricks • Insulation materials based on fossil resources with hydrophobic properties • Insulation materials based on renewable resources • Resilient floor coverings • Textile floor coverings • Varnishes and glazes • Wood based products and boards • Wall paints
Hungarian ecolabel	**http://www.kornyezetbarat-termek.hu** • Rock-like building materials and elements (general criteria) • Porous concrete building materials • Lime-sand bricks • Bituminous road pavements and road surface coatings for maintenance • Fire extinguishing agents and equipment • Auxiliary criteria for polymer concrete building elements • Automatic forced draught burners for gaseous fuels **Other Central and Eastern European ecolabels include:** • Czech Ecolabel: http://www.ekoznacka.cz • Croatian Ecolabel: http://www.mzopu.hr • Polish Ecolabel (no homepage) • Slovakian Ecolabel: http://www.sazp.sk • Ukrainian Ecolabel: http://www.ecolabel.org.ua
IBO quality mark	**www.ibo.at/produktpruefung.htm** IBO – quality mark for several construction products
Dutch ecolabel: Milieukeur	**www.milieukeur.nl** • Paints • Linoleum • Concrete products • Rubber tiles

4.2. Wood product labels

The House of Commons Environmental Audit Committee (UK) report on sustainable timber provides a good overview of existing Ecolabel schemes for wood products addressing several quality issues of each scheme. It concludes that the following two schemes (FSC, PEFC) are of most use in green public procurement (House of Commons Environmental Audit Committee 2006).

Table 4. International Ecolabels relevant for construction	
Forest Stewardship Council (FSC)	www.fsc.org/en The Forest Stewardship Council (FSC) promotes environmentally appropriate, socially beneficial, and economically viable management of the world's forests. FSC certification is carried out by FSC accredited certification bodies. There are two types of FSC certificates available from certification bodies: Forest Management (FM) Certificate and Chain of Custody (COC) Certificate.
Programme for the Endorsement of Forest Certification schemes (PEFC)	www.pefc.org The PEFC Council (Programme for the Endorsement of Forest Certification schemes) is an independent, non-profit, non-governmental organisation, founded in 1999 which promotes sustainably managed forests through independent third party certification. The PEFC provides an assurance mechanism to purchasers of wood and paper products that they are promoting the sustainable management of forests.

4.3. International building assessment labels

Building assessment labels certify houses that have a high energy and environmental performance. They have been developed according to national and European legislation and standards, have existed since the early 90's and have been continuously updated.

Table 5. Examples of international Building assessment labels	
BREEAM Buildings	www.breeam.org BREEAM Buildings can be used to assess the environmental performance of any type of building (new and existing). Standard versions exist for common building types and less common building types can be assessed against tailored criteria under the bespoke BREEAM version. Buildings outside the UK can also be assessed using BREEAM International. Versions are updated regularly in line with UK Building Regulations and European environmental performance standards. Different

	building versions have been created since its launch to assess various building types, including offices, schools, retails, industrial and courts among others.
Passive House certificate	**www.passiv.de** The Passive House Institute is an independent body that evaluates and certifies buildings and building components against the passive house criteria for energy performance. The certificate demonstrates high energy performance and supports planners and architects in achieving the passive house specifications. It is based on relevant national and European calculation methods.
TQ-Tool	**www.argetq.at** The ARGE TQ-Tool supports the design, construction and planning of buildings. The tool is based on a comprehensive criteria set including resource efficiency, reducing environmental and health-related impacts, user comfort, long-life efficiency, security, quality, technical infrastructure and costs. The TG-certificate documents the overall energy and environmental performance of the building and is complementary to energy certificates (see EPBD process) and ongoing CEN standardisation work. The certificate is based on the TQ-assessment tools and gives a summary of the assessment results as well as relevant detailed data for the design and implementation process.

4.4. National building assessment labels

Table 6. Examples of national Building assessment labels	
Minergie (Switzerland)	**www.minergie.com/index_en.php** MINERGIE® is a sustainability brand for new and refurbished buildings. Comfort is at the heart of MINERGIE® – the comfort of the users living or working in the building. A wholesome level of comfort is made possible by high-grade building envelopes and the continuous renewal of air. Specific energy consumption is used as the main indicator to quantify the required building quality. In this way, a reliable assessment can be assured. Only the final energy consumed is relevant. If architects and engineers can achieve the standard, they have complete freedom both in their design and choice of materials and also in their choice of internal and external building structures.
Haute qualité environnementale – HQE (France)	**www.assohqe.org** The French national assessment and planning approach is the HQE (haute qualité environnementale) method. It aims to achieve a high environmental quality in the building sector, focussing on designing buildings that use less water and energy and require less maintenance.
klima:aktiv haus (Austria)	**http://www.klimaaktiv.at/article/archive/11911** The klima:aktiv house scheme assesses the overall energy and environmental performance of new buildings. The criteria are based on four categories such as “design and implementation”, “energy and maintenance”, “building materials and products” and “user comfort and room air quality”. The assessment methodology uses national standards and calculation methods. For the Austrian Government 50% of new buildings should achieve the klima-aktiv house standard by 2015 (see: http://www.klimaaktiv.at/article/articleview/53645/1/12033).

4.5. Passive houses

Passive houses aim to achieve a very high energy performance in buildings by using as much passively-generated heating, cooling and ventilation as possible and thereby reducing the energy consumption significantly compared to average buildings. Attaining the passive house standard is an ambitious target that nevertheless is already achievable for a wide range of

building types (including renovation). The following basic design principles based on the concept of the Trias Energetica[24] must be followed[25]:

- Reduce heat loss (e.g. insulation, cold bridges),
- Reduce electricity consumption (e.g. intelligent lighting systems),
- Utilise natural solar heat (e.g. window area sun orientation),
- Display and control energy consumption, and
- At the very end: select the energy source (e.g. solar panels, CHP, biomass boiler).

Research projects have been carried out addressing the topics of promotion and developing a common baseline for the performances of Passive Houses. The following information boxes introduce two major projects, namely the PEP (Promotion of European Passive Houses) and the CEPHEUS (Cost Efficient Passive Houses as European Standards).

PEP – Promotion of European Passive Houses

The 'Passiv House Concept' is a sound and relatively low-cost method to achieve significant energy savings in residential and other buildings. The PEP project, a consortium of European partners, supported by the European Commission, strives to spread the knowledge of this standard throughout the professional building community in Europe.

The PEP project provides services and information about practical solutions for Passiv House applications to specific target groups, most importantly municipalities, architects, energy designers, structural designers and building developers all over Europe. In this context the PEP introduces the Passiv House Concept in a very hands-on manner and provides guidance on how to integrate it in urban environments. An information package specifically designed for municipalities has been published on the PEP website. The package contains information on the benefits of passive house constructions, the master planning of low-energy neighbourhoods, as well as relevant European calculation and certification standards. Also, the PEP project has prepared two approaches to passive house certification in relation to national Energy Performance certification schemes and the European Energy performance of buildings Directive (EPBD).

A full report on the proposed scheme can be obtained at:
http://erg.ucd.ie/pep/pdf/Final%20Report_WP3.4_PassivHaus_Certification.pdf

PEP project website: http://www.europeanpassivehouses.org

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[24] The Trias Energetica is a simple and logical concept that helps to achieve energy savings, reduce our dependence on fossil fuels, and save the environment. The 3 elements of Trias Energetica are:
1. Reduce the demand for energy by avoiding waste and implementing energy-saving measures;
2. Use sustainable sources of energy instead of finite fossil fuels;
3. Produce and use fossil energy as efficiently as possible.

For more information please visit the website: http://triasenergetica.com.

[25] See also Trecodome, Chiel Boonstra 2007 at Local Renewables Conference Freiburg, http://www.local-renewables2007.org/index.php?id=5072.

CEPHEUS – Cost Efficient Passive Houses as European Standards

Under the umbrella of CEPHEUS a total of almost 250 residential buildings were constructed to the Passivhaus standard between 1998 and 2000 in five European countries, notably Austria, Germany, France, Sweden and Switzerland. The project proved the practicability of the concept through in-use measurements during the winter of 2000-2001. It also spurred the commercial development of the necessary technologies, in particular in Germany, Austria and Switzerland.

CEPHEUS successfully demonstrated the huge potential for energy efficiency improvements in Europe. Not only has CEPHEUS tested new technologies, but it has also generated knowledge on the efficiency of different technical measures, such as construction without thermal bridges and the use of highly efficient heat recovery mechanisms. The results of CEPHEUS have been extensively documented.

A publication list can be found at:
http://www.energieinstitut.at/HP/Upload/Dateien/CEPHEUS_Projektdokumentationen.pdf.

Official CEPHEUS project websites: http://www.cepheus.de/eng **and** http://www.cepheus.at

5 Verification issues

The above mentioned ecolabels mainly focus on building materials and can be easily used to verify the compliance with green criteria in tender documents. This section discusses various verification possibilities for each stage of the procurement process.

5.1. Preliminary design/ architects' competition

Each Member State has transposed into national legislation the European Public Procurement Directives[26], which lay down the rules that need to be followed when carrying out public procurement in order to ensure open, transparent and competitive procedures and avoid discrimination. For the preliminary design and architects' competition, the European Parliament resolution on the follow-up to the report on Competition in Professional Services (2006/2137(INI)) is of relevance[27]. This highlights the possibility of inviting experts in certain fields (such as those who possess strong environmental construction knowledge) to participate in a jury to award the contract[28].

It is also important to specify suitable verification methods in order to give clear guidance to the jury for carrying out the evaluation procedure. This may include proof of the capacity to construct/renovate environmental buildings as well as proof of compliance with required calculation methods.

5.2. Tendering of the construction works

Once the design of the building is finalised a separate call for tender may be published for the actual construction works. Within these tender documents there are a variety of possibilities for including green criteria based on comparable and credible environmental information (e.g. construction products or waste management on the construction site).

There are a number of alternative ways to verify compliance with environmental criteria. One approach is to make use of existing ecolabels, both for the setting of criteria and as one possible means of proving compliance with the criteria (as long as other forms of proof are also accepted).

You may only refer to ecolabels which themselves meet a number of requirements:

- The requirements for the label are based on scientific information.

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[26] Directive 2004/17/EC and Directive 2004/18/EC.

[27] See: www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P6-TA-2006-0418+0+DOC+PDF+V0//EN, 10 October 2007.

[28] IFZ 2001: Austrian Criteria Catalogue "Check it!" Module 6 structural engineering. See: www.ifz.tugraz.at/oekoeinkauf/index_en.php/filemanager/download/141/modul6_eng%5B1%5D.pdf, 4.July 2007.

- The ecolabels are adopted with the participation of all stakeholders, such as government bodies, consumers, manufacturers, distributors and environmental organisations.
- They are accessible to all interested parties.

The International Standards Organisation has provided a set of criteria for defining different types of ecolabelling scheme – ISO 14024[29]. These key criteria include:

- the reliability of information (i.e. are there adequate procedures in place for validation and compliance monitoring?);
- the transparency of the administrative procedures of the scheme;
- the existence of a formal process of consultation with stakeholders.

According to ISO classification, there are three types of eco-labelling schemes, outlined below.

Type I labels

This group is perhaps the most useful for contracting authorities. These Type I labels label products based on life-cycle environmental impact, the criteria are set by an independent body and monitored through a certification or auditing process. Transparency and credibility is ensured by the third-party certification. Most of the existing official national and multi-national eco-label schemes in Europe belong to this category.

Type II labels

Informative environmental self-declaration claims. These are environmental claims made about goods by their manufacturers, importers or distributors. They are not independently verified, do not use pre-determined and accepted criteria for reference, and are arguably the least informative of the three types of environmental labels.

Type III labels

These labels don't make any judgement on the environmental quality of the product, but simply inform the consumer of its environmental impacts. A "score" is given for the product for certain environmental impacts, based on LCA methods. This environmental score is compiled by a third party certification agency based on a number of performance indicators (EPI), e.g., energy use, air emissions, water emissions, etc. This provides contracting authorities with an opportunity to compare the scores of different products and purchase those with the best score, but doesn't provide any guidance on what good performance is.[30]

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[29] International Standard Organization, ISO 14024: Environmental Labels & Declarations - Type 1 environmental labelling - Guiding principles and procedures that cover ecological trademarks and ecologos.

[30] Information on EPDs, together with a searchable database of EPDs and product-specific requirements, is available at the website of the Global Type III Environmental Product Declarations Network (GEDNet): www.environdec.com/gednet.

Environmental Product Declarations (EPDs) that have been issued by EPD certification bodies[31] are a form of Type III label. They provide "objective, comparable and credible information about the environmental performance of products and services as they are based on internationally accepted and valid calculation methods and being non-selective, neutral and open to all interested parties" (EPD 2007).[32]

Both Type I and Type III (EPDs) Ecolabels can be useful in relation to the procurement of construction works. Both provide a potential source of independently verified information on the environmental characteristics of products that may be used to prove compliance with criteria set in tenders. They also indicate which environmental issues are of most significance for different construction materials. However, unlike Type I ecolabels, EPDs do not indicate minimum performance standards for the different environmental parameters. As such they cannot be used directly in the setting of specifications, and can be of more use when assessing relative performance at the award stage of the tendering procedure.

The outcomes of the TC 350 work which is aimed at establishing a general framework document on the sustainability of construction works and the assessment of integrated buildings performance and which should become available by 2010, may simplify verification processes in the future.

[31] See: www.environdec.com/gednet, 11 October 2007

[32] See: www.environdec.com/gednet, 4 July 2007

6 Life-cycle costing considerations

According to the UK Office of Government Commerce[33] "The project procurement lifecycle considers the whole life of a project from inception through to design and construction, operation and finally re-use or disposal. It is a process which identifies where and when key decisions are to be made and determines the critical outputs that should be delivered at each stage of the project." It encompasses all phases such as project development, the preliminary design/architects' competition, submission planning, implementation planning, and the construction work and implementation of building services (see Table 8).

Life cycle costing (LCC) is central to the current international drive to achieve better value for money from the buildings and constructed assets procured and used. Governments are increasingly focusing on achieving better value from constructed assets and with this has come a recognition that better value does not mean lowest capital cost alone. Instead, the focus has shifted to the evaluation of all the costs and impacts of operating constructed assets over their life cycle, and to minimising both the life cycle costs and the environmental impact.

Life cycle costing calculations in the construction sector have been employed for many years[34]. A recently published study on the development of a common methodology of LCC in construction[35] looked at how to stimulate the use of LCC in the public procurement of construction works and products, for instance in the MEAT (Most Economically Advantageous Tender) selection. The report proposes the use of life cycle costs in the award process of the tender by expanding the quality criteria (Davis Langdon Management Consulting 2007, p. 15).

In general, over the life span of a building, running and maintenance costs will exceed the initial costs of construction by far. Running costs may constitute up to 85% of the total costs.

On the same scale, the design costs are likely to be 0.3–0.5% of the lifetime costs, and yet it is through the design process that the largest impact can be made on the 85% figure. Thus, more action should be undertaken to make life cycle costing a common practice on which decisions relating to construction work are based. This should allow an assessment expressed in monetary value taking into account all significant and relevant costs from inception to disposal, including, for example, operation, energy, maintenance, cleaning, but also in-house resources, the economical life-span of each part of the facility and consultancy fees.

[33] See: www.ogc.gov.uk/documents/CP0016AEGuide11.pdf

[34] See: http://ec.europa.eu/enterprise/construction/suscon/tgs/tg4/lcalccintro_en.htm

[35] Davis Langdon Management Consulting 2007: Towards a common European methodology for Life Cycle Costing (LCC) – Guidance Document. See: http://ec.europa.eu/enterprise/construction/compet/life_cycle_costing/index_life_cycle_en.htm

6.1. Life Cycle Costing (LCC) and Life Cycle Assessment (LCA) in construction

Whilst LCC and LCA[36] are two distinct and different processes that have developed and are practised as separate disciplines in the construction industry, there are many parallels and interrelationships between the two. For example, both:

- Are concerned with assessing the long term impacts of decisions
- Require analysis of an often diverse range of inputs
- Use similar data on inputs of materials and energy
- Take into account operation and maintenance
- Consider opportunities for recycling vs. disposal
- Provide a basis for rational decision making, particularly in appraising options.

However, the two disciplines differ as regards the basis of the resulting decisions:

- LCC combines all relevant costs associated with an asset into outputs expressed in financial terms as a basis for making investment decisions
- LCA enables decisions to be made on the basis of potential environmental impacts by scoring and rating environmental criteria. Whilst costs can be firmly attributed to some environmental factors there is currently no widely agreed methodology for others and some cannot be quantified at all in cost terms.

As a result, LCC and LCA do not necessarily produce a common output. Nevertheless, environmental impact assessment has a key place in overall long-term decision-making and consideration should be given to how to integrate it with the LCC process at the earliest stage.

The use and sequence of LCC and LCA will depend on the priorities of the decision-maker. The range of approaches might cover, for example:

- Use of LCC and LCA as two of the criteria in the evaluation of a single investment option (such as the decision to construct an asset), where other evaluation criteria might include functionality, aesthetics, speed of construction, future investment returns etc.
- Use of LCC and LCA as two of the criteria in the evaluation of a number of alternative investment options (either entire constructed assets or specific components, materials or assemblies within them)
- Use of LCC to provide a financial/economic evaluation of those sustainability impacts that have a widely agreed and readily calculated monetary value
- Use of LCC to provide a financial/economic evaluation of alternative options identified in an LCA assessment
- Use of LCA as a means of identifying alternative options with a good environmental performance and then carrying out a LCC analysis on those options only

[36] LCA in this background report is referring to the ISO 14040 standard family, including ISO 14044.

- Use of LCC to select cost-effective options, then making a final decision in the light of a process of LCA carried out on those options only.

Thus it can be seen that LCC and LCA can either be used alongside each other in a broader evaluation process, or either process can provide input for the other.

6.2. LCA tools for construction

A variety of European and national LCA-tools exist.

It is of special importance that the LCA tools have a transparent approach, including weighting factors to enable easily comparable outputs for the contracting authority.

Table 6. LCA tools for construction

EC Joint Research Centre (JRC) database European	The LCA Resources Directory of the JRC maintains a directory that contains metadata information about life cycle thinking related services, tools and databases and the corresponding developers and vendors. The LCA Resources Directory will be updated and extended every 3 to 6 months. http://lca.jrc.ec.europa.eu/lcainfohub/index.vm
BEAT Denmark	A PC tool for performing an environmental assessment of products, building elements and buildings, consisting of a database containing data for energy sources, means of transport, products, building elements and buildings; a user interface which allows the user to add, edit and delete data in the database and an inventory tool, which allows the user to perform calculations for products, building elements and buildings. www.dbur.dk
Build it Germany	A Design for Environment Software for the assessment of buildings with an integrated calculation of U-values, mass and heat insulation, based on LCA.
EcoEffect Sweden	This is a method to calculate and assess environmental loads caused by a building during its lifetime. It is based on LCA. www.ecoeffect.tk
Eco-Install Netherlands	A software tool that calculates the integral environmental effect of an installation within its civil construction. The environmental analysis is based on LCA methodology. The result can be used for conceptual choices at the design stage.
EcoPro Germany	EcoPro is a Life Cycle Analysis (LCA) tool. It calculates the impacts of energy and material usage and flows on the environment. It allows the graphical modelling of the life cycles of products. The life cycle systems can contain as many subsystems as required - a top-down approach is possible. http://cic.vtt.fi/eco/e_ecopro.htm
Eco-proP Finland	EcoProP sets performance-based requirements for building construction projects. The application can be used at the project-planning phase but later users can also add targets and goals. EcoProP is based on a generic and holistic building property.

	http://cic.vtt.fi/eco/e_ecopro.htm
Eco-Quantum Greencalq Netherlands	These programmes make it possible to express the environmental performance of buildings in one or more figures, calculated on the basis of an LCA approach. In the design phase, the computer program calculates the sustainability performance of a building. www.sbr.nl/default.aspx?ctid=2322
EcoSoft Switzerland, Austria, Germany	ECOSOFT is a software-tool to calculate the ecological performance of the construction of a building. It uses data from Switzerland, Austria and Germany. It results in classification factors such as greenhouse gas potential or primary energy consumption (renewable and non-renewable). www.ibo.at
Ecotech Germany, Austria	Software tool for the physical, technical, ecological and economic calculation of building performance with an interface to CAD programmes. LCA data is integrated for the ecological assessment. www.ecotech.cc
OI3-Index Austria	OI3-Index: Software tool used for social housing subsidies in Austria, dealing with primary non-renewable energy, GWP-, and AP- potential of building materials with an interface to common programmes for building physics. It is part of the calculation of the energy consumption for heating. www.oebox.at
Envest UK	Envest is a software tool that simplifies the otherwise very complex process of designing environmentally friendly buildings. Designers input their building designs (height, number of storeys, window area, etc) and choices of elements (external wall, roof covering, etc). Envest identifies those elements with the most influence on the building's environmental impact, and shows the effects of selecting different materials. It also predicts the environmental impact of various strategies for heating, cooling and operating a building. www.bre.co.uk/service.jsp?id=52
Equer France	Equer is a simulation tool for predicting the environmental consequences of design choices over the future life cycle of a building. The life cycle assessment methodology has been chosen to allow the assessment of environmental impacts during the different phases (production of materials, construction, utilisation, renovation and demolition) and it is linked to a thermal simulation tool. www.uni-weimar.de/scc/PRO/TOOLS/fr-equer.html
GEQ Austria	GEQ – Gebäude.Energie.Qualität is designed for calculating energy building certificates. It also possible to use it to calculate the following classification factors: greenhouse gas potential, primary energy consumption and acidification potential. www.zet.at
LEGEP Germany	This is a design tool within a CAD system, with integrated quantity surveying, energy calculation and LCA. www.legep.de
OGIP	OGIP is an instrument for realising an architecturally and environmentally

Switzerland	optimised project within given costs. www.uni-weimar.de/scc/PRO/TOOLS/ch-ogip.html
TEAM International	TEAM carries out an environmental evaluation of a building, based on LCA. www.ecobilan.com
More information The University of Weimar carried out a survey on different tools and instruments related to buildings. Please see: www.uni-weimar.de/scc/PRO/TOOLS/inter.html	

7 Developing environmental criteria within the European framework

The aim of developing simple, universally applicable environmental criteria for construction that any European public authority could simply insert into tendering documents is hard to achieve. This is because of the given complexity of the "product group", the differing climatic conditions and the differing national legislative frameworks, although the EPBD approach (see section 3.1.1) has achieved some harmonisation.

The criteria options presented in the accompanying Product Sheet are an adaptable set of recommendations and guidelines, addressing the most common environmental issues that are applicable across the EU-27. Nevertheless – depending on the contracting authority and the country where these criteria will be implemented – some hurdles will need to be addressed properly.

7.1. Different national calculation methods and standards for energy

As noted above, the EPBD states that all Member States must put in place methodologies for calculating the energy performance of all new buildings and major renovation works, and to set minimum energy performance standards. As shown in the released country reports (EPBD country reports 2007), Member States in the majority of cases use their own minimum performance requirements and calculation methods.

The Commission is currently considering proposing EU minimum performance requirements (kWh/m²/a) for new and renovated buildings (taking into account different European climate zones) however those are not likely to be established before 2009. Until then contracting authorities have to rely on existing (national) standards and guidelines for sustainable construction[37].

7.2. Different climatic zones

It goes without saying that the different climatic zones in Europe have a substantial impact on the energy demands of a building in terms of heating and cooling, and the potential use of local renewable energy sources in the building. As such no universal minimum standards can be set.

[37] Guidelines for sustainable construction exist in many Members States. One example is the Guideline for Sustainable Building of the German Federal Office for Building and Regional Planing from 2001 that addresses, amongst other topics, the question of calculating the energy demand and use for public buildings in Germany (Federal Office for Building and Regional Planing (BBR) 2001).

7.3. Local/national differences in availability and sustainability of materials used

It is a major challenge to define what constitutes a more "environmental construction material or product". In the future, the use of EPDs (Environmental Product Declarations), should provide the contracting authority with the possibility of comparing the environmental impacts of different materials used, however this approach is not yet very advanced.[38] A valid current alternative is to refer to the underlying criteria of ecolabelling schemes and recognise the relevant label as a possible (but non-exclusive) proof of compliance with those criteria. However, the most important construction materials are not yet covered by many ecolabels, and the availability of products complying with these criteria may vary significantly between countries.

Various Member States have set up guidelines on sustainable construction. An overview of the existing resources as well as the relevant legislation regarding the energy performance of buildings can be found in Annex I (see Table 13).

In order to comply with the latest national legislation regarding the minimum energy performance requirements, contracting authorities will need to consult the national body responsible for the implementation of the EPBD. Table 12 in Annex I lists the participants designated by the Member States and participating countries for the Concerted Action EPBD II, a body that fosters the implementation of the EPBD.

[38] The Bundesamt für Bauwesen und Raumordnung (BBR) announced that from end of 2007 on EPD and LCA data will be available for over 200 product groups. In 2008 the BBR will develop guidelines for contracting authorities to include these data in tenders, encouraging producers and suppliers in the construction sector to provide offers based on EPDs and LCAs. Further information is available at www.bmvbs.de and www.positivlisten.de.

8 Conclusions

This section highlights the main aspects that have influenced the recommended environmental criteria for the procurement of construction works (including products) presented in the Product Sheet.

- The level of ambition regarding the overall environmental performance, including energy performance, strongly depends on the architects' design. Therefore, it is important to focus on the integration of environmental requirements into the architects' competition procedure for construction works.
- Existing European legislation may, in the future, move towards the development of minimum environmental performance criteria, but no minimum values exist yet at the European level. Therefore existing national performance values have to be taken into account.
- For construction products, ecolabels and Environmental Product Declarations (EPD) are useful verification tools for both bidders and contracting authorities.
- Life Cycle Costing (LCC) and Life Cycle Assessment (LCA) are highly useful instruments for the procurement of construction works, but have to be used carefully in tendering procedures because of their complexity, often requiring expert consultation.
- GPP of construction works should be based on an integrated, systemic approach, rather than simply focusing on individual components.

9 Introduction to environmental criteria in construction

This section gives an overview of environmental criteria that can be included at the different stages of the procurement process in all EU-27 countries within the discussed scope and legislative framework (see sections 2 and 4). Depending on the existing climatic conditions and the habits and work procedures in the construction sector, the proposed environmental criteria may need to be given more or less importance. Therefore, no weighting of the criteria is proposed here.

9.1. Procurement of construction works and products

9.1.1 The stages of the procurement process

In terms of procurement, the construction sector is extremely complex both in *procedural* terms, as there is usually competitive tendering for the architectural design and the construction works and in terms of the *variety of materials and services procured*.[39]

To best determine how environmental concerns can be taken into account it is important to be aware of the different stages of the construction process, and of the various parameters that can be determined at these different stages (see Table 7). The design phase has a very strong influence on the later installation of construction services.[40]

[39] Construction works also includes the installation of heating, ventilation, air conditioning and refrigeration (HVACR) as well as energy supply, lighting and water systems. A specialist company may be contracted to design and install (and sometimes maintain) these services for the building – often called "building services".

[40] As one example the design of the light flow in the building has a strong impact on the later energy demand for the lighting of the building. Natural light corridors and the selection of north-south (resp. light/shadow) orientation are good practice examples of sustainable construction efforts related to lighting.

Table 7. Stages of the construction process and potential impact on the environmental performance of the building	
Stage of the construction process	**Aspects which may impact on the environmental performance of the building**
Building design	• Net energy demand (for space heating, cooling, ventilation) • Selected materials (wood, glass, metal etc) • Intelligent transport systems • Waste generation • Noise control • Lighting services needed • Potential for using localised RES
Building construction	• Percentage of sustainable building materials • Recycability of materials • Reduction of dangerous substances • Energy demand for the construction plot
Building services installation	• Final energy demand • Localised RES • Wastewater generation

The above mentioned tendering stages have been identified as the most common stages of procurement in the European building sector (DEEP 2007). However, this scheme may vary, both in terms of the exact stages gone through and the number of competitive tendering rounds. If there is only one tendering round including all stages, all approaches and criteria should be addressed in this tendering stage.[41]

Table 8 hereunder outlines in further detail a typical procurement process for construction works. Procedures may vary in terms of the number of stages gone through: contract for architectural/design services, contract for construction works, contract for energy performance services including the installation/retrofitting of specific technical installations (e.g. heating system). Thus the opportunities for inserting demands into tendering procedures will also differ from case to case.

[41] The stages in principle also consider the specific situation of "Design, Build and Operate" schemes and Public Private Partnerships.

Table 8. Typical processes for construction work in a European public authority		
Phase 1	**Project development**	This stage is probably one of the most important phases in the building process. All project stages are based on specifications formulated in this stage, so here we can find the **highest potential for environmental building design**. The public authority has to develop specifications for: • Choice of site, orientation • Life cycle costs • Size (e.g. room allocation plans) • Design – construction (e.g. light-weight or solid construction) • Materials to be used • Standards for the energy performance of the building if possible (e.g. benchmarks for heating and cooling, renewable energy sources for the building services)
Phase 2	**Preliminary design / architects' competition**	• Architects' competition – competitive tendering to select the architect to carry out design work[42] • Revised preliminary design, including preliminary selection of superstructure, building materials, constructions
Phase 3	**Submission planning**	Final design for submission to building authority for planning permission (determination of superstructure, building materials, constructions)
Phase 4	**Implementation planning**	Final selection of superstructure, building materials, constructions, systems for building services as the basis for tendering for the construction work.
Phase 5	**Construction work and implementation of building services**	Selection of construction firm through competitive tendering to carry out the construction work according to the implementation plan. This should include clear quality assurance measures for monitoring energy and ecological performance. A contracting authority may opt for a separate procurement procedure for the building services as technical building services are becoming increasingly complex, account for one-third of the overall construction costs, and greatly influence the life cycle costs of a building.

Competitive tendering, if applied carefully, can have a highly positive influence on achieving high environmental performance standards in construction projects. It is also very important

[42] Competitive tendering may not always be carried out to select the architect, this may well depend on the size of the project.

that environmental parameters are addressed at the beginning of the process, in the design phase.

9.2. Different building types – adequate solutions

This Background Report is valid for any construction work carried out in the Member States. Different building types that public authorities procure include school buildings, hospitals, office buildings, function rooms (e.g. theatres) and university buildings. For each building type a different approach is necessary in view of maximising the environmental performance of the building. This means addressing aspects differently regarding e.g. the flexibility of the rooms, different use times in the sections of the building (e.g. classrooms, the sports hall of a school building), air exchange (air quality), heat and energy demand, and lighting.

A good architectural design already addresses these needs both in the case of new or renovated buildings.

9.3. Construction supply chain

The organisation of the construction supply chain has a proven impact on the quality of construction works (and hence on life cycle costs), on waste production and transport logistics. A number of Member States (Finland, The Netherlands, United Kingdom) therefore promote partnering models (supply teams) in which the most important supply chain members (architects, consultants, main contractor, specialist engineering contractor) co-operate from the very beginning of a project. A public procurement approach aimed at achieving the purchase of environmental buildings can benefit from a partnering model approach and the contracting authority should welcome such approaches.

9.4. Aspects to consider when including environmental criteria

For each stage of the construction process, the contracting authority has several possibilities for including environmental criteria into the tender documents. The following table indicates examples of environmental criteria for the main sections of a tender document.

Table 9. Including green criteria in different sections of the tender

Section of the tender documents	"Green" examples
Subject matter	• "Construction works for a primary school building meeting the passive-house standard" • "Architects' competition for the design of an office building meeting environmental construction criteria"
Technical specifications	• "The primary energy demand of the building should be at least 10% [*percentage depending on the level of ambition already set in the legislative framework*] lower than the required minimum standard for new buildings based on the standards of [*include national standard, e.g. for Germany EnEV 2004*]"
Selection criteria	• "The technical capability of the bidder for building a bridge in a protected area must be demonstrated, for example by having a certified Environmental Management System (EMS) for such projects"
Award criteria	• "Additional points will be awarded for the percentage of final energy demand provided by localised renewable energy sources [*include acceptable RES*], above the minimum standard set in the technical specifications. [*Following: specification of the assessment scheme (e.g. bonus system*]"
Contract performance clauses	• "For the avoidance, use and disposal of waste on the construction site the contracted company must fulfil the obligations of the provided instructions on recycling facilities/ possibilities and waste treatment."

10 Recommended criteria options

Important note:	**It is strongly recommended to have the CONSTRUCTION PRODUCT SHEET at hand when reading this section.**

The following sections provide a series of guidelines including alternative approaches that may be used. The contracting authority wishing to use these guidelines will need to identify which alternative is most appropriate. The guidelines principally apply to the energy performance of buildings and the use of environmental construction materials and products and can be used for the construction of new buildings as well as for renovation works. The concrete criteria for use in public tendering for construction works and services can be found in the Product Sheet for Construction.

The information is given in two sections – Core criteria (quick wins) and Comprehensive criteria. Specific Implementation Notes on how the criteria should be applied are included in the Product Sheet for Construction.

10.1. Core environmental criteria (quick wins)

The Core criteria are designed for use by any European public authority. They address the most significant environmental impacts, and are designed for use with minimum additional verification efforts or cost increases.

It should be possible for contracting authorities to apply the Core criteria without significant expert consultation. This may however depend to some extent on the national legislative framework and the extent to which this framework can be useful for the writer of the call for tenders in specifying standards and calculation methods.

10.1.1 Subject matter

Defining the subject matter in a precise way is important for reasons of transparency towards bidders.

The subject matter may include environmental criteria such as:

- Specific terms related to environmental construction, e.g. ‘eco-design’, ‘low energy consumption’, ‘passive house standard’, ‘environmentally-friendly construction materials’
- User aspects, e.g. ‘intelligent energy systems’, ‘healthy living conditions’’

10.1.2 Selection criteria

Ensuring that the architect employed to design the building is experienced in environmental construction techniques is just as important as setting appropriate environmental technical specifications. It is therefore highly recommended to include environmental technical selection criteria (e.g. requiring experience with environmental construction) at the stage of the architects’ design competition as well as to ensure the environmental technical capacity of

the bidding construction companies. Furthermore, there are also specific exclusion criteria, which apply to the situation of the construction companies and the construction services companies: if the national laws of a Member State include provisions on environmental law, the violation of such laws (and a final decision in this sense by a court) would consitute grave professional misconduct and may lead to the possible exclusion of bidders who have been convicted in this sense (Articles 53 and 54 of Directive 2004/17/EC and Article 45 of Directive 2004/18/EC).

For the Core criteria the indicative list shows the main areas of experience required. A more comprehensive list can be found in the Comprehensive criteria section.

10.1.3 Specifications/award criteria – Energy consumption[43]

The ideal approach for ensuring a high standard of energy performance in new constructions and major renovation works is to set a specific minimum standard that must be achieved when preparing the initial technical specification of the building. Standards for any of these options should be based on existing national/regional minimum standards and calculation methods. Problems may occur when standards are not yet available in a given country, or if the set standards are not sufficiently ambitious. It is advisable to demand a higher energy performance than that set in respective national/regional legislation and/or available guidelines.

In order to allow contracting authorities to establish effective environmental criteria for the energy performance of buildings, this document contains supporting information such as:

- A list of national contacts for the implementation of the EPBD (see Annex I).
- A list of national legislation and guidance documents available on maximum thresholds for the net (primary) energy consumption of new/renovated buildings and related calculation methods (see Annex I).
- A list of relevant CEN standards for assessing the energy performance of buildings (see Annex II).

Other requirements which may improve energy performance include, for instance, a requirement to carry out appropriate quality checks throughout the construction works (e.g. "blower door tests", which test the air-tightness of the construction[44]). Such requirements can significantly determine whether the final energy performance meets the initial design.

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[43] There are three main ways to specify energy consumption, depending on the definition of the system boundaries:

- **Net energy**: Energy that is available to consumers for use in appliances and systems. Calculation considers only the building properties and not those of the heating/cooling system and results in the net energy use. To perform the calculation of net energy, data for indoor climate requirements, internal heat gains, building properties and outdoor climatic conditions are needed.
- **Final energy**: Energy consumption measured at the final use level. For a building, energy inflow measured at the gate of the building.
- **Primary energy**: Energy consumption measured at the natural resource level/primary energy content.

[44] Adequate air-tightness is not only a prerequisite for faultless building physics, but is also very important for the energy performance of a building. Air change rates have to be adapted to the energy standard (e.g.

Monitoring the actual energy consumption of the building after construction is also critical. No matter how efficient a building is in design, the actual energy consumption is of course highly dependent on the behaviour of the building users. Furthermore, if energy consumption is effectively monitored it is much easier to identify areas for improvement. Ensuring regular book-keeping of energy consumption, the installation of an energy display panel clearly visible to building users, and appropriate training for the building manager on energy efficiency aspects are all effective methods for influencing user behaviour.

10.1.4 Specifications/award criteria – Construction materials and products improving the environmental performance of a building

Whilst the energy performance of a building during the use phase remains the most significant aspect in environmental terms, the choice of materials used in construction has a substantial influence on its environmental impact. The primary energy content of the materials themselves (resulting from extraction, processing, transportation and disposal), the use of toxic or dangerous substances and the consumption of non-renewable resources contribute to the main environmental impacts.

The best choice for a construction material or product depends on many parameters. This includes the product's environmental, social and economic performance, the application technique, its specific use in the building, the exposure, its maintenance impacts and costs and the building's estimated service life.

Some independent (Type I) ecolabels label building products. Using ecolabel criteria can be seen as a first step towards improving the environmental profile of the materials used. Where a contracting authority has good knowledge of the market availability and relative price of ecolabel-compliant products it may be possible to use the ecolabel criteria as minimum specifications. In other cases it may be more appropriate to use ecolabel criteria in the award stage.

It is also possible to exclude the use of certain substances. A requirement or preference to use less environmentally dangerous materials and products should accompany this. In this case an environmental construction material or product is taken to mean one that complies with the criteria underlying any Type I ecolabel meeting ISO standard 14024 or possessing an Environmental Product Declaration (EPD).

10.1.5 Contract performance clauses

Contract clauses can be used to include environmental considerations which need to be respected during the performance stage. They need to be set out clearly in the call for tenders

passive house standard n50 < 0,6 h-1) and to the type of ventilation system (e.g. with or without heat recovery). For quality assurance, a blower door test following EN 13829 is essential. Therefore requiring a blower door test is very important. "n50" means the amount of leaking air in comparison to the volume of the building measured with a 50 Pa pressure difference between the indoor building volume (or parts of it) and the outside. For example n50 = 1 h-1 means, that the measured air volume of the building changes once per hour at a pressure difference of 50 Pa. For passive houses n50 values under 0.6 h-1 are essential for the operating of the heat recovery system.

to make tenderers aware of all obligations. Contract performance clauses are mandatory and contracting authorities have a broad range of possibilities to include environmental aspects here.

For the Core criteria these relate to the transport and recycling of building materials and waste reduction and management during the construction works.

10.2. Comprehensive environmental criteria

The Comprehensive criteria are intended for use by authorities that wish to purchase the best option available on the market, and may require additional administrative effort or a slight cost increase as compared to other products fulfilling the same function.

For construction works, the proposed options are relatively complex and likely call for considerable expertise in environmental construction (in-house or outsourced). Given the substantial difference in terms of the life-cycle cost of a building that can be achieved through energy and water efficient construction, it is certainly worth investing in external expertise to assist in guiding the construction process and in evaluating proposals.

Different options are presented for the criteria in the Product Sheet for Construction. It is not intended that these should all be applied together, but rather that a specific option is selected as the most appropriate for the construction work in question.

10.2.1 Subject matter

For the comprehensive approach it is recommended to make the description of the subject matter as detailed as possible and refer to as many environmental terms which relate to the detailed environmental technical specifications and/or award criteria as possible (see 10.1.1).

10.2.2 Selection criteria

The Comprehensive criteria list expands on that used in the Core criteria. The indicative list shows the main areas of experience required.

10.2.3 Specifications/award criteria – Energy consumption and Renewable Energy Sources

In addition to the proposed core criteria (see 10.1.3), the tender documents can address specific issues that contribute to even more energy efficient buildings. As these criteria need quite some expertise in the topic they are included in the more comprehensive criteria section.

Three areas in particular are addressed below:

- The Passive House solution
- The use of localised RES
- The use of innovative energy efficient technologies

Passive Houses

The 'Passive House Concept' is a sound and relatively low-cost method to achieve significant energy savings in residential and other buildings. It is an ambitious concept which nevertheless is already achievable for a wide range of building types (including renovation work). The following basic design principles must be followed:

- Reduce heat loss (e.g. insulation),
- Reduce electricity consumption (e.g. intelligent lighting systems),
- Utilise natural solar heat (e.g. window area sun orientation),
- Display and control energy consumption, and
- At the very end: select the energy source (e.g. solar panels, CHP, biomass boiler) (comp. Trecodome, Chiel Boonstra 2007 at Local Renewables Conference Freiburg).

It is a good option to include the Passive House specifications as a minimum requirement in the construction project. Several similar criteria schemes have been developed across Europe (see the following table).

Table 10. Example Passive House information sources in Europe

Name	Country	Link
Passiv Haus Institute Standard	Germany	www.passiv.de, http://www.ig-passivhaus.de
MINERGIE-P	Switzerland	www.minergie.ch/index.php?standards-6
PassivHausUK	UK	www.passivhaus.org.uk/index.jsp?id=669
CEPHEUS project	EU	www.cepheus.de/eng
European Passive Houses	EU	www.europeanpassivehouses.org

Use of localised RES

If the Passive House standard is not applied as a minimum requirement, there are other approaches through which to ensure that a low energy-consuming building is constructed. The first of these focuses on using Localised Renewable Energy Sources (l-RES) within a building (i.e. included in the building itself, such as solar panels, biomass boilers etc.). Again the most effective approach is to demand a minimum percentage of RES of the primary, final or net energy consumption of the building (for heating, cooling, ventilation, domestic hot water, and electricity), however it is also possible to include award criteria to encourage the submission of proposals based on the use of localised RES.

Contracting authorities can foster the use of localised RES through tendering. It contributes to the development of innovative emerging technologies. Nevertheless, the description should not be too technically prescriptive thus allowing bidders to propose flexible solutions.

Innovative energy efficient technologies

Alongside demanding a certain percentage of l-RES in order to foster innovative solutions, the tender documents can include environmental criteria for specific applications which

impact on the overall energy performance. This could cover energy efficient lighting, heating, cooling and ventilation systems/technologies in the building.

As an example, the tendering process for the new office building of the German Federal Environmental Agency (UBA) in Dessau, starting in 1997, included performance criteria for the yearly heat energy consumption < 30 kWh/(m²·a) in the technical specifications of the building. This value was 50% lower than required under existing legislation (Legislation for the protection against loss of heat [Wärmeschutzverordnung 95]).

For the architects' competition, participating architects were asked to develop concepts to include innovative technologies that increase the visibility of energy saving technologies. The building now works with several linked applications such as Earth Heat Exchanger and heat recovery systems.

10.2.4 Specifications/award criteria – Environmental construction materials and products

Besides the mentioned core criteria in section 10.1.4 it is important to address the environmental performance of the building materials used for the construction.

This section provides detailed environmental criteria for the most common building elements and the most common related building material groups such as products made of wood, iron, plastic and concrete. The approach does not claim to be complete, and seeks to highlight that contracting authorities must justify why they prefer one construction material type to another, in the light of the non-discrimination principles underlying the European Public Procurement Directives.

To decide which building materials are most suitable in environmental construction, one should take into account the following three factors:

- Ecological Impact Categories (quantitative LCA, respective ISO 14040)
- Investment and Maintenance Costs (LCC analysis)
- Social-cultural Impacts (qualitative aspects, e.g. impacts on ecosystems and the health of people not covered by LCA/LCC)

LCA approaches are useful tools to identify environmental building materials and – although quite demanding – are therefore included in the Comprehensive criteria section. It is recommended to select construction materials and products based on a comprehensive and complete LCA.[45]

It is recommended to include a general section on environmental building materials to strongly highlight the focus of the procured materials as follows:

[45] Several studies on the LCA of concrete, wooden, aluminium, carbon and PVC based construction materials and products are available online (e.g. http://lca.jrc.ec.europa.eu/lcainfohub/directory.vm). It has to be highlighted that different LCA studies have significantly different quality levels, depending on various factors such as used premises and used data sources. An example for the scope of possible interpretations can be seen in the discussion about LCA of PVC (see http://www.greenspec.co.uk/html/materials/windowframes.html).

"Only those building materials should be used, which demonstrate a high environmental and health compatibility regarding extraction, production, transport, use and disposal".[46]

Further, bidders are required, where appropriate, to present (1) technical data sheets, (2) safety data sheets and (3) complete declarations of ingredients.

The following principles should be followed in the design and construction of the building:

- Resource efficient construction following intelligent construction planning and design;
- Optimisation of the flexibility of the construction for possible future technical, functional or aesthetic adaptations;
- Inclusion of sub-functions in one element to optimise maintenance costs.

The proposed criteria cover crosscutting aspects (such as the durability of the construction, the use of recycled/re-used content), as well as criteria specific for some of the most common materials used in construction.

The use of natural insulation materials such as recycled cellulose, cork, cotton, coconut fibre, sheep wool and hemp must be weighed against other insulation materials such as mineral wools, polyurethanes or polystyrenes, based on criteria for thermal performance (certified resistance, lambda[47] and R-values[48]), durability, mechanical properties and technical requirements (acoustics, fire protection, building application, e.g. wall, roof, floor). This includes using an LCA approach and the final choice may also strongly depend on the availability of the insulation materials in the market place. Products have to be CE marked according to existing European product standards or be technically evaluated through technical agreement procedures (European Technical Approval or national agreements) as long as European standards do not exist for this kind of products.

As regards insulation, it may be recommended to evaluate the possibility of using Vacuum Isolation Panels (VIP). The vacuum core consists of fine-pored materials such as mineral wools, silicates, silicon dioxide or polystyrol. VIP's characteristics are among others:

- Reduced thermal conduction – λ-values around 0.004-0.005 W/mK (compared to traditional materials between 0.025 and 0.040 W/mK)
- VIP save up to 90% of the reserved space for insulation because of its low thickness, contributing to additional floor space

As with the use of natural insulation materials discussed above, the use of VIP's must also be weighed against the performance and properties of other insulation materials.

Hundreds of construction materials and products exist that are used frequently in construction works. This Background Report and the Product Sheet focus on some important materials that have considerable impacts on the environment. Nevertheless, it must be highlighted that the

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[46] Taken from the UBA tender for the new office building in Dessau, Germany. See: http://www.procuraplus.org/index.php?id=5551.

[47] Lambda is a value for measuring the thermal conductivity of a material.

[48] The R-value describes the insulation properties of certain building insulation materials.

environmental assessment of construction materials and products has to be done on a case by case basis, because of the huge differences in design and used building materials across Europe.

The standardisation work carried out in the framework of the Construction Products Directive (CPD) is of special importance for the (future) development of harmonised European environmental performance criteria. It is likely that the outcomes of the related work of the mandate 350 to CEN will influence criteria development in the coming years (CEN/TC 350 Secretariat 2006).

For the time being contracting authorities can identify more comprehensive environmental data from a range of databases such as the Austrian Oebox contracting authorities' database, the UK Breeam assessment tool or the Swiss Eco-bau information hub[49] as well as from the ongoing European standardisation work[50].

The Comprehensive criteria in the Product Sheet are divided into two sections. Section 1 follows a more holistic approach, using LCA methodologies and focussing on material efficiency. This approach can be combined with key environmental criteria for specific construction material types referred to in Section 2.

10.2.5 Specifications/award criteria – Noise control

Construction works should be designed and built in such a way that noise perceived by the occupants or people nearby is kept down to a level that will not threaten their health and will allow them to sleep, rest and work in satisfactory conditions. Contracting authorities can, in their tender documents, explicitly highlight their aim to reduce noise during the construction and use of a building, and as such contribute to a healthy living environment.

10.2.6 Specifications/award criteria – Water management

Water resources are limited in quantity and quality in many countries across Europe. A responsible use of this scarce resource can be achieved by including environmental criteria in the technical specifications and/or award criteria section of the tender. Specific areas that can be addressed include the installation of water-saving devices, and the use and re-use of rainwater and grey-water[51].

The level of ambition set will depend on the specific European region and rainwater availability.

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[49] See www.oebox.at; www.breeam.org; www.eco-bau.ch , 22 October 2007.

[50] See: http://www.cen.eu/CENORM/BusinessDomains/TechnicalCommitteesWorkshops/CENTechnicalCommittees/CENTechnicalCommittees.asp?param=481830&title=CEN/TC%20350, 22 October 2007.

[51] Grey water is defined as water that has been used one time for (dish)washing or similar purposes and can be reused in devices not necessarily needing fresh water input such as flush toilet water systems.

10.2.7 Contract performance clauses

Contract clauses can be used to include environmental considerations at the performance stage. They need to be set out clearly in the call for tenders to make tenderers aware of all obligations. Contract performance clauses are mandatory.

For the Comprehensive criteria these relate to the transport and recycling of building materials, as well as to waste reduction and management during the construction works.

11 Further aspects to consider

As already noted, a building has many environmental impacts throughout its life cycle, from the choice of site to the disposal of materials. The most significant of these impacts are addressed through the criteria outlined above. However many other aspects can be taken into consideration to further improve the environmental performance of buildings. A number of these are indicated below.

11.1. Environmental site and building design

The first question that needs to be addressed is whether a new building is really needed in order to meet the space requirements or if existing buildings can be used. If existing buildings can be used, the authority needs to decide which renovation measures are necessary. Given the large amount of energy used in the preparation and transport of construction materials and in the construction process itself, it is usually a more environmentally friendly option to refurbish, reuse or redesign existing buildings rather than construct new ones (see section 2).

Decisions about the location and appraisal of the site will fundamentally influence the sustainability of a building. The consideration of ecological and social aspects during landscape and spatial planning, as well as regional and urban planning and in urban planning competitions, is an important prerequisite for sustainability.

11.2. Alternative cost models

Alternative cost models (e.g. third party financing, Energy Performance Contracting) offer ways to overcome the gap between construction costs and life-cycle costs. Many energy and environmental agencies in the different Member States have experience with Energy Performance Contracting. Energy Performance Contracting is a method to finance and implement energy saving measures. A private enterprise - a so called “Contractor” – conducts planning, pre-financing, implementation, maintenance and monitoring of the measures during the contracting period (usually between 5 and 12 years). The Contractor guarantees minimum energy cost savings and receives a yearly payment resulting from the actual energy cost savings to cover its investments[52]. In addition to the expertise in energy saving measures brought in by the contractor, the biggest advantage for the building owner is that they do not need to finance the improvements up front – they are financed through the actual energy cost savings themselves.

[52] See: http://www.oegut.at/en/themen/erweitertes-europa/conviba/contracting.php.

As one example the German Energy Agency (dena) provides comprehensive information on the possibilities and issues to keep in mind when undertaking energy contracting of sustainable energy services (see http://www.dena.de/.

11.3. Behavioural aspects

The consumption of heat, hot and cold water, electricity etc. are of course not only determined by the design and construction of the building, but also by the behaviour of those using the building. No matter how efficient your office heating system is, energy consumption will considerably increase if it is left on all weekend. Measures can be taken to address this issue, one of which is the training of building users in energy- and water-saving behaviour. The establishment of an energy accounting system or environmental management system are possible measures for ensuring the systematic and continuous monitoring and improvement of such aspects. A complementary approach carried out by the City of Stuttgart (see following table) involved the installation of monitoring equipment which indicated very precisely how much energy was being consumed, when and where in the building, allowing a very accurate analysis of where potential savings may lie.

Energy management in Stuttgart

The City of Stuttgart has been running an energy management scheme for over 25 years, carefully monitoring energy consumption in public buildings with the objective of highlighting areas for improvements in energy efficiency.

Energy consumption is analysed in various ways. A data carrier exchange with Neckarwerke Stuttgart AG (the local public utility), for example, enables an analysis of the annual energy consumption of all municipal facilities. However, for highly effective energy management it needs to be possible to monitor real time energy consumption within buildings, and make appropriate responses.

Carrying out such monitoring involved the installation of an intelligent monitoring station as a building substructure and a transmission system for the gathered data. At the time of the system's installation it was necessary for Stuttgart to develop both the data transmission system and the software for effectively analysing the data received as no suitable hard- or software was available on the market.

The resulting system – the Stuttgarter Energiekontrollsystem (SEKS) – has enabled municipal buildings' energy consumption to be reduced by up to 20% in some cases. In overall terms in the 25 years the City of Stuttgart has been running its energy management programme, the savings made have been five times higher than the money invested in the energy management system and other improvements.

11.4. Promote renovation work

The highest savings in energy efficiency can be achieved through the renovation of the existing building stock.[53] Therefore actively promote renovation, rather than wait until forced.

[53] See: http://ec.europa.eu/environment/etap/pdfs/newsletter_etap_8.pdf.

12 Information sources

12.1. European legislation

- European Directive 2002/91/EC on the Energy Performance of Buildings (EPBD): http://eur-lex.europa.eu/LexUriServ/site/en/oj/2003/l_001/l_00120030104en00650071.pdf
- European Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC): http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_114/l_11420060427en00640085.pdf
- European Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products: http://eur-lex.europa.eu/LexUriServ/site/en/consleg/1989/L/01989L0106-19930802-en.pdf
- European Directive 2000/60/EC establishing a framework for Community action in the field of water policy: http://eur-lex.europa.eu/LexUriServ/site/en/consleg/2000/L/02000L0060-20011216-en.pdf
- Mandate (343) to CEN, CENELEC and ETSI for the elaboration and adoption of standards for a methodology calculating the integrated energy performance of buildings and estimating the environmental impact, in accordance with the terms set forth in Directive 2002/91/EC. The mandate is accessible in the following database: http://ec.europa.eu/enterprise/standards_policy/mandates/database/index.cfm?fuseaction=search.detail&id=221
- Standardisation mandate to CEN for the development of horizontal standardised methods for the assessment of the integrated environmental performance of buildings (Mandate 350): http://ec.europa.eu/enterprise/standards_policy/mandates/database/index.cfm?fuseaction=search.detail&id=228#
- Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste: http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=Directive&an_doc=2006&nu_doc=12
- Directive 2004/42/EC of the European Parliament and of the Council of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in decorative paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC: http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=Directive&an_doc=2004&nu_doc=42
- Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and

Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_396/l_39620061230en00010849.pdf

12.2. Studies, other information

- AgBB (Committee for Health-related Evaluation of Building Products) 2005: A contribution to the Construction Products Directive: Health-related Evaluation Procedure for Volatile Organic Compounds Emissions (VOC and SVOC) from Building Products. See: www.umweltbundesamt.de/building-products/archive/AgBB-Evaluation-Scheme2005.pdf, 6 December 2007
- CEN Technical Committee (TC) 350, on the Sustainability of Construction Works: http://www.cen.eu/CENORM/BusinessDomains/TechnicalCommitteesWorkshops/CENTechnicalCommittees/CENTechnicalCommittees.asp?param=481830&title=CEN/TC%20350
- CEN Technical Committee (TC) 351, on Construction products: http://www.cen.eu/CENORM/BusinessDomains/TechnicalCommitteesWorkshops/CENTechnicalCommittees/CENTechnicalCommittees.asp?param=481830&title=CEN/TC%20351
- CEN/TC350 Secretariat 2006: CEN/TC 350 – WI 00350001. Sustainability of construction works Framework for assessment of integrated buildings performance. Part 1: Environment, Health and Comfort and Life Cycle Cost Performances. European Standard working document as of November 2006.
- Davis Langdon Management Consulting 2007: Towards a common European methodology for Life Cycle Costing (LCC) – Guidance Document. Bruxelles: http://ec.europa.eu/enterprise/construction/compet/life_cycle_costing/index_life_cycle_en.htm
- European Commission 2004: Buying green! A handbook on environmental public procurement. Brussels: http://ec.europa.eu/environment/gpp/guideline_en.htm
- European Commission 2007: Direction General Environment. 'Green' versus 'Sustainable' public procurement. See: http://ec.europa.eu/environment/gpp/green_vs_sustainable.htm, 22 October 2007.
- EIPRO 2005: Environmental Impacts of Products (EIPRO). EU DG JRC-IPTS. Bruxelles: http://ec.europa.eu/environment/ipp/identifying.htm
- ENPER-EXIST 2007: Applying the EPBD to improve the Energy Performance Requirements to Existing Buildings – ENPER-EXIST. WP 1 Final Report. April 2007. See: www.enper-exist.com/pdf/reports/WP1_final_report_MS_04_07_07.pdf, 1 October 2007.
- Environmental Association Vorarlberg [Umweltverband Vorarlberg] 2007: Green Procurement in Construction. See: www.umweltverband.at/index.php?id=beschaffung#322.

- EPD 2007: Using EPDs. See: www.environdec.com/page.asp?id=300&menu=3,0,0, 4 July 2007.
- Federal Office for Building and Regional Planing 2001: Guideline for Sustainable Building. Berlin: http://www.bbr.bund.de/cln_005/nn_25610/EN/Publications/SpecialPublication/2006__2001/DL__GuidelineSustainable,templateId=raw,property=publicationFile.pdf/DL_GuidelineSustainable.pdf
- Gesellschaft für ökologische Bautechnik Berlin mbh 1999: Machbarkeitsstudie mit Empfehlungen zur Umsetzung der ökologisch - bautechnischen Ziele. Berlin: http://www.procuraplus.org/fileadmin/template/projects/procuraplus/files/tenders/UBA_Neubau_BMU_Krit_2.2.pdf
- Gesellschaft für ökologische Bautechnik Berlin mbh 2000: Leitlinien für die Baustoffauswahl. Berlin
- ICLEI 2007: The Procura+ Manual. A Guide to Cost-effective Sustainable Public Procurement. ICLEI – Local Governments for Sustainability. See: www.procuraplus.org, 24 August 2007.
- ifz 2001: Austrian Criteria Catalogue "Check it!". Module 6 structural engineering. See: www.ifz.tugraz.at/oekoeinkauf/index_en.php/filemanager/download/141/modul6_eng%5B1%5D.pdf, 4.July 2007.
- OGC 2007: Sustainability. Achieving Excellence in Construction Procurement Guide. Office of Government Commerce (OGC). See: www.ogc.gov.uk/documents/CP0016AEGuide11.pdf, 19 October 2007.
- ÖIBB - Austrian Institute for Construction Biology and Construction Ecology [Österreichisches Institut für Baubiologie und Bauökologie] 2007: Scientific research on building materials. See: www.ibo.at/forschung.htm#projekte, 1 October 2007.
- Trecodome, Chiel Boonstra 2007: Passive Housing in Europe – innovation in construction. Presentation at the Local Renewables Conference Freiburg: See: www.iclei-europe.org/fileadmin/template/events/lr_freiburg_2007/files/Presentations/A2_Boonstra.pdf

12.3. Internet sources

- www.eebd.org
- www.lensebuildings.com
- www.greenspec.co.uk
- www.uba.de
- www.procuraplus.org
- www.iclei-europe.org/deep
- www.natureplus.org

- www.blauer-engel.de
- http://ec.europa.eu/environment/ecolabel/index_en.htm
- www.eco-bau.ch
- Increasing Recycling and Reuse of Construction and Demolition Waste: http://ec.europa.eu/environment/integration/research/newsalert/pdf/68na3.pdf

Best practice examples obtainable online at:

- www.eu-greenbuilding.org
- www.greenbuildings.org

Annex I – Supporting information sources for contracting authorities

Table 12. Participants for the Concerted Action EPBD II			
No.	**Member States/ Country**	**Organisation**	**Description**
1	Austria	Österreichisches Institut für Bautechnik (OIB) Schenkenstraße 4 AT-1010 Wien	Platform of the Austrian provinces for matters relating to construction; organised as a private association with the nine provinces as members.
2	Belgium	Belgian Building Research Institute (BBRI) Boulevard Poincaré 79 BE-1060 BRUXELLES	Research institute founded in 1960 at the initiative of the trade association in application of the 1947 "De Groote" Order.
3	Bulgaria	Energy Efficiency Agency (EEA), the Bulgarian national energy agency	Governmental.
4	Cyprus	Ministry of Commerce, Industry & Tourism Energy Service	Governmental.
5	Czech Republic	Ministry of Industry and Trade Na Františku 32 CZ-110 15 Praha 1	Governmental.
6	Croatia[54]	Ministry of Environmental Protection, Physical Planning and Construction Republike Austrije 20 10000 Zagreb	Governmental
7	Denmark	Danish Energy Authority Amaliegade 44 DK-Copenhagen	Governmental.
8	Estonia	Ministry of Economic Affairs and Communications Energy Efficiency and Renewables Division Energy Department Harju 11, EE-15072 Tallinn	Governmental.
9	Finland	Ministry of the Environment Housing and Building Department Government Office: Kasarmikatu 25, PO Box 35, FI-00023 Helsinki	Governmental.

[54] Participation of Croatia is subject to Article 4 (b) of the Decision No 1639/2006/EC on participation of third countries.

10	France	Ministère de l'Economie, des Finances et de l'Industrie Télédoc 161 - Bd V. Auriol 61 FR-75703 PARIS Cedex 13	Governmental.
11	Germany	Deutsche Energie Agentur (dena) GmbH, German national energy agency Chausseestr. 128a, DE-10115 Berlin	Public utility in which the Ministry for Economy and the Kreditanstalt für Wiederaufbau each hold 50% of the shares.
12	Greece	Centre for Renewable Energy Sources (CRES), Greek national energy agency, 19th km Marathonos Av. Pikermi GR 19009 Athens	Public entity under the auspices of the Ministry of Development, established under private law.
13	Hungary	Budapest University of Technology and Economics Faculty of Architectural Engineering Department of Energetics and Building Service Engineering 3. Bldg. K. II.45 Műegyetem rkp HU-1111 Budapest	Governmental.
14	Ireland	SEI, The Irish national energy authority Glasnevin, IE-Dublin 9	Governmental.
15	Italy	Rete Nazionale delle Agenzie Energetiche Locali (RENAEL) c/o Rete di Punti Energia Via Stresa 24 IT-20125 Milano	Association of local energy agencies, all owned by the municipality or the province.
16	Latvia	Building Department, Ministry of Economics,	Governmental.
17	Luxembourg	No information	
18	Lithuania	Ministry of the Environment of Lithuania A. Jaksto St 4/9, LT-01105 Vilnius	Governmental.
19	Malta	Ministry for Resources and Infrastructure 1st Floor, Project House, MT-CMR 02 Floriana	Governmental.
20	Netherlands	SenterNovem, the Dutch national energy agency Catharijnensingel 59 PB 8242 NL-3503 RE Utrecht	Governmental.
21	Norway	Norwegian Water Resources and Energy Directorate (NVE)	Governmental.

22	Poland	Instytut Techniki Budowlanej (Building Research Institute) ul. Filtrowa 1 , PL-00-611 Warszawa	Governmental.
23	Portugal	ADENE, the Portuguese national energy agency Estrada de Alfragide, Praceta 1, nº 47Alfragide, PT-2720 -537 Amadora	Private non-profit, stakeholder organisation with the Ministry for Economy holding 70% of the shares.
24	Romania	No information	
25	Slovakia	Výskumný a vývojový ústav pozemných stavieb NOVA (VVÚPS - NOVA sro, Research and Development Institute for Building Construction) Studená 3 SK-820 02 Bratislava 22	Private commercial institute, which already has a contract with the Ministry to prepare the method for the Buildings Directive and to work out the data at national level.
26	Slovenia	Ministry of Environment, Spatial Planning and Energy, Agency for Energy Efficiency and Renewable Energy Dimičeva 12, SI-1000 Ljubljana,	Governmental.
27	Spain	IDAE, the Spanish national energy agency C/Madera, 8 ES-28004 MADRID	Governmental.
28	Sweden	STEM, Swedish Energy Agency Head of International Secretariat Box 310 SE-631 04 - Eskilstuna	Governmental.
29	UK	FaberMaunsell Marlborough House Upper Marlborough Road St Albans UK-Herts, AL1 3UT	Private commercial body appointed by the government.

Table 13. Information sources on national legislation and guidelines for sustainable construction and energy performance of buildings							
Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
AUSTRIA	National/Regional legislation	Implementation of the EPBD	Energy Certification Providing Act, May 24th 2006	Austrian Parliament	www.bmj.gv.at	Wolfgang Jilek Energy Commissioner of Styria; Representative of the Austrian Bundesländer	Tel.: +43 316 / 877-4554 or -4555 E-Mail: wolfgang.jilek@stmk.gv.at
AUSTRIA	Guidelines on sustainable construction	General, but also used by public sector	Voralberg, Ökoleitfaden: Bau	Umweltverband Vorarlberger Gemeindehaus	http://www.umweltverband.at/fileadmin/Image_Archive/umweltverband/downloads/PDF Oekoleitfaden/intern/indexBau.htm	Dipl. Ing. Dietmar Lenz ÖkoBeschaffungsService	Tel.: 05572/55450-14 E-mail: d.lenz@gemeindehaus.at
BELGIUM (Brussels Region)	National/Regional legislation	Implementation of the EPBD	under project	Brussels Ministry of Energy Brussels Ministry of Environment	www.ibgebim.be	Ronald Piers Département Utilisation rationnelle de l'Energie Bruxelles Environnement	Tel.: +32 (0)2 / 775.75.75 E-Mail: energie@ibgebim.be/

Table 13. Information sources on national legislation and guidelines for sustainable construction and energy performance of buildings							
Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
BELGIUM (Brussels Region)	Guidelines on sustainable construction	specific to public sector	"URE" Toolkit (Utilisation Rationelle de l'Energie): series of tools and guidance for public builders and architects mainly focusing on energy efficiency.	IBGE - Institut Bruxellos pour l'Environnement Brussel Region	The "URE" tools are presented in the document "Vademecum URE" (http://www.ibgebim.be/FRANCAIS/pdf/Energie/07_Vademecum_UREmars07FBO.pdf) but the detailed guidance can be downloaded pro subject area (water, lighting, heat, etc.) on the IBGE Website: http://www.ibgebim.be/francais/contenu/content.asp?ref=1764	Ronald Piers Département Utilisation rationnelle de l'Energie Bruxelles Environnement	Tel.: +32 (0)2 / 775.75.75 E-Mail: energie@ibgebim.be/
BELGIUM (Brussels Region)	Guidelines on sustainable construction	specific to public sector	Practical Guide for sustainable construction and renovation of small buildings (=>1000m²) (FR: Guide pratique pour la construction et rénovation durables de petits bâtiments)	IBGE - Institut Bruxellos pour l'Environnement Brussels Region	http://130.104.235.38/ibge-guide/guide.aspx	Ronald Piers Département Utilisation rationnelle de l'Energie Bruxelles Environnement	Tel.: +32 (0)2 / 775.75.75 E-Mail: energie@ibgebim.be/

Table 13. Information sources on national legislation and guidelines for sustainable construction and energy performance of buildings							
Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
BELGIUM (Flemish Region)	National/Regional legislation	Implementation of the EPBD	Energy Performance Decree,7 May 2004 + Execution order of 11 March 2005 (energy performance) Execution order of 2 December 2005 (energy certificate)	Flemish Energy Agency Department of Environment, Nature and Energy	www.energiesparen.be/energieprestatie	Wina Roelens Flemish Energy Agency Belgium	Tel.: 09/2446663 E-mail: wina.roelens@ewbl.vlaanderen.be
BELGIUM (Flemish Region)	Guidelines on sustainable construction	specific to public sector	Energy prestation certificates for public building, 2007	Belgium Ministry of the Flemish Government	http://www2.vlaanderen.be/ned/sites/economie/energiesparen/epc/doc/brochure_epcpubliekegebouwen.pdf	Wina Roelens Flemish Energy Agency Belgium	Tel.: 09/2446663 E-mail: wina.roelens@ewbl.vlaanderen.be
BELGIUM (Flemish Region)	Guidelines on sustainable construction	specific to public sector	MODERN OFFICES: MORE COMFORT WITH LESS ENERGY. A guide for construction teams concerning climate and energy performance of buildings, 2005	Belgium Ministry of the Flemish Government	http://www2.vlaanderen.be/ned/sites/economie/energiesparen/doc/brochure_kantoren.pdf	Wina Roelens Flemish Energy Agency Belgium	Tel.: 09/2446663 E-mail: wina.roelens@ewbl.vlaanderen.be

Table 13. Information sources on national legislation and guidelines for sustainable construction and energy performance of buildings							
Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
BELGIUM (Flemish Region)	National/Regional legislation	Implementation of the EPBD	Ministerial decree of 20 October 2006 fixing the tasks of the municipality within the framework of the energy performance legislation.	Flemish Energy Agency Department of Environment, Nature and Energy	http://www.energiesparen.be/energieprestatie/ http://www2.vlaanderen.be/ned/sites/economie/energiesparen/epb/doc/takenvandegemeente.pdf	Wina Roelens Flemish Energy Agency Belgium	Tel.: 09/2446663 E-mail: wina.roelens@ewbl.vlaanderen.be
BULGARIA	National/Regional legislation	Implementation of the EPBD	19 February 2004,Energy Efficiency Act (Decree № 54/2004) Ordinance for Energy efficiency certification of buildings	Ministry of Regional Development and Public Works Ministry of Energy and Economy and Energy Efficiency Agency	www.mrrb.government.bg www.seea.government.bg	Shneshana Todorova Energy Efficiency Agency Bulgaria	Ministry of Regional Development and Public Works Directorate Public Relations/ International Relations Tel.: 9405 430, 988 29 54 E-mail: press@mrrb.government.bg
CZECH REPUBLIC	National/Regional legislation	Implementation of the EPBD	Act on Energy Management, March 29th 2006	Ministry of Industry and Trade	http://www.mpo.cz	Irena Plockova Ministry of Industry and Trade	Ministry of Industry and Trade Tel.: +420 224 851 111 E-mail:

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							posta@mpo.cz
CZECH REPUBLIC	Guidelines on sustainable construction	specific to public sector	Energy efficient construction of public buildings (NÍZKOENERGETICKÉ STAVĚNÍ VEŘEJNÝCH BUDOV)	EkoWATT (www.ekowatt.cz) Czech Energy Agency (www.ceacr.cz)	http://www.ekowatt.cz/library/dokumenty/studie/0702_Nizkoenergeticke_staveni_verejnych_budov.pdf	EkoWATT Praha	Tel: +420 266 710 247 E-mail: info@ekowatt.cz
DENMARK	National/Regional legislation	Sustainable construction	Action plan for environmentally sustainable building and construction practices, 2001	Danish Environmental Council for Cleaner Products, Danish Product Panel for Building and Construction	http://glwww.mst.dk/indu/01030200.htm	Claus Pilvang/Henrik Kærgaard Danish Environmental Council for Cleaner Products, Danish Product Panel for Building and Construction	Tel.: 48 10 42 00 E-Mail: niras@niras.dk
DENMARK	National/Regional legislation	Implementation of the EPBD	Danish Building Regulations 1995, BR 95 (Addendum 12, 13, 14); Danish Building Regulations for Small Dwelling 1998, BR 98 (Addendum 9, 10, 11)	Danish Energy Authority Danish National Agency of Enterprise and Construction	www.sbi.dk/Be06	Søren Aggerholm Danish Building Research Institute, Sbi	Tel.: +45 45 86 55 33 E-mail: sbi@sbi.dk

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Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
ESTONIA	National/Regional legislation	Implementation of the EPBD	draft Act regarding the transposition of the EPBD in national law (+ relevant building acts) approved by the Parliament on 27th September 2006	Ministry of Economic Affairs and Communications	http://www.mkm.ee/eng/index.php?keel=en	Heikki Kulbas Ministry of Economic Affairs and Communication	Tel.: +372 6256495 E-Mail: heikki.kulbasmkm.ee
FINLAND	National/Regional legislation	Sustainable construction	The National Building Code of Finland (see guidelines section D on energy management)	Finnish Ministry of Environment	http://www.ymparisto.fi/default.asp?contentid=230588&lan=en&clan=en	Finnish Ministry of Environment	E-mail via contact form: http://www.ymparisto.fi/feedback.asp?users=250&sourceid=242553&contact=1&lan=en
FINLAND	National/Regional legislation	Sustainable construction	Land use and Building Act, 1999	Finnish Ministry of Environment	http://www.ymparisto.fi/default.asp?contentid=109607&lan=en	Finnish Ministry of Environment	E-mail via contact form: http://www.ymparisto.fi/feedback.asp?users=250&sourceid=242553&contact=1&lan=en
FINLAND	National/Regional legislation	Sustainable construction	Land use and Building Decree, 1999	Finnish Ministry of Environment	http://www.ymparisto.fi/default.asp?contentid=109608&lan=en	Finnish Ministry of Environment	E-mail via contact form: http://www.ymparisto.fi/feedback.

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							asp?users=250&sourceid=242553&contact=1&lan=en
FRANCE	National/Regional legislation	Sustainable construction	National action plan adopted in March 2007, including 15 specific GPP targets (including building and constrcution)	French Ministry for Sustainable Development	http://www.ecologie.gouv.fr/pnaapd.html	French Ministry for Sustainable Development	E-mail: ministere@ecologie.gouv.fr
FRANCE	guidelines on sustainable construction	general, but also used by public sector	HQE Eco Guidelines General guideline website	Association HQE (Haute Qualité Environnementale)	http://www.assohqe.org/documents_referentiels.php	Communication / Infos générales : Carine CHARLIER	E-mail: ccharlier@assohqe.org
FRANCE	National/Regional legislation	specific to public sector	20 % of new constructions should be compliant with HQE standards or equivalent	French Ministry of Economy, Finance and Industry	http.//www.minefi.gouv.fr/directions_services/daj/guide/gpem/table.html	Communication / Infos générales : Carine CHARLIER	E-mail: ccharlier@assohqe.org
FRANCE	Guidelines on sustainable construction	general, but also used by public sector	RT 2005 (termic reglementation)	Ministry for Employment,Social Cohesion and Housing	http://www.rt2005.com/sw11604.asp	Marie-Christine Roger Ministry for Employment, Social Cohesion and Housing	Ministry for Employment, Social Cohesion and Housing, Housing Department E-mail: infologement.dg

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Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
							uhc@equipement.gouv.fr
FRANCE	National/Regional legislation	Implementation of the EPBD	National Law on Energy Efficiency, 13.07.2005	French Government	http://www.legifrance.gouv.fr/WAspad/Ajour?nor=ECOX0400059L&num=2005-781&ind=1&laPage=1&demande=ajour	Marie-Christine Roger Ministry for Employment, Social Cohesion and Housing	Ministry for Employment, Social Cohesion and Housing, Housing Department E-mail: infologement.dguhc@equipement.gouv.fr
FRANCE	Guidelines on sustainable construction	general, but also used by public sector	Tools of ADEME such as: Guide d'audit énergétique, 1999 (ADEME-COSTIC)	ADEME, French Environment and Energy Management Agency	http://www2.ademe.fr/servlet/KBaseShow?sort=-1&cid=96&m=3&catid=15030	ADEME, French Environment and Energy Management Agency	E-mail via contact form: http://www2.ademe.fr/servlet/getDoc?cid=96&m=3&id=29676&ref=16525

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Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
FRANCE	National/Regional legislation	Implementation of the EPBD	Construction and Housing Code (CCH) certain articles have been modified to integrate the requirements of the European directives.	Ministry for Employment,Social Cohesion and Housing	http://www.legifrance.gouv.fr/citoyen/uncode.ow?code=CCONSTRL.rcv	Marie-Christine Roger Ministry for Employment, Social Cohesion and Housing	Ministry for Employment, Social Cohesion and Housing, Housing Department E-mail: infologement.dguhc@equipement.gouv.fr
FRANCE	National/Regional legislation	Implementation of the EPBD	Urban Code (CU) certain articles have been modified to integrate the requirements of the European directives.	Ministry for Employment,Social Cohesion and Housing	http://www.legifrance.gouv.fr/citoyen/uncode.ow?code=CURBANIL.rcv	Marie-Christine Roger Ministry for Employment, Social Cohesion and Housing	Ministry for Employment, Social Cohesion and Housing, Housing Department E-mail: infologement.dguhc@equipement.gouv.fr
GERMANY	Guidelines on sustainable construction	general, but also used by public sector	Guideline for Sustainable Building of the Federal Office for Building and Regional Planning (January 2001) – currently under revision	Federal Office for Building and Regional Planning 2001: Guideline Sustainable Building.	http://www.bmvbs.de/Anlage/original_8183/Leitfaden-Nachhaltiges-Bauen.pdf	Ralf Dittrich Federal Office for Building and Regional Planning	Tel.: 030 18 - 300 -0 E-mail: buergerinfo@bmvbs.bund.de

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Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
GERMANY	National/Regional legislation	Implementation of the EPBD:	Energy Saving Act 1976 (+ amendments)	Federal Ministry of Transport, Building and Urban Development Federal Ministry of Economics and Technology Ministry for the Environment, Natural Conservation and Nuclear Safety	http://www.gesetze-im-internet.de/eneg/	Deutsche Energie-Agentur GmbH (dena)	Tel.: +49 (0)30 72 61 65 – 600 E-mail: info@dena.de
GERMANY	National/Regional legislation	Implementation of the EPBD:	Energy Saving Ordinance (EnEV 2007/2008 - valid as of Oct 1st 2007)	Federal Ministry of Transport, Building and Urban Development Federal Ministry of Economics and Technology Ministry for the Environment, Natural Conservation and Nuclear Safety	http://energieausweis.enev-online.de/enev_2007/index.htm	Melita Tuschinski Institut für Energie-Effiziente Architektur mit Internet-Medien	Fax: +49 (0) 711 / 6 15 49 27 E-mail: info@enev-online.de

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GREECE	National/Regional legislation	Implementation of the EPBD:	no english info on the website of the ministry (www.ypan.gr) - maybe enquire? Grammatia@ypan.gr	Ministry of Development Ministry of Environment	www.ypan.gr www.minenv.gr www.cres.gr/greenbuilding	Ilias Sofronis CRES	Tel.: +30210 6603300 E-mail: cres@cres.gr
HUNGARY	National/Regional legislation	Implementation of the EPBD:	Ministerial Order TNM 7/2006	State Office of Housing and Buildings (now: Ministry of Interior) Ministry of Economy and Transport	www.egt.bme.hu	Andras Zold Budapest University of Technology	Tel.: +361 463 1331 E-mail: info@egt.bme.hu
IRELAND	Guidelines on sustainable construction	general, but also used by public sector	TGD Technical Guidance Documents - 1997-2004	Department of the Environment, Heritage and Local Government -DEHLG	http://www.environ.ie/en/TGD/	Department of the Environment, Heritage and Local Government - DEHLG	Tel.: 1890 20 20 21 or 01 888 2000
IRELAND	Guidelines on sustainable construction	general, but also used by public sector	Building Energy Manager's Resource Guide	Sustainable Energy Ireland	http://www.sei.ie/getFile.asp?FC_ID=2107&docID=656	Paula Rice Sustainable Energy Ireland	E-mail: paula.rice@sei.ie

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IRELAND	National/Regional legislation	Implementation of the EPBD:	Energy Performance of Buildings Regulations 2006	Department of the Environment, Heritage and Local Government -DEHLG Department of Communications, Marine and Natural Resources - DCMNR	http://www.environ.ie/en/DevelopmentandHousing/BuildingStandards/ www.sei.ie/epbd	Department of the Environment, Heritage and Local Government - DEHLG	Tel.: 1890 20 20 21 or 01 888 2000
IRELAND	National/Regional legislation	Implementation of the EPBD:	Building Regulations (Amendment) 2005	Department of the Environment, Heritage and Local Government -DEHLG Department of Communications, Marine and Natural Resources - DCMNR	http://www.environ.ie/en/DevelopmentandHousing/BuildingStandards/ www.sei.ie/epbd	Department of the Environment, Heritage and Local Government - DEHLG	Tel.: 1890 20 20 21 or 01 888 2000
IRELAND	National/Regional legislation	Implementation of the EPBD:	Building standards	Department of the Environment, Heritage and Local Government -DEHLG	http://www.environ.ie/en/DevelopmentandHousing/BuildingStandards/ www.sei.ie/epbd	Department of the Environment, Heritage and Local Government - DEHLG	Tel.: 1890 20 20 21 or 01 888 2000

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Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
ITALY	National/Regional legislation	Implementation of the EPBD:	Legislative Decree (D. Lgsl. N. 192/2005)	Ministry of Economic Development Ministry of Environment Ministry of Infrastructures	http://gazzette.comune.jesi.an.it/2005/222/10.htm	Giacomo Parodi RENAEL - Rete Nazionale Agenzie Energetiche Locali	Tel.: +39 02 67655589 E-mail: renael@renael.it
ITALY	National/Regional legislation	Implementation of the EPBD:	Legislative Decree (D. Lgsl. N. 311/2006)	Ministry of Economic Development Ministry of Environment Ministry of Infrastructures	http://gazzette.comune.jesi.an.it/2007/26/9.htm	Giacomo Parodi RENAEL - Rete Nazionale Agenzie Energetiche Locali	Tel.: +39 02 67655589 E-mail: renael@renael.it
LATVIA	National/Regional legislation	general, but also used by public sector	Latvian Building Code LBN 002-01“Thermal requirements of the envelope structures of buildings” 2001	Ministry of Economy	http://www.em.gov.lv/em/2nd/?cat=56&id=13930	Dzintars Grasmanis Ministry of Economy Latvia	Tel.: 67013040 E-mail: dzintars.grasmanis@em.gov.lv

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LITHUANIA	National/Regional legislation	Implementation of the EPBD:	main provisions:Law Amending the Law on Construction no. X-404,17 November,2005 calculation procedure: Building Technical Regulation STR 2.01.09:2005 „Energy Performance of Buildings; Certification of Energy Performance of Buildings“, 20 December, 2005	Ministry of Environment Ministry of Economy	www.am.lt www.spsc.lt.	Nina Cesonienne Ministry of Environment Vilnius	Tel.: 2663584
LITHUANIA	Guidelines on sustainable construction	Construction products	Rules for certification of building products	Certification Centre of Building Products (Statybos produkcijos sertifikavimo centras - SPSC	http://www.spsc.lt/cert/D-SPSC-SN_(EN).pdf	Inga Karunkeviciene SPSC	Tel.: +370-5-2728077 E-Mail: inga@spsc.lt centras@spsc.lt

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LITHUANIA	National/Regional legislation	Construction products	Rules for certification of building products	Certification Centre of Building Products (Statybos produkcijos sertifikavimo centras - SPSC	http://www.spsc.lt/cert/D-SPSC-SN_(EN).pdf	Inga Karunkeviciene SPSC	Tel.: +370-5-2728077 E-Mail: inga@spsc.lt centras@spsc.lt
LUXEMBOURG	National/Regional legislation	Implementation of the EPBD:	Law of the 5th August 1993 concerning the rational utilisation of energy	Ministry of Economy and Foreign Trade, Department for energy	http://www.eco.public.lu/	Tom EISCHEN Ministry of Economy and Foreign Trade Luxembourg	Tel.: (+352) 478-1 E-mail: info@eco.public.lu
LUXEMBOURG	National/Regional legislation	Implementation of the EPBD:	Grand-ducal regulationconcerning the thermal insulation of buildings 1995	Ministry of Economy and Foreign Trade, Department for energy	http://www.eco.public.lu/	Tom EISCHEN Ministry of Economy and Foreign Trade Luxembourg	Tel.: (+352) 478-1 E-mail: info@eco.public.lu
LUXEMBOURG	National/Regional legislation	Implementation of the EPBD:	Grand-ducal regulationconcerning the energy performance in residential buildings 2006	Ministry of Economy and Foreign Trade, Department for energy	http://www.eco.public.lu/	Tom EISCHEN Ministry of Economy and Foreign Trade Luxembourg	Tel.: (+352) 478-1 E-mail: info@eco.public.lu
MALTA	National/Regional legislation	Implementation of the EPBD:	Malta Resources Authority Act 2006	Ministry for Resources and Infrastructure	http://www.mri.gov.mt/techguid.htm; www.bicc.gov.mt; www.mra.org.mt	MRES Customer Care Coordinator (Building Regulations Office)	Tel.: +356 22997787 E-mail: customercare.mres@gov.mt

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NETHER-LANDS	National/Regional legislation	Sustainable construction	28 Jun 07- proposals cutting energy use by 30 per cent in about half of all existing buildings in the Netherlands by 2020.	Ministry of Housing, Spatial Planning and the Environment Senternovem	http://www.vrom.nl/docs/200706-meer-met-minder.pdf	Marjolein Heinemans SenterNovem The Netherlands	Tel.: (030) 239 35 33 E-mail: duurzaaminkopen@senternovem.nl
NETHER-LANDS	National/Regional legislation	Sustainable construction	http://www.senternovem.nl/Compass/Projects_by_type_of_instrument/Government_Instruments.asp	Federation of Dutch energy companies (EnergieNed), coalition of housing associations (Aedes) Platform for energy transition in the built environment (PeGO).	http://www.energiened.nl/_upload/bestanden/11661_persbericht%20Meer%20met%20Minder.pdf	Marjolein Heinemans SenterNovem The Netherlands	Tel.: (030) 239 35 33 E-mail: duurzaaminkopen@senternovem.nl
NETHER-LANDS	Guidelines on sustainable construction	general, but also used by public sector	Energy performance of building directive	Ministry of Housing, Spatial Planning and the Environment Senternovem	http://www.senternovem.nl/mmfiles/EnergieBesparingsMonitor%20gebouwde%20omgeving%202006_tcm24-205779.pdf	Marjolein Heinemans SenterNovem The Netherlands	Tel.: (030) 239 35 33 E-mail: duurzaaminkopen@senternovem.nl

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NETHER-LANDS	National/Regional legislation	Sustainable construction	1 January 2003 - Building Decree	Ministry of Housing, Spatial Planning and the Environment	http://international.vrom.nl/pagina.html?id=10963	Marjolein Heinemans SenterNovem The Netherlands	Tel.: (030) 239 35 33 E-mail: duurzaaminkopen@senternovem.nl
NETHER-LANDS	National/Regional legislation	Sustainable construction	New building regulations	Ministry of Housing, Spatial Planning and the Environment	http://international.vrom.nl/pagina.html?id=10963	Frans van Ekerschot Coordinator EPBD, Ministry of Housing, Spatial Planning and the Environment	Ministry of Housing, Spatial Planning and the Environment Tel.: (070) 339 39 39 E-mail: vrominfo@postbus51.nl
NORWAY	national/Regional legislation	Implementation of the EPBD:	Directive on Energy efficient Public Building	Ministry of Local Government and Regional Development Ministry of Petroleum and Energy	http://www.bygningsenergidirektivet.no/modules/module_109/publisher_view_product.asp?ientityID=9621&mids=a1377ahttp://www.bygningsenergidirektivet.no/modules/module_109/publisher_view_product.asp?ientityID=9621&mids=a1377a	Olav K. Isachsen Norwegian Water Resources and Energy Directorate Norway	E-mail: oki@nve.no

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NORWAY	Guidelines on sustainable construction	Construction products	Environmental declaration of building materials, products and components. Byggforsk 2000.	Norwegian Building Research Institute	http://www.sintef.no/content/page1____2882.aspx	Svein Baade Head of section	E-mail: nbl@nbl.sintef.no Phone: (+47) 73 59 10 78 Fax: (+47) 73 59 10 44
POLAND	National/Regional legislation	Implementation of the EPBD:	National legislatio on building energy efficiency	Association of Energy Auditors	http://www.zae.org.pl/	Anna Micun Ministry of Transport and Construction Poland	Association of Energy Auditors Tel.: (22) 825-16-02 E-mail: zae@zae.org.pl
PORTUGAL	National/Regional legislation	Implementation of the EPBD:	4 April 2006,National Decrees on Building Energy efficiency (decree 78/2006; decree 79/2006; decree 80/2006)	Ministry of the Economy, Directorate General for Geology and Energy Ministry of Public Works Ministry of the Economy	http://www.adene.pt/ADENE/Canais/SubPortais/SCE/Legislacao/Nacional/	Eduardo Maldonado University of Porto Carlos Nascimento ADENE Portugal	E-mail: carlos.nascimento@adene.pt
ROMANIA	National/Regional legislation	Implementation of the EPBD:	Law 372/15.12.2005	Ministry of Transports and Public Works	http://www.mt.ro/	Octavia Cocora UCTB Faculta e Instalatii Bucuresti	Ministry of Transports and Public Works, Informing and Public Relations Department E-mail:

Table 13. Information sources on national legislation and guidelines for sustainable construction and energy performance of buildings							
Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
							relpub@mt.ro
SLOVAK REPUBLIC	National/Regional legislation	Implementation of the EPBD:	08.11.2005, Act N° 555/2005	Ministry of Construction and Regional Development	http://www.zbierka.sk/ciastka.asp?ro=2005-&cc=225	Zuzana Sternova VUPS-Nova Slovak republic	Ministry of Construction and Regional Development Tel.: +421 (0) 2 583 17 111 E-mail: informacie@build.gov.sk
SLOVENIA	National/Regional legislation	Implementation of the EPBD	No information	Ministry of the Environment and Spatial Planning Department for Energy Efficiency and Renewable Energy	http://www.mop.gov.si/en/	Boris Selan Ministry of the Environment and Spatial Planning Department for Energy Efficiency and Renewable Energy	Tel.: +386 1 300 69 90 E-mail: boris.selan@gov.si
SPAIN	Guidelines on sustainable construction	specific to public sector	"Pràctiques de sostenibilitat en l'edificatìo", 2005	Generalitat de Catalunya	http://www10.gencat.net/ptop/binaris/PractiquesSostenibilitat_tcm32-33015.pdf	Mercè Rius ITeC, Institut de Tecnologia de la Construcció de Catalunya	Tel.: 93·309 34 04 E-mail: info@itec.es
SPAIN	National/Regional legislation	Implementation of the EPBD:	Reglamento de Instalaciones Térmicas en los	Ministry of Industry, Tourism and Commerce	http://www.idae.es/index.asp?i=en	IDAE	Tel.: 91 456 49 00 E-mail:

Table 13. Information sources on national legislation and guidelines for sustainable construction and energy performance of buildings							
Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
			Edificios (RITE)				comunicacion@idae.es
SPAIN	National/Regional legislation	Sustainable construction	RT 2006 - Solar ordinance : Obligation to install thermic and photovoltaic solar panels during a construction or renovation	Ministry of Industry, Tourism and Commerce	http://www.idae.es/index.asp?i=en	IDAE	Tel.: 91 456 49 00 E-mail: comunicacion@idae.es
SPAIN	National/Regional legislation	Sustainable construction	Building Act 38/1999, of 5 November (BOE (Official State Gazette) 06.11.1999)	Ministry of Industry, Tourism and Commerce	http://www.boe.es/g/es/boe/dias/1999/11/06/	IDAE	Tel.: 91 456 49 00 E-mail: comunicacion@idae.es
SPAIN	Guidelines on sustainable construction	general, but also used by public sector	Guide to Sustainable Building for Housing in the Basque Autonomous Community	IHOBE	http://www.ihobe.net/Pags/AP/AP_Noticias/hemeroteca.asp?cod=12856D30-97AF-42A4-98C6-4F63493471F3	IHOBE	Tel.: 94 423 07 43 E-mail: info@ihobe.net
SPAIN	Guidelines on sustainable construction	general, but also used by public sector	Urbanismo bioclimático. Criterios medioambientales en la ordenación de asentamientos	Ciudades para un futuro màs sostenible	http://habitat.aq.upm.es/ub/	Esther Higueras Ciudades para un futuro màs sostenible	E-mail via contact form: http://habitat.aq.upm.es/cgi-bin/hmail2?quien=ehiguera&don

Table 13. Information sources on national legislation and guidelines for sustainable construction and energy performance of buildings							
Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
							de=aq.upm.es&pers=Esther%20Higueras
SWEDEN	National/Regional legislation	Sustainable construction	The Planning and Building Act,	Ministry of Sustainable Development National Board of Housing, Building and Planning (Boverket)	http://www.boverket.se/upload/publicerat/bifogade%20filer/2005/Legislation_hela_ny.pdf	Nikolaj Tolstoy National Board of housing Building and Planning (Boverket) Sweden	Tel.: 0455-35 32 03 E-mail: registraturen@boverket.se
SWEDEN	National/Regional legislation	Sustainable construction	The Act on Technical requirments for Construction works, etc,	Ministry of Sustainable Development National Board of Housing, Building and Planning (Boverket)	http://www.boverket.se/shopping/ShowItem.aspx?id=846&epslanguage=SV	Nikolaj Tolstoy National Board of housing Building and Planning (Boverket) Sweden	Tel.: 0455-35 32 03 E-mail: registraturen@boverket.se
SWEDEN	National/Regional legislation	Sustainable construction	The Environmental Code with ordinances of relevance	Ministry of Sustainable Development National Board of Housing, Building and Planning (Boverket)	http://www.boverket.se/shopping/ShowItem.aspx?id=846&epslanguage=SV	Nikolaj Tolstoy National Board of housing Building and Planning (Boverket) Sweden	Tel.: 0455-35 32 03 E-mail: registraturen@boverket.se
UK	Guidelines on	general, but	Code for	Department for	http://www.planningpo	Department for	Tel.: 020 7944

Table 13. Information sources on national legislation and guidelines for sustainable construction and energy performance of buildings							
Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
	sustainable construction	also used by public sector	sustainable Homes – Technical Guide, March 2007	Communities and Local Government: London	rtal.gov.uk/uploads/code_for_sustainable_homes_techguide.pdf	Communities and Local Government	4400 E-mail: Contactus@communities.gsi.gov.uk
UK	Guidelines on sustainable construction	general, but also used by public sector	Code for Sustainable Homes - A step-change in sustainable home building practice, 2006	Department for Communities and Local Government: London	http://www.planningportal.gov.uk/uploads/code_for_sust_homes.pdf	Department for Communities and Local Government	Tel.: 020 7944 4400 E-mail: Contactus@communities.gsi.gov.uk
UK	Guidelines on sustainable construction	specific to public sector	Sustainable Construction: practical guidance for planners and developers	Ministry of Construction, Department for Trade and Industry	http://www.sustainable-construction.org.uk	Claire Bonham-Carter Sustainable Development Group	Tel.: 020 7601 1659 E-mail: claire.bonham-carter@fabermaunsell.com
UK	Guidelines on sustainable construction	specific to public sector	Breeam Tools assessment methods and tools are all designed to help construction professionals understand and mitigate the environmental impacts of the developments they design and build	BREEAM	http://www.breeam.org/page.jsp?id=13	BREEAM Office	Tel.: 01923 664462 E-mail: breeam@bre.co.uk

Table 13. Information sources on national legislation and guidelines for sustainable construction and energy performance of buildings							
Country/ Member States	**Type of document (legislation/ guidance)**	**Objective/ Goal**	**Document name**	**Responsible authority**	**Internet Sources**	**Contact person**	**Contact details**
UK	Guidelines on sustainable construction	general, but also used by public sector	Sustainable Communities – Building for the future	Office of the Deputy Prime Minister	http://www.communities.gov.uk/pub/872/SustainableCommunitiesBuildingfortheFutureMaindocument_id1139872.pdf	Department for Communities and Local Government	Tel.: 020 7944 4400 E-mail: Contactus@communities.gsi.gov.uk
UK	Guidelines on sustainable construction	specific to public sector	Planning policies for sustainable building - guidance for Local Development Frameworks	Local Government Association (LGA)	http://www.lga.gov.uk/Documents/Publication/planning%20policies%20complete.pdf http://www.lga.gov.uk/Publication.asp?Isection=0&ccat=28&id=SX1039-A783D652	LGconnect, Local Government House	Tel.: 020 7664 3131 E-mail: info@lga.gov.uk

Annex II – List of CEN standards applicable to the energy performance of buildings

Table 14. CEN standards - energy performance of buildings

Name	(EN) number	Year	Current status	Description
Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics	EN 15251	2007	Currently valid.	This European Standard specifies the indoor environmental parameters which have an impact on the energy performance of buildings. The standard specifies how to establish indoor environmental input parameters for building system design and energy performance calculations. The standard specifies methods for long term evaluation of the indoor environment obtained as a result of calculations or measurements. The standard specifies criteria for measurements that can be used if required to measure compliance by inspection. The standard identifies parameters to be used by monitoring and displaying the indoor environment in existing buildings. This standard is applicable mainly in non-industrial buildings where the criteria for indoor environment are set by human occupancy and where the production or process does not have a major impact on the indoor environment. The standard is thus applicable to the following building types: single family houses, apartment buildings, offices, educational buildings, hospitals, hotels a
Thermal performance of buildings - Calculation of energy use for space heating	EN ISO 13790	2004	Currently being revised.	This standard gives a simplified calculation method for assessment of the annual energy use for space heating of a residential or a non-residential building, or a part of it, which will be referred to as 'the building'. It does not apply to buildings with air conditioning systems likely to provide space cooling during the heating season. This method includes the calculation of: 1. the heat losses of the building when heated to constant internal temperature; 2. the annual heat required to maintain the specified set-point temperatures in the building; 3. the annual energy required by the heating system of the building for space heating, using heating system characteristics which are to be found in specific European or International Standards, or, by default, in national documents. The building can have several zones with different set-point temperatures, and can have intermittent heating. The calculation period is the month. For residential buildings the calculation can also be performed for the heating season.

Table 14. CEN standards - energy performance of buildings				
Name	**(EN) number**	**Year**	**Current status**	**Description**
Thermal performance of buildings - Calculation of internal temperatures of a room in summer without mechanical cooling - General criteria and validation procedures	EN ISO 13791	2004	Currently valid.	This document specifies the assumptions, boundary conditions, equations and validation tests for a calculation procedure, under transient hourly conditions, of the internal temperatures (air and operative) during the warm period, of a single room without any cooling/heating equipment in operation. No specific numerical techniques are imposed by this document. Validation tests are included in Clause 7. An example of a solution technique is given in Annex A. This document does not contain sufficient information for defining a procedure able to determine the internal conditions of special zones such as attached sun spaces, atria, indirect passive solar components (Trombe walls, solar panels) and zones in which the solar radiation may pass through the room. For such situations different assumptions and more detailed solution models are needed (see Bibliography).
Thermal performance of buildings - Calculation of internal temperatures of a room in summer without mechanical cooling - Simplified methods	EN ISO 13792	2005	Currently valid.	This document specifies the required input data for simplified calculation methods for determining the maximum, average and minimum daily values of the operative temperature of a room in the warm period: a) to define the characteristics of a room in order to avoid overheating in summer at the design stage; b) to define whether the installation of a cooling system is necessary or not. Clause 6 gives the criteria to be met by a calculation method in order to satisfy this document.
Energy performance of buildings - Methods of expressing energy performance and for energy certification of buildings	prEN 15217		Currently being developed.	Defines: a) Global indicators to express the energy performance of whole buildings, including heating, ventilation, air conditioning, domestic hot water and lighting systems. This includes the different possible indicators as well as a method to normalize them b) Ways to express energy requirements for the design of new buildings or renovation of existing buildings c) Procedures to define reference values and benchmark d) Ways to design energy certification schemes

Table 14. CEN standards - energy performance of buildings				
Name	**(EN) number**	**Year**	**Current status**	**Description**
Energy performance of buildings : Assessment of energy use and definition of ratings	prEN 15203		currently being developed.	Defines the uses of energy to be taken into account for setting energy performance ratings for new and existing buildings, and provides: a) A method to compute the asset rating, a standard energy use that does not depend on occupant behaviour, actual weather and other actual (environment or input) conditions. b) A method to assess the operational rating, based on the delivered energy. c) A methodology to improve confidence in the building calculation model by comparison with actual energy consumption. d) A method to assess the energy effectiveness of possible improvements
Thermal performance of buildings - Sensible room cooling load calculation - General criteria and validation procedures	prEN 15255		Currently being developed.	Sets out the level of input and output data, and prescribes the boundary conditions required for a calculation method of the sensible cooling load of a single room under constant or/and floating temperature taking into account the limit of the peak cooling load of the system. It includes a classification scheme of the calculation method and the criteria to be met by a calculation method in order to comply with this standard. The purpose is to validate calculation methods used to evaluate the maximum cooling load for equipment selection and HVAC system design; evaluate the temperature profile when the cooling capacity of the system is reduced; provide data for evaluation of the optimum possibilities for load reduction; allow analysis of partial loads as required for system design, operation and control.
Thermal performance of buildings - Calculation of energy use for space heating and cooling - General criteria and validation procedures	prEN 15265		Currently being developed.	Specifies the assumptions, boundary conditions and validation tests for a calculation procedure for the annual energy use for space heating and cooling of a building (or of a part of it) where the calculations are done on an hourly basis. Does not impose any specific numerical technique. Purpose of this standard is to validate calculation methods used to describe the energy performance of each room of a building; provide energy data to be used as interface with system performance analysis (HVAC, lighting, domestic hot water, etc).

Table 14. CEN standards - energy performance of buildings				
Name	**(EN) number**	**Year**	**Current status**	**Description**
Energy performance of buildings: Overall energy use, primary energy and CO2 emissions.	prEN 15315		Currently being developed.	Collates results from other standards that specify calculation of energy consumption within a building; accounts for energy generated in the building, some of which may be exported for use elsewhere; presents summary in tabular form of the overall energy use of the building. Specifies calculation of primary energy consumption and carbon dioxide emission for the building as a whole; gives general principles for the calculation of primary energy factors and carbon dioxide emission factors.
Energy performance of buildings - Calculation of energy use for space heating and cooling -	prEN ISO 13790		(Revision of EN ISO 13790; 2004)	Gives calculation methods for assessment of the annual energy use for space heating and cooling of a residential or a non-residential building, or a part of it. Includes the calculation of heat transfer by transmission and ventilation of the building when heated or cooled to constant internal temperature; the contribution of internal and solar heat sources to the building heat balance; the annual energy needs for heating and cooling; the annual energy required by the heating and cooling systems of the building for space heating and cooling; the additional annual energy required by a ventilation system. Building can have several zones with different set-point temperatures, and can have intermittent heating and cooling. Calculation period is one month or one hour or (for residential buildings) the heating or cooling seasons. Provides common rules for the boundary conditions and physical input data irrespective of the chosen calculation approach.
Thermal performance of buildings - Heat transfer via the ground - Calculation methods	prEN ISO 13370		(Revision of EN ISO 13370:1998)	Gives methods of calculation of heat transfer coefficients and heat flow rates, for building elements in thermal contact with the ground, including slab-on-ground floors, suspended floors and basements. It applies to building elements, or parts of them, below a horizontal plane in the bounding walls of the building. Includes calculation of the steady-state part of the heat transfer (the annual average rate of heat flow), and the part due to annual periodic variations in temperature (the seasonal variations of the heat flow rate about the annual average).

Annex III – Level of implementation of CEN standards in national legislation related to energy performance of buildings

Table 15. Level of implementation of CEN standards in national legislation related to energy performance of buildings							
Country	**Name**	**(EN) number**	**Year**	**Applied for three year extension?**	**Current status**	**Based on CEN standards? (which ones?)**	**Link(s)**
Austria	OIB -Guideline	ÖNORM B 8110-1, ÖNORM B 8110-2, ÖNORM B 8110-3, ÖNORM B 8110-4, ÖNORM B 8110-6, ÖNORM B 8110-5, ÖNORM H 5055, ÖNORM H 5056, ÖNORM H 5057, ÖNORM H 5058, ÖNORM H 5059	2007	no	finished in May 2007		http://www.on-norm.at/publish/normung_europa.html?&L=0%3BL%3D053D0 http://www.oib.or.at/
		ÖNORM EN ISO 13790: 2004	2006			yes, EN 13790: 2004	https://www.on-norm.at/ecom/?LANG=DE&_requestid=48873
Germany	DIN standards	DIN V 4108-6	2003-06	no	currently valid.	yes, EN 832	http://www.din.de/cmd?level=tpl-home&contextid=din
		DIN V 4701-10	2003-08		currently valid.	yes, EN 832	http://www.din.de/cmd?level=tpl-home&contextid=din
		DIN V 18599 (Part 1-10)	2005		currently valid.		http://www.din.de/cmd?level=tpl-home&contextid=din http://www.ibp.fhg.de/wt/berichte/2004/jb_04_43.htm

Table 15. Level of implementation of CEN standards in national legislation related to energy performance of buildings							
Country	**Name**	**(EN) number**	**Year**	**Applied for three year extension?**	**Current status**	**Based on CEN standards? (which ones?)**	**Link(s)**
		Energieeffizienz von Gebäuden - Berechnung des Energiebedarfs für Heizung und Kühlung (ISO/DIS 13790:2005); Deutsche Fassung prEN ISO 13790:2005			currently being developed.	yes, prEN 13790	http://www.din.de/cmd?workflowname=dinSearch&languageid=de
Ireland	Dwellings Energy Assessment Procedure – DEAP		2007	no	currently being developed.		www.sei.ie/epbd/deap
UK	Standard Assessment Procedure - SAP		2007	no	currently valid.		http://www.sap-appendixq.org.uk/page.jsp?id=1
UK		BS EN ISO 13790:2004	2004		currently valid.	yes, EN 13790: 2004	http://www.bsi-global.com/en/Shop/Publication-Detail/?pid=000000000030103903
Italy	UNI standards	UNI EN ISO 13790:2005	2005	no	currently valid.	yes, EN 13790: 2004	http://www.uni.com/it/normazione/en_recep.htm
France	RT2005	RT2005	2000-2005	no	currently valid.	yes, prEN 13790	http://www.rt2000.net/ http://www.infociments.fr/infocim/M2/RT2000.pdf http://www.thermexcel.com/french/ressourc/rt2000_rt2005_rt_2000_rt_2005.htm
Belgium	Flemish Region		2007	no	currently valid.		http://www.energiesparen.be/energieprestatie/#software http://training.eebd.org/page.aspx?id=126&ui=en&lang=en&ap=1
Denmark	Sbi-direction 213: Energy demand in building			no	currently valid.	info only in Danish	http://www.sbi.dk/miljo-og-energi/energiberegning/anvisning-213-bygningers-energibehov

Table 15. Level of implementation of CEN standards in national legislation related to energy performance of buildings							
Country	**Name**	**(EN) number**	**Year**	**Applied for three year extension?**	**Current status**	**Based on CEN standards? (which ones?)**	**Link(s)**
Netherlands	Energieprestatie	NEN 5128:2004 (residential buildings) NEN 2916:2004 (non-residential buildings)	2006	no	currently valid.	no	http://www2.nen.nl/nen/servlet/dispatcher.Dispatcher?id=000013 http://www.senternovem.nl/epn/epc_in_2006/nieuwe_normen.asp
Netherlands	Guidelines on sustainable construction	National Standard on the Environmental Assessment of Building Products (NEN8006)	/	/	/	/	Netherlands Standardization Institute (NEN) www.nen.nl / www.mrpi.nl Taco van den Broek, e-mail: Taco.vandenbroek@nen.nl
Portugal	Building and HVAC regulation			no			http://www.p3e-portugal.com/_ficheiros/5/1/regulamentos_seminarios_7_11Abril.pdf
Belgium	Brussels Region			no			http://training.eebd.org/page.aspx?id=126&ui=en&lang=en&ap=1
Bulgaria	Ordinance on Energy conservation and heat retention of buildings		2005		currently valid.		http://www.mrrb.government.bg/
Czech Republic	draft implementing regulation to the Act	ČSN EN 13790-1	2005	no	currently being developed.	yes, prEN 13790	http://eshop.cni.cz/iPopWeb/ikapr/productSearchAction.do;jsessionid=0000ON44R4R2DVP3CE15TBQZI2I:-1 http://www.aeaonline.cz/

Table 15. Level of implementation of CEN standards in national legislation related to energy performance of buildings							
Country	**Name**	**(EN) number**	**Year**	**Applied for three year extension?**	**Current status**	**Based on CEN standards? (which ones?)**	**Link(s)**
Estonia				yes	currently being developed.		http://www.evs.ee/index.php3?lk=english
Greece					currently being developed.	at least partly.	http://www.elot.gr/catalogues.htm
Hungary						yes	http://www.mszt.hu/angol/index_eng.htm http://www.egt.bme.hu/
Latvia				yes	have not yet been adopted.	yes	
Lithuania	Building Technical Regulation STR 2.01.09:2005 „Energy Performance of Buildings; Certification of Energy Performance of Buildings“		2005	no		at least partly.	http://www.am.lt/VI/
Luxembourg	Verordnung über die Gesamteffizienz von Gebäuden			no	currently being revised.	at least partly, DIN EN ISO 13789 + DIN EN ISO 13370	http://www.eco.public.lu/documentation/legislation/projets_de_reglements/2006/08/21_perfen.pdf
Norway	proposal for new energy requirements	NS-EN 832	2007	no	currently being revised.	yes, prEN 13790	http://www.be.no/beweb/regler/tekhoering06/
Poland	Ordinance about the scope and form of energy certificate for building and apartments			no			www.mtib.gov.pl-projekt (server not found)

Table 15. Level of implementation of CEN standards in national legislation related to energy performance of buildings							
Country	**Name**	**(EN) number**	**Year**	**Applied for three year extension?**	**Current status**	**Based on CEN standards? (which ones?)**	**Link(s)**
Romania	According with the law 372/15.12.2005, the calculation procedures (art. 3) will be adopted by the Government until the end of 2006.			no	should have been adopted by now - no information found.		http://www.norme.ro/
Slovak Republic	The final calculation procedures (art. 3) should be adopted after the preparation of the EN standards.		2007	no	have not yet been adopted.	yes, all.	http://www.build.gov.sk/mvrrsr/index.php
Slovenia	Regulation on efficient use of energy in buildings		2007	no	currently being developed.	at least partly.	/
Spain	/		/	/	/	/	/
Sweden	There is no general calculation method and software tool for energy calculations in Sweden.			no		no	http://www.boverket.se/shopping/ShowItem.aspx?id=2331&epslanguage=SV (complete collection of regulations on building including general building code and energy requirements)
Finland					Have recently been developed by The Finnish Development Centre for Building Services Ltd. (TAKE)		http://akseli.tekes.fi/opencms/opencms/OhjelmaPortaali/ohjelmat/CUBE/en/system/projekti.html?id=7681805&nav=Project (I can't access the actual project site)

Annex IV – Harmful substances

CFC, HCFC, HFC, SF_6

As chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) contribute to ozone depletion, they are subject of the Montreal Protocol. Under Regulation (EC) 3093/94, the production of chlorofluorocarbons, other fully halogenated chlorofluorocarbons and other ozone depleting substances (ODS) has been phased out. Council Regulation 2037/2000 is the European Union's current legislative instrument to phase-out ODS. The most relevant application of HCFCs for the building sectors has been the production of foams. From 1 January 2004, the use of HCFCs for the production of all foams, including polyurethane spray and block foams, shall be prohibited.

While hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF_6) do not deplete the ozone layer, they belong to the six main greenhouse gases (the others are carbon dioxide, nitrous oxide, methane and perfluorocarbons), which are subject to the Kyoto Protocol and have to be included in the national greenhouse gas inventories. Some Member States have prohibited or constrained the use of HFCs and SF_6 by national regulations. A number of public authorities have also enacted council resolutions concerning the renouncement of HCFCs (before Council Regulation 2037/2000 was adopted) and HFCs in public procurement.

Volatile organic compounds (VOC)

It is a matter of definition whether a chemical is to be regarded as being a volatile organic compound (VOC) or not. A common definition of a VOC is an organic compound having a boiling point less than or equal to 250ºC measured at a standard pressure of 101.3 kPa. VOCs undergo chemical reactions in the atmosphere, that cause a number of indirect effects, in particular the formation of photochemical oxidants such as tropospheric ozone, which is one of the big remaining air quality problems in the EU. When highly concentrated in the air, ozone can impair human health and can damage forests, vegetation and crops.

Furthermore, VOCs are one possible source of indoor pollution. VOCs may also cause headaches, fatigue or irritation to the eyes, nose, throat, lungs or skin. Additionally, some solvents can also be absorbed through the skin (e.g. butylglycol).

Directive 2004/42/EC[55] aims to prevent the negative environmental effects of emissions of VOCs from decorative paints and vehicle refinishing products. It lays down maximum limits for the VOC content of these products. The sub-categories of the relevant products are listed in Annex I to the proposal. Limit values for decorative paints in phase I range from 50 g/l for water borne primers to 750g/l for some special solvent borne primers (the so-called “binding primers”). For phase II (applicable from 1 January 2010), limit values will be further lowered significantly for most categories.

[55] Directive 2004/42/EC of the European Parliament and of the Council of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in decorative paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC.