

A policy framework for Energy Performance Assessment for existing dwellings

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Energy Performance Assessment
Method for Existing Dwellings

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1 Introduction

The “Policy Paper” of the EPA-ED project tries to give policy makers and stakeholders outside the inner expert circle on the EU directive of energy performance for buildings (EPBD) useful orientation and advice regarding to their efforts on implementation of the EPBD procedures in national and/or regional law.

The EC-funded project EPA-ED is focussed on existing residential buildings and dwellings, the available Policy Paper focuses on this core, too.

During the processing time of EPA-ED a lot of tools, guidelines, process models and a special EPA software tool have been developed. All of these EPA-ED tools are field-tested in national case studies and pilot projects. The output of this pilot projects on residential buildings includes a lot of experience on the specific problems of implementation of the EPBD in the existing building stock.

Besides this report the resulting know how is documented in a couple of other reports, guidelines, and brochures of the EPA-ED project. All of them are available on the project’s Website: www.epa-ed.org (Download in PDF-Format).

However, this report describes possible and useful activities of stakeholders and policy makers “on the way to successful implementation of the EPBD in existing dwelling stock”.

Chapter 2 gives a short overview on the legal basis of energy performance assessment in Europe, dealing with some general statistics, and the given regulation of the European Community. The special requirements on the EPBD for existing buildings are summarised by a fact sheet on “Existing Buildings” regarding to EPBD.

Chapter 3 explains the EPA-ED scheme for energy performance assessment on existing dwellings. In this chapter you will find a compressed, but informative documentation of the EPA-ED process. Chapter 3 also shows you, which kind of support EPA-ED has been preparing for you. A lot of cross-references to other EPA-ED reports and information sources from outside EPA-ED will help orientating through the different tools and methods related to the EPBD.

Chapter 4 gives an outlook of policy instruments, being in line with the needs of a successful implementation of the EPBD.

Some conclusions and recommendations complete this report.

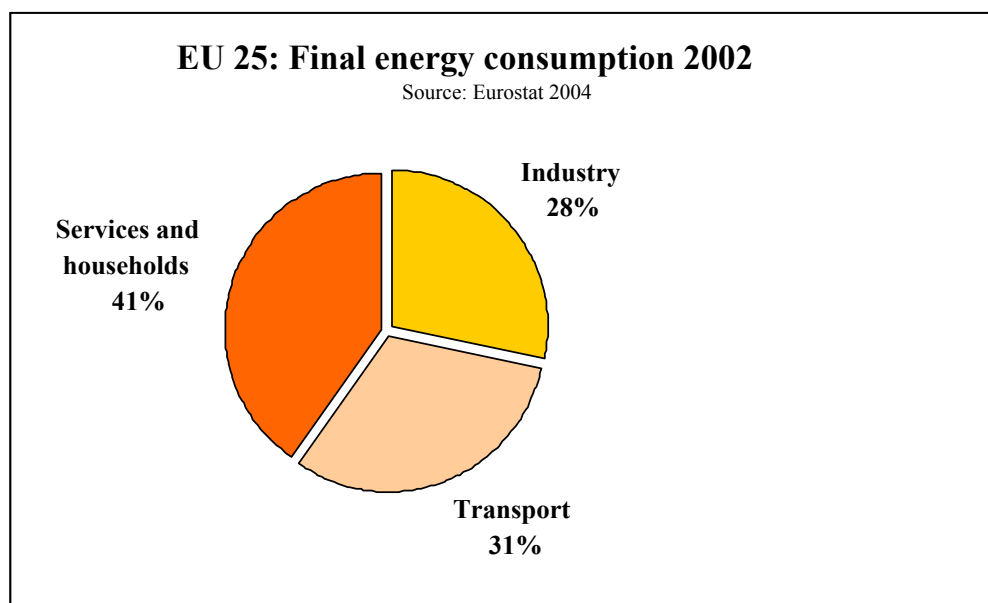
2 The legal basis of energy performance assessment in Europe

2.1 General information

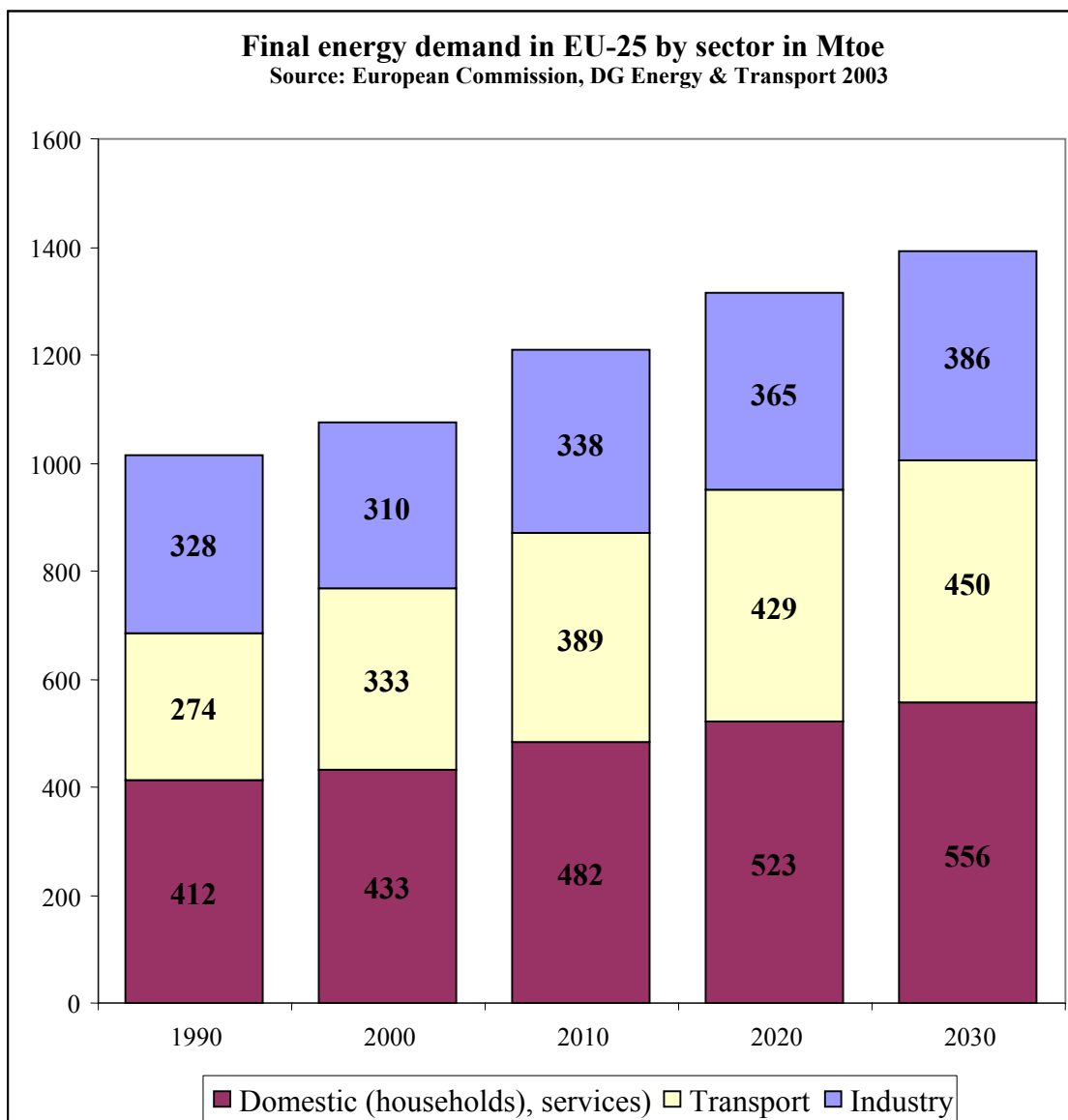
To succeed in cutting its greenhouse gas emissions to 8% below 1990 levels by 2008-2012, as required by the Kyoto protocol, the European commission has launched the European Climate Change Programme (ECCP) in 2000.

This Programme wants to establish a community strategy for the implementation of the Kyoto protocol.

In the 25 EU member states nearly 41 % of the final energy consumption is resulting from the building sector (buildings for housing and services). Regarding this fact, the building sector is the most important sector for setting activities in order to fulfil several goals of the Kyoto protocol, and the European Climate Change Programme.



The European Commission – DG for Energy and Transport, published an energy outlook study (“European Energy and Transport Trends to 2030”) which confirms the actual relevance of the building sector for the future. Without significant activities the total energy demand will increase, and the building sector will maintain its important role as well.

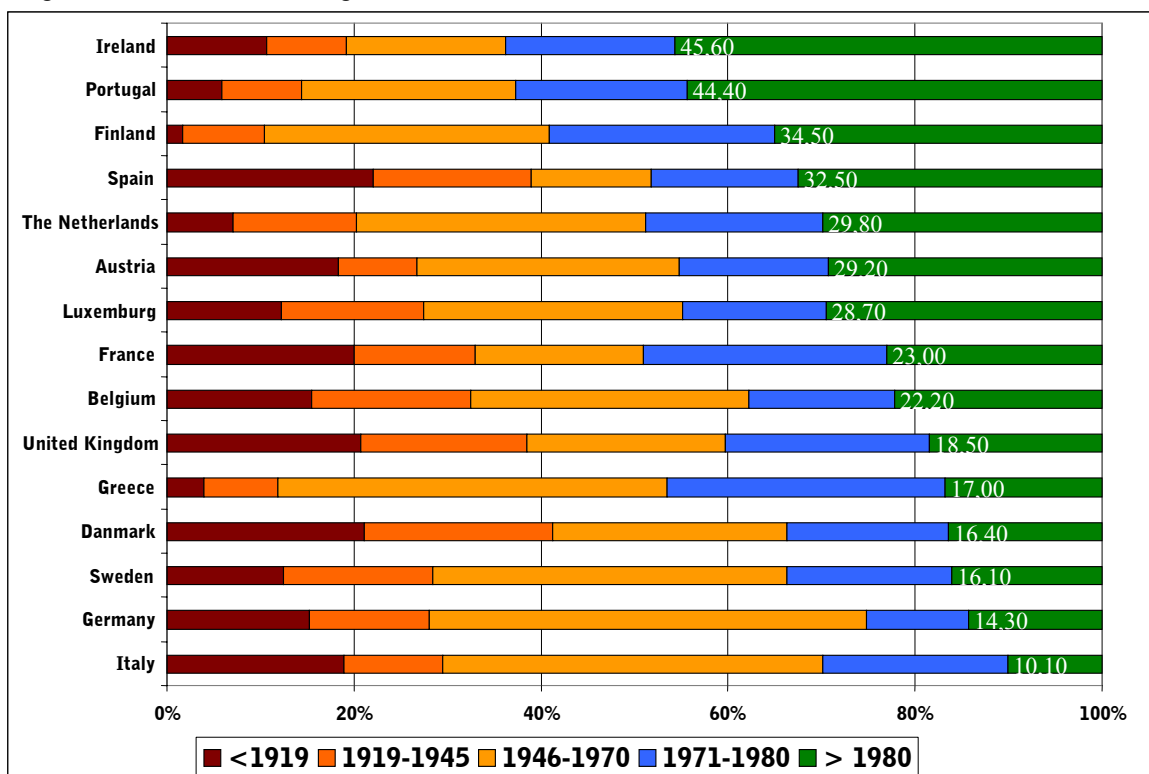


Source: European Commission, DG Energy and Transport: European Energy and Transport Trends to 2030. January 2003.

Within the first ECCP report, cost effective measures for the reduction of green house gas emissions were identified and a list of priority actions on community level was given. Within this actions, promotion of energy performance of buildings took an important part, and a new directive on energy performance of building was recommended. The Directive 2002/91/EC on the energy performance of buildings (EPD) was adopted finally in late 2002 and builds up an overall framework to promote energy efficiency of buildings. This Directive has to be implemented until the 4th of January, 2006 into national law by the EU members.

The energy performance of a building should include all the aspects which determine energy efficiency and not just the quality of the building's insulation. This integrated approach should take account of aspects such as heating and cooling installations, lighting installations, the position and orientation of the building, heat recovery, etc. Energy performance certificates should be made available when buildings are constructed, sold or rented out (for detailed information see chapter 2.2). As shown in the table below, the share of buildings older than 20 years ranges in most of the member states between 70 and 90 percent from the overall building stock. There is a high potential for energy saving in major part of the existing dwelling stock. For this large amount of European buildings adequate methods on calculation, assessment, and advice are needed, in order to provide an energy performance certificate in a efficient way. EPA-ED is addresses this issue and provides professional solutions for a energy performance assessment for existing dwellings (for more information on EPA-ED see chapter 3.)

Figures: The EU-15 Building Stock

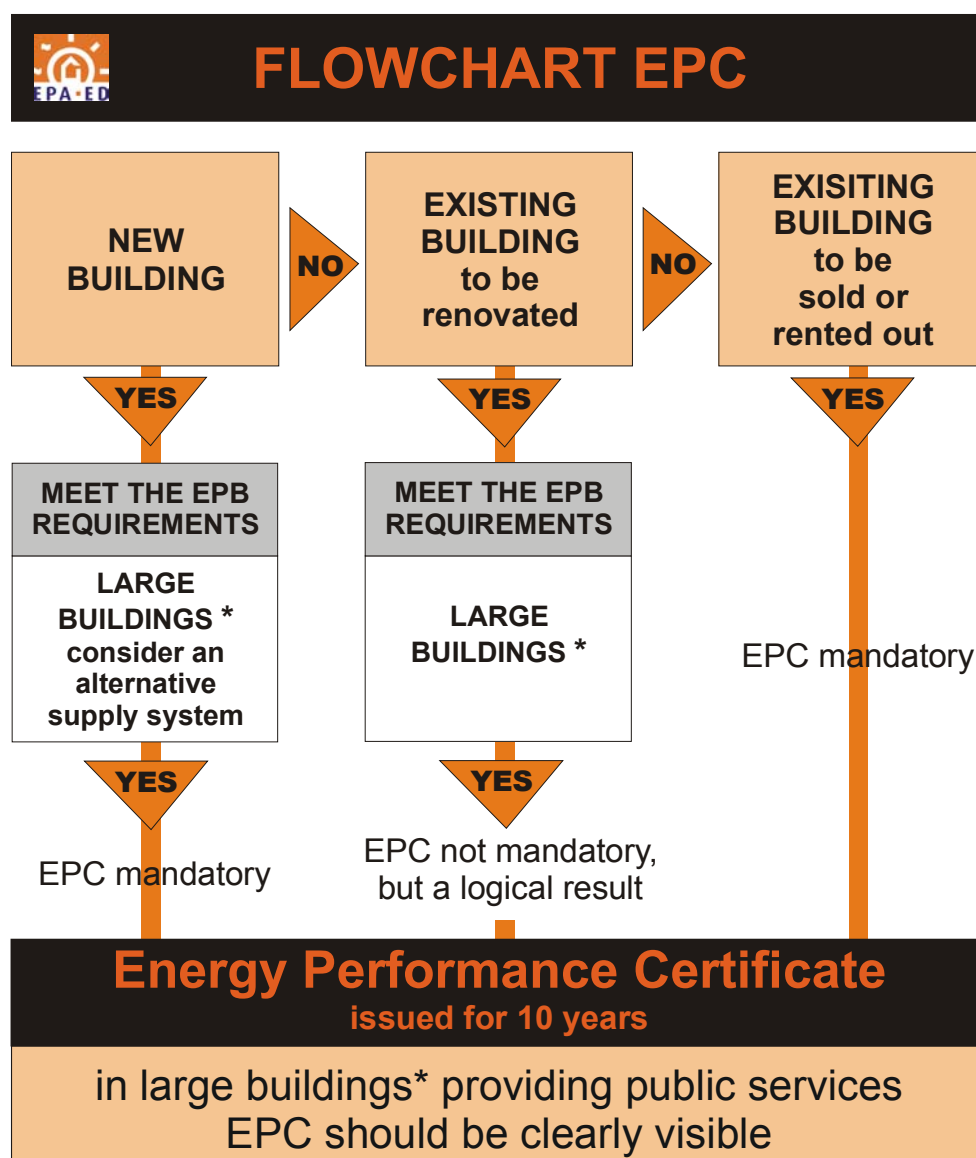


Source: National Agency for Enterprise and Housing: Housing Statistics in the European Union 2003. Denmark 2003.

2.2 The EC-Directive on energy performance of buildings

Actually the Directive on the Energy Performance of Buildings (EPBD) is the most important legislative instrument for reducing the energy consumption of buildings in the European Community. Parts of this directive with relevance for the existing building stock can be found in Appendix A. The following information (flowchart and textbox) gives a summary of relevant articles and aspects of the EPBD, and is focused on the requirements for existing buildings. The fact-sheet can also be used as a “small checklist” for the assessment on the “necessity to execute” the directive for the existing building stock on a national and/or regional level.

Figures: Decision aid for the application of Energy Performance Certificates



* LARGE BUILDINGS: over 1000m² floor area

Source: EBM Consult / Bart Poel, 2004; own graphic design

FACT-SHEET: Existing buildings & the directive on the energy performance of buildings

A. Which kind of existing buildings does the EU directive on the energy performance of buildings primarily address?

- All existing buildings should have an **Energy Performance Certificate** when sold or rented out.
- Existing buildings subject to major renovation and a total useful floor area more than 1000 m², will have to meet **Energy Performance requirements**.
- Existing buildings with an usefull floor area over 1000 m², occupied by public authorities and by institutions providing public services visited by a large number of persons, should **display an Energy Performance Certificate** in a prominent place.

B. What is a major renovation ?

Major renovations are cases such as those where the total cost of the renovation related to the building shell and/or energy installations such as heating, hot water supply, air-conditioning, ventilation and lighting is higher than 25 % of the value of the building, excluding the value of the land upon which the building is situated, or those where more than 25 % of the building shell undergoes renovation.

C. Which kinds of requirements have to be set for existing buildings referring to point A and B?

For all of these buildings a set of minimum energy performance requirements will be set by the national and/or regional governments in the member states. The official deadline for the definition of this requirements is January 4, 2006. If there is a lack of qualified and/or accredited experts, the member states have an additional period of three years to apply the directive.

The most important requirement is related to the "energy performance of a building" (EPB). This EPB can be expressed as a numeric indicator. The EPB is defined as the amount of energy actually consumed or estimated to meet the different needs associated with a standardised use of the building, which may include, inter alia, heating, hot water heating, cooling, ventilation and lighting.

D. What does point C stands for in practice?

The fulfillment of these requirements will include the calculation and assessment of the EPB before and after renovation. Measures in renovation have to improve the energetic quality of existing buildings.

E. Which kinds of energy saving measures are thinkable?

Possible measures in existing buildings include insulation of the building shell; improving technical systems in heating, cooling, and/or ventilation of the building; installation of energy supply systems using renewable energy resources (solar, biomass, ...); and/or improving the quality of the energy consumption system(s) of the building (e.g. lighting). The effects on different measures have to be discussed and communicated between experts (e.g. consultants, building owners) and users (e.g. dwelling owners, tenants). Therefore the "Energy Performance Certificate" will be the most important instrument.

F. What is an Energy Performance Certificate (EPC) that should be issued ?

An energy performance certificate is a certificate on the energy performance of a building. It includes the EPB expressed in a numeric indicator and reference values (e.g. current legal standards and benchmarks) in order to make it possible for consumers to compare and assess the energy performance of the building. The certificate shall be accompanied by recommendations for the cost-effective improvement of the energy performance.

For each building, which should be sold or rented out, an EPC has to be available to the owner or by the owner to the prospective buyer or tenant. The validity of the certificate shall not exceed 10 years.

G. Are there any special measures designed on boilers, and/or air-condition systems in existing buildings?

Boilers: regular inspections (fired with non-renewable resources) for boilers with an effective output rate of 20kW to 100 kW; output rate >100 kW – inspection every two years (gas: max. four years). For heating installations with boilers of an effective rated output of more than 20 kW which are older than 15 years, the Member States shall lay down the necessary measures to establish a one-off inspection of the whole heating installation (including assessment of the boiler efficiency, boiler size,...). On the basis of this inspection, the experts shall provide advice to the users on the replacement of the boilers, other modifications to the heating system and on alternative solutions.

Air-condition systems: regular inspection of systems of an effective rated output of more than 12 kW. This inspection (including assessment of the air-conditioning efficiency and the sizing) shall be provided to the users on possible improvement or replacement of the air-conditioning system and on alternative solutions.

2.3 EPBD and status of implementation in Europe

Referring to the date of transposition of the EPBD, the Member States of EU-25 have to improve their activities on implementation of the directive in the next months. On January 4, 2006 the most important requirements of EPBD have to be defined (see articles 1 to 6 of EPBD), and national (and/or regional) law has to be compatible with the EPBD. Only in the case of a “lack of qualified and/or accredited experts”, the member states have an additional period of three years to apply the articles 7,8, and 9 of directive (dealing with existing buildings, boilers, and air-condition systems).

At the moment it is very difficult to give a reliable overview on the actual status of implementation in the Member States: New activities, decisions, and steps on implementation are being set up nearby every month in the different countries. Several networks, working groups on an international, national and/or in some of the Member States also on the regional level are working hard at the moment. Most of the member states will probably use the additional period three-year period to fully implement the Directive.

International projects, web sites and networks (most of them with funding by the EU) are in force facilitating the implementation of the Directive. An Important initiative is the Concerted Action that serves as an exchange platform for policy makers. The European Commission supports this activity. CEN, the European Standardization Organization is developing a series of standards that will form a basis for the harmonization of the local EPBD framework and the tools. A list of useful web sites is provided on the EPA-ED website (www.epa-ed.org). The EPA-ED methodology and tools are in line with the EPBD and the CEN-standards currently available. New standards can be incorporated relatively easy.

In Appendix C an overview of the difference in the status of implementation of the EPBD in several Member states is presented based on recent literature (EUROACE 2004, ENPER-TEBUG 2003).

Most of them are preparing new regulations and consider the development of tools in order to fulfill the requirements of the EPBD.

EPA-ED has been developing methods, tools, and standards for an energy performance assessment for existing dwellings in accordance with the EPBD.

3 EPA-ED: a scheme for energy performance assessment of existing dwellings

Implementing the EU directive for the energy performance of buildings (EPBD) in the field of existing buildings into national law, needs different national strategies on energy performance assessment for buildings.

This kind of strategies must relate to the following aspects:

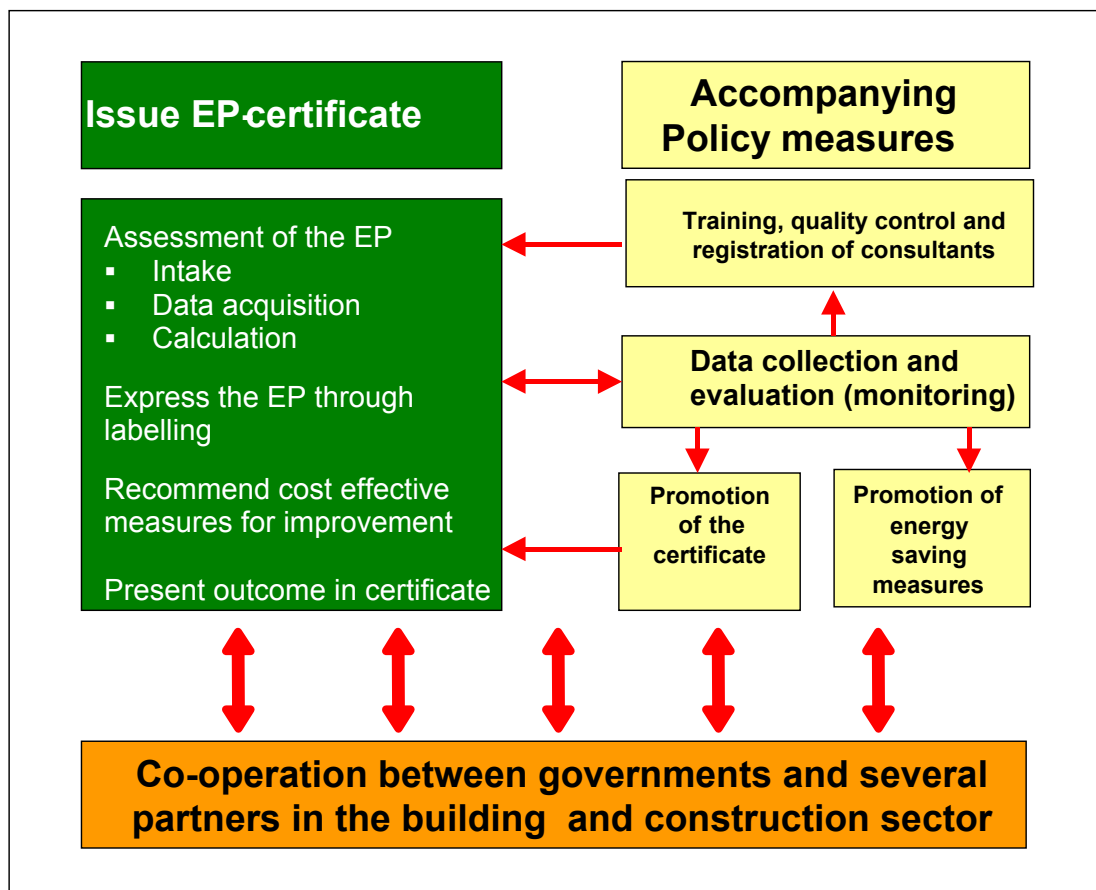
- National strategies have to fit the specific context which is given by the national building stock and stakeholders. In different countries the constitution of the building stock varies significantly: There are different building types, regarding to the age, the ownership, the technical standards of the buildings, the regional climate, and aesthetic and architecture, both defined on socio-cultural aspects of the sites.
- However: Keep it smart and simple! The KISS-principle should be the core force in any part of an implementation strategy. This principle couldn't be stressed enough: Each of the European countries has its own building culture, but not even each country needs its fully-specialized legislation on EPBD.
- Actually a lot of European networks and projects is developing tools, methods, and standards (including parameters for calculation, construction elements, ...): Learn from this projects and don't be afraid by stealing their ideas. In each country one or more institutes, and/or consultants are working about the implementation of the EPBD – get in contact with them.

Besides this general notes on implementation, the following aspects should be borne in mind:

- 1. Successful energy performance assessment and certification of existing buildings includes**
 - the inspection of the existing building on a high quality level,
 - the calculation of the existing and the possible energy performance,
 - the labeling of assessed buildings,
 - recommendations of measures for the improvement of the building.
- 2. In conjunction with these consultancy activities, there is a need for accompanying measures:**
 - training and registration of high-level-experts for EPBD,
 - data collection and evaluation of the assessed buildings, and the improvement of the overall implementation strategy,
 - the promotion of the energy certificate on the national and/or regional level,
 - the promotion of the results of the chosen energy-saving measures.
- 3. Beside this a successful implementation of the EPBD will benefit a lot from coordinated activities, through the involvement of:**
 - the regional governments in the member states
 - the building and construction industries, like producers of building materials (e.g. insulation materials), producers of technical equipment for heating, cooling, and ventilation;
 - property developers, investors in the building sector;
 - national associations for architecture, engineering, and construction consultants;
 - institutions for the education and further education in the construction sector, (e.g. universities, training institutes, ...)

The following picture gives an overview of the different accompanying policy measures and components for energy assessment of existing buildings.

Figure: The EP-certificate and accompanying measures.



Source: Own development

Each of these EPBD components has to be adopted to national requirements, using the already existing basis principles of EPA-ED (see also www.epa-ed.org).

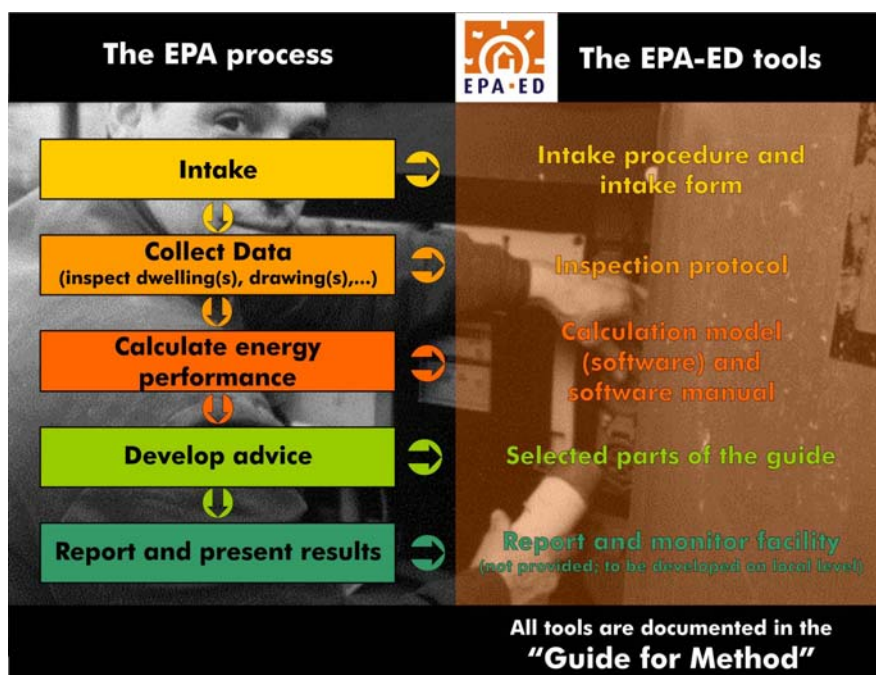
With the legal basis in mind (see Chapter 2) it can be stated that EPA-ED focuses on the calculations for the energy performance certificates regarding to the EPBD. But EPA-ED is not only a calculation tool. EPA-ED also provides checklists and tools for the building inspection, proposals on the labeling of buildings, and an overall process model for fulfilling the EPBD. In the sections below these parts of EPA-ED are presented, a description of accompanying measures completes the possibilities of implementation the EPBD.

3.1 Energy Performance Certificate

The Energy Performance certificate, which has to be handed over to buyers and tenants, is the result of the energy performance assessment. The process to achieve an energy performance certificate includes the following stages:

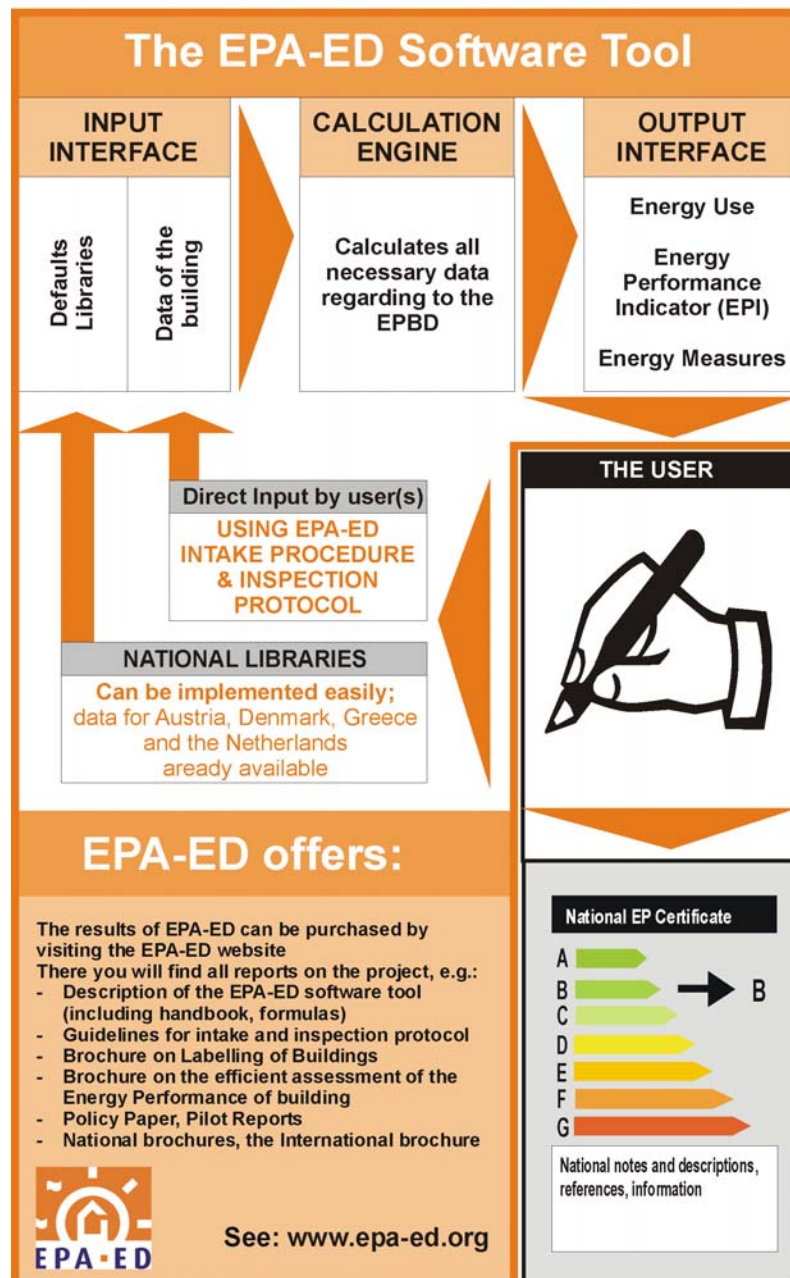
- **INTAKE:** during the first contact with the client the assessment process is discussed and the information need made explicit. EPA-ED is working with a report on the intake procedure that provides guidance and contains an intake form.
- **COLLECT DATA from the user/owner, drawings and inspection of the building:** adequate inspection of the building is crucial. EPA-ED provides the report “Guidelines for an inspection protocol”
- **CALCULATE ENERGY PERFORMANCE:** based on the collected data the energy performance is calculated resulting in an energy performance indicator: the EPA-ED software tool is in accordance with the EPBD and reflects all relevant CEN-standards available.
- **Labelling of the building** in terms of making the calculated indicator comparable is defined on local level. The software provides all necessary data to establish a label (see also section 3.2. Labeling of Buildings)
- **DEVELOP ADVICE:** from the calculations of the energy performance an energy saving advice can be specified together with the cost effectiveness using the EPA-ED software tool.
- **REPORT AND PRESENT RESULTS:** The software results in a variety of data that can be included in a report and can act as a basis for monitoring. Guidance for the content of a report is given in the EPA-ED report “Guide for the use of the EPA-ED method”, September 2004, report number: EPA-ED OTB 0402, Author: Jan-Willem Smit, OTB Research Institute, The Netherlands”

All these stages in the process have been addressed by the EPA-ED project, as you can see in the figure below on the structural scheme of the EPA-ED Tools:



The tools prepared by EPA-ED fulfill all requirements of the EPBD, focused on the issues of existing buildings (particularly articles 3, 4, and 7 of the directive). However, the calculation of the energy performance of buildings needs efficient instruments and software tools, which are reducing complexity to their users. EPA-ED offers you a lot of tools and methods in order to implement the EPBD for existing dwellings on regional and/or national level (see figure).

Figure: Input – Output Scheme of the EPA-ED process



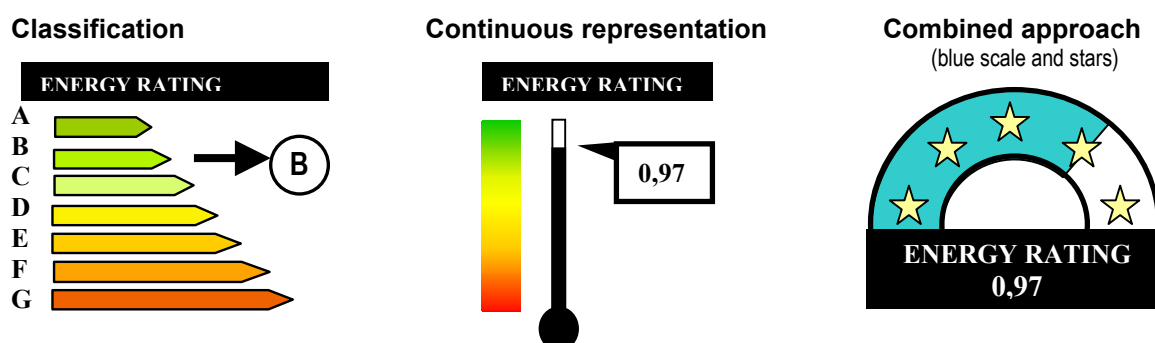
Source: EPA-ED 2004, own drawings.

3.2 Labelling of Buildings

The Commission's decision on the EPBD implies the labeling of buildings based on energy performance indicators. In contrast to singular methods of building assessment, labeling schemes are concentrated on comparisons of different buildings of the same type (like the use of a building, the age of a building, or the construction type of a building).

Energy Labeling of Buildings becomes a new strategy for communication of the goals of energy policies in Europe in even more European countries in the last years (e.g. in the UK, Denmark, Germany, Austria, ...).

Figure: Examples for different kind of Energy Labels of Buildings



Source: EPA-ED brochure on Energy Performance Labeling of Buildings, August 2004.

One of the most interesting initiatives on Energy Performance Labeling on European Level is given by the "Display Campaign" (see www.display-campaign.org) of "Energy Cities" (see www.energie-cities.org), an European Network Project which is funded by the European Commission. DISPLAY is focused on improvement of the energy performance of buildings of municipalities, which is also a core task of the EPBD.

DISPLAY provides an own energy label and a calculation method (including software) for the building stock of municipalities:



The flyer includes the following information:

- Sample Energy Label:** For Wyvern First School, showing Energy consumption (135 kWh/m²), CO₂ emissions (25 t/m²), and Water consumption (316 l/m²). The label is categorized as 'B'.
- An exemplary partnership!**
 - Co-ordination: Energie-Cities, the association of European local authorities promoting local sustainable energy policy.
 - Partner cities: Almada (PT), Malmö (SE), Charlton (SE), Milton Keynes (GB), Cork County (IE), Modena (IT), Frankfurt a.M. (DE), Newcastle upon Tyne (GB), Graz (AT), Odense (DK), Helsinki (FI), Pápa (HU), Iasi (RO), Rennes (FR), Lausanne (CH), Rochefort (FR), Leicester (GB), Stará Zagora (BG), Lubochova (SK), Utrecht (NL).
 - Experts: Sophie Atali - ICE (FR), Zdravko Gvozdchev - EnEffect (BG), Prof. Dr. Thomas Lüdtendorf, University of Karlsruhe (DE), Andrea Ricci - ISS (IT).
 - Contact: Peter Schikien, E-mail: display@energie-cities.org
- display logo:** Energie-Cities' European Municipal Buildings Climate Campaign.
- Message:** "To improve the energy and environmental performance of your municipal buildings. Join the European Campaign Display!"
- Website:** www.display-campaign.org

Source: www.display-campaign.org

Interested municipalities can sign up this campaign in order to promote the aims of the EPBD in the public sector, and the private sector as well.

At the moment the following cities are participating in the display campaign:

Countries	Cities
AUSTRIA	Graz
BELGIUM	Charleroi
BULGARIA	Stara Zagora
DENMARK	Odense
FINLAND	Helsinki
FRANCE	Rennes, Rochefort
GERMANY	Ettlingen, Saarbrücken, Stadt Frankfurt am Main
HUNGARY	Pécs
IRELAND	Cork County
ITALY	Modena
NETHERLANDS	Utrecht
PORTUGAL	Almada
ROMANIA	Iasi
SLOVAKIA	Lubochna
SPAIN	Gijón
SWEDEN	Malmö
SWITZERLAND	Lausanne, Martigny
UNITED KINGDOM	Leicester, Milton Keynes, Newcastle upon Tyne

Source: www.display-campaign.org

Besides the basic necessities of the EPBD for municipalities and governments this campaign is also a best practice example for activities on public relation and communication on the overall tasks of the EPBD.

3.3 Definition of technical standards

In order to support the member states to fulfill the requirements of the EPBD for existing buildings, technical standards are being defined. CEN – the European Committee for Standardization is preparing a set of standards related to the EPBD. An overview of this set of standards and their interactions is described in an umbrella document. The standards will touch a wide range of subjects from labelling schemes, calculation methods to component testing. (see www.cenorm.be). In most of the EU member states specialised working groups on standardisation are working on transformation and incorporation on local level. This is one of the important challenges for the EU member states.

Within the EPA-ED project the tools and the software are designed to be flexible towards the modification resulting from standards to be issued in the near future. Especially the architecture of the software (modular calculation engine, user interface and libraries) facilitates a relative simple and cheap adaptation to future developments. Also fine-tuning to the local situation in order to create an efficient assessment process is easy to realise.

3.4 Actors and stakeholders involvement on EPBD

The EPA-ED method offers the opportunity to encourage the rational use of energy (RUE) and renewable energy sources (RES) in existing residential buildings. Next to using the EPA-ED method for energy labeling purposes when selling or renting out dwellings, as demanded by the European Energy Performance Directive (EPD), another approach for using the EPA-ED method is by integrating this into the control and maintenance of a dwelling.

In the report “Strategy for stimulating RUE and RES in existing dwellings” for this purpose strategies have been developed that try to identify possible use of the EPA-ED method at so called “natural moments”: Examples of such “natural moments” are maintenance activities which can differ from regular maintenance of the performance of a building to upgrading of the performance of a building by a complete refurbishment.

The figure below gives an overview on a typology of owners/users of existing residential buildings, types of possession, and possible actions regarding to the renovation of existing buildings. This report gives information on the participating actors, core messages, and the most important facts to involve the usage of RUE and RES in existing residential buildings. Based on this market characteristics it describes individual strategies for six interventions: :

- Strategy 1: Selling
- Strategy 2: Maintenance individual dwelling
- Strategy 3: Maintenance group of dwellings
- Strategy 4: Renovation individual dwelling
- Strategy 5: Renovation group of dwellings
- Strategy 6: Strategic Asset Management

Typology of owner/users	Types of possession		Selling (EPBD)	Renting out (EPBD)	Major renovation (EPBD) Major renovations	Maintenance	Strategic Asset Manag.
Social rent	Housing associations	All building types in large repetitive numbers	X (Strat. 1)	X	X (Strat. 4/5)	X (Strat. 2/3)	X (Strat. 6)
	Municipalities	All building types in large repetitive numbers	X (Strat. 1)	X	X (Strat. 4/5)	X (Strat. 2/3)	X (Strat. 6)
Commercial rent	Private persons	Individual	X (Strat. 1)	X	X (Strat. 4)	X (Strat. 2)	
	Large real estate investors	All building types in large repetitive numbers	X (Strat. 1)	X	X	X (Strat. 2/3)	X (Strat. 6)
Owner occupied	Individual owner	Individual	X (Strat. 1)		X (Strat. 4)	X (Strat. 2)	
	Association of owners	Multi-family building			X	X (Strat. 3)	
Tenant	Individual tenant	Individual				NL	
	Tenant association	Multi-family building			DK	DK	

Figure: Typology of owner/users and types of possession, combined with possible actions as characteristics for developing RUE/RES strategies (some situations are typical Dutch (NL) or Danish (DK))

Also additional benefits can be defined by including aspects of maintenance, health care, improvement of the economic value of the building by taking measures on the improvement of the energy performance in action. The core message should be: the value added is much more than saving of energy costs.

Additionally to this kind of strategies, the following stakeholders have a big influence on the successful implementation of the EPBD:

- **Architects:** Not all architects are interested in the energy performance of buildings, yet less have the competence to develop successful measures in order to improve the energy performance of buildings. Therefore special requirements on information and communication are needed.
- **Real estate funds:** Real estate funds are dealing with high quality developments in the construction sector. Kind of site management, income from property and investment, operating revenues are typical indicators for the managers of real estate funds. If it is possible to succeed in taken the energy performance into account of real estate funds, a big step forward on implementation of the EPBD will be done.
- **Financing institutions:** Financing institutions decide more the less on the available budget for renovation measures. If the bank-financing strategies don't include meaningful measures on the energy performance of existing buildings, the building owners will get in conflict with economic interests. The financing institutions should be involved in developing national strategies on EPBD.
- **Environmental Agencies:** In some countries the construction sector, energy consumption, and different public authorities and organisations administrate environmental impacts. In these cases interdisciplinary workgroups for the implementation of the EPBD should be arranged at an early stage of the implementation process.
- **Public building owners:** Public authorities in the role of building owners should be set positive examples. Therefore they should carry out the EPBD on high level standards wherever it is possible (and not only under formal execution of the EPBD).

An example of co-operation between the European Commission and the construction industry as an important stakeholder is given by the EUROACE network. EuroACE, the European Alliance of Companies for Energy Efficiency in Buildings was formed in 1998 by twenty of Europe's leading companies involved with the manufacture, distribution and installation of a variety of energy saving goods and services. EUROACE offers its members information about the ongoing implementation process of the EPBD on the European level (see www.euroace.org).

3.5 Training and registration of the consultants

Regarding accuracy of the measured energy performance of an existing dwelling, data collected by a consultant in the Inspection of a building have a very strong impact on the outcome of the calculation of the Energy Performance Indicator. For a reliable data basis and the comparability of the collected data, consultants have to be aware of what are the sensible points in the Stage of Inspection.

Requirements regarding qualification of the consultants have therefore to be defined, additional training helps promoting a more accurate Data output. Requirements regarding qualification can be a certain number of working years and/or a certain level of education. Registration of the consultants helps building owners to find a qualified and reliable consultant.

3.6 Public awareness and knowledge of the scheme

If regulations and instruments are not or not enough known in the target groups, this can lead to their incomplete implementation. Results from evaluation of energy labeling in Denmark show that there is still a high percentage of houses that are not labeled. Successful implementation of obligatory maintenance of boilers in Greece failed as a consequence of poor knowledge of the public about possible energy savings through maintenance, and low capacities of the ministry. Therefore, promotional measures have to be taken to make the scheme known among the target group, which is, in this case, building owners and tenants, but also real estate agents.

According to the EPBD, possible measures to improve the energy performance of a building have to be pointed out with the assessment procedure. This requirement can be met with the structure of the certificate handed out to the building owner. But to make sure recommended improvements will be carried out, some more emphasis has to be put on promotion of energy saving measures, both among building owners and tenants and on the building sector, including construction businesses, architects and engineers.

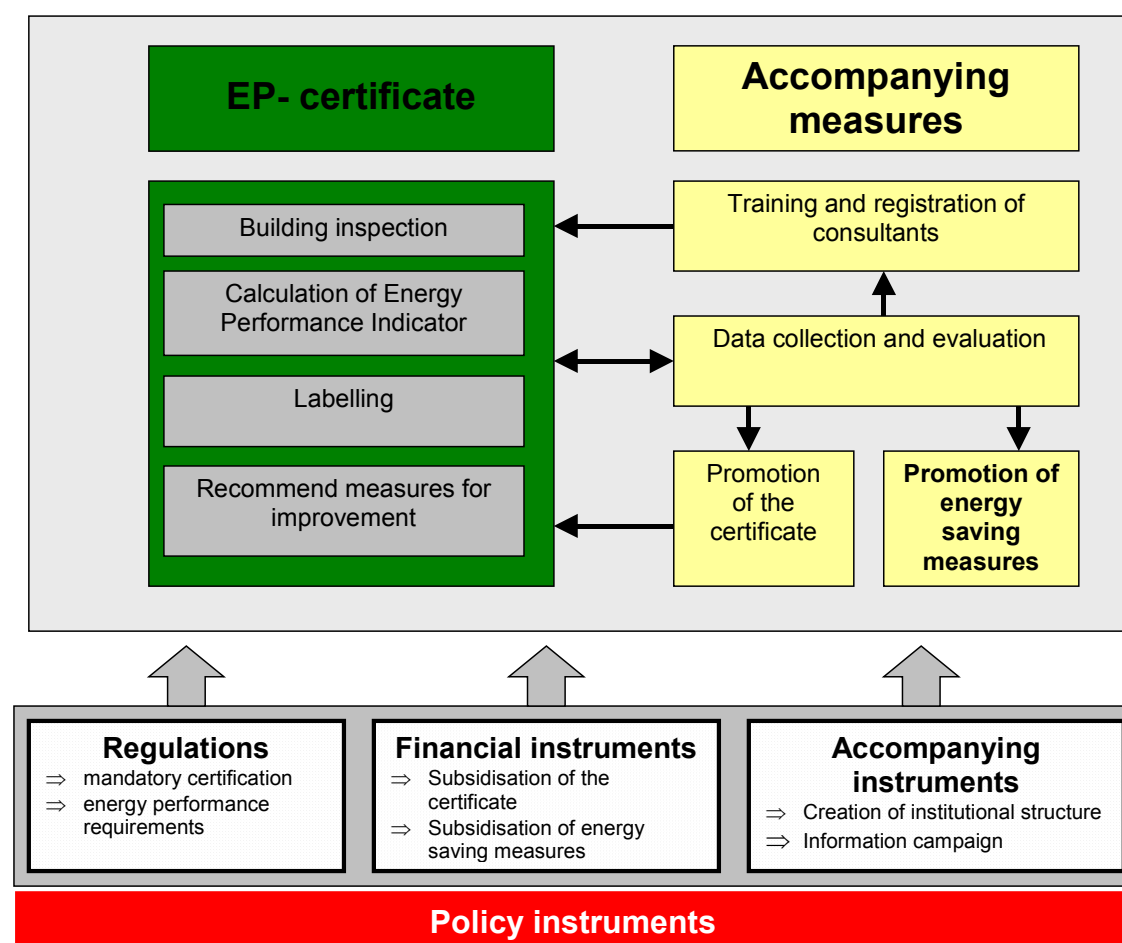
3.7 Management of data

The implementation of the EPBD will lead to a large amount of data on energy performance of existing buildings through energy performance certificates. These data can be, on one side quality control of the scheme, but also a basis for adaptation or introduction of policies, as financial incentives for energy saving measures. In order to be able to use the collected data, they have to be accessible on a central level, and there have to be resources to evaluate these data.

4 A policy framework for the EPBD

As shown in the EPA-ED scheme, translation into new policies or adaptation of existing policies has to meet a number of needs in order to achieve successful implementation. Though policies in the EU member states may differ a lot due to various factors (see section 2.), a general guideline for policy implementation shall be given in this chapter.

The following picture shows how different policy instruments refer to the scheme of EPA-ED:



Some accessions to these instruments have been already drafted in chapter 3 of this report (e.g. under 3.6. Public awareness).

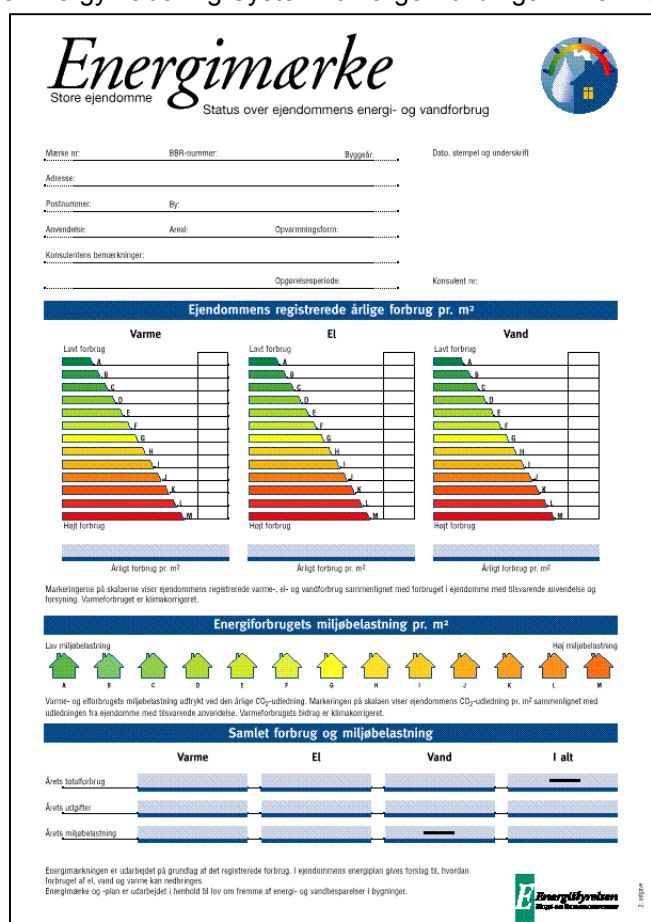
4.1. Regulations

All regulations on energy performance assessment of existing buildings have to fulfil the requirements of the Energy Performance Directive.

As shown above, this means introduction of a mandatory certification scheme and setting of energy performance requirements for both new and existing buildings (energy performance requirements for existing buildings are only needed when they are subject to major renovation and larger than 1000m², see article 6 EPBD) in all member states

The design of the regulatory implementation will depend strongly on national structures. While in some member states, existing schemes will have to be adapted only (e.g. EPA from the Netherlands and ELO from Denmark), other member states will have to introduce new regulations on energy performance requirements.

Figure: ELO – the Energy Labelling System for large Buildings in Denmark



Energimærke
Store ejendomme Status over ejendommens energi- og vandforbrug

Mærke nr.: _____ BBR-nummer: _____ Byggeår: _____ Dato, stempel og underskrift: _____
 Adresse: _____
 Postnummer: _____ By: _____
 Anvendelse: _____ Areal: _____ Opvarmningsform: _____
 Konsulentens bemærkninger: _____
 _____ Opførelsesperiode: _____ Konsulent nr.: _____

Ejendommens registrerede årlige forbrug pr. m²

Varme		El		Vand	
Årligt forbrug pr. m ²	Årligt forbrug pr. m ²	Årligt forbrug pr. m ²	Årligt forbrug pr. m ²	Årligt forbrug pr. m ²	Årligt forbrug pr. m ²
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10
11	11	11	11	11	11
12	12	12	12	12	12
13	13	13	13	13	13
14	14	14	14	14	14
15	15	15	15	15	15
16	16	16	16	16	16
17	17	17	17	17	17
18	18	18	18	18	18
19	19	19	19	19	19
20	20	20	20	20	20

Mærketallet på skiltet viser ejendommens registrerede varme-, el- og vandforbrug sammenlignet med forbruget i ejendomme med tilsvarende anvendelse og forsyning. Varmeforbruget er klimakorrigeret.

Energiforbrugets miljøbelastning pr. m²

Lav miljøbelastning: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
 Høj miljøbelastning: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z

Varme- og elforbrugets miljøbelastning udtrykt ved den årlige CO₂-udledning. Mærketallet på skiltet viser ejendommens CO₂-udledning pr. m² sammenlignet med udledningen fra ejendomme med tilsvarende anvendelse. Varmeforbrugets bidrag er klimakorrigeret.

Samlet forbrug og miljøbelastning

	Varme	El	Vand	I alt
Årets totalforbrug	_____	_____	_____	_____
Årets udgifter	_____	_____	_____	_____
Årets miljøbelastning	_____	_____	_____	_____

Energimærketallet er udarbejdet på grundlag af det registrerede forbrug. I ejendommens energiplan gives forslag til, hvordan forbruget af el, vand og varme kan nedbringes.
 Energimærke og -plan er udarbejdet i henhold til lov om fremme af energi- og vandbesparelser i bygninger.

Energistyrelsen
EPA og ELO

Source: www.elo.dk

The general structure and scheme of an energy performance assessment is already described in chapter 3(EPA-ED).

Normally it is necessary to adapt a few of national regulations and legislation (e.g. construction law, energy law, different laws on subsidy/grants of the building sector) This can be a time consuming process, that has to start as early as possible. Last but not least technical standards have to be issued in order to fulfil the requirements of the EPBD.

4.2. Financial Instruments, Subsidies

When it comes to energy performance assessment of existing buildings, two major points are be addressed as financial policy instruments

certification costs

In spite of the mandatory character promoting certification is a crucial point if enforcement is not organised in a extensive way. Those who have to pay for certification do not get benefits from it. This problem can be addressed by introduction of a transparent scheme for the costs of the certification. Additionally, if real estate agencies pay for the costs, incentives could be given by refunding the costs if energy saving measures are taken out within a certain time frame after certification. This could lead to better communication between building owner and tenant/seller and buyer regarding energy performance of the building.

subsidies for energy saving measures

Subsidies for energy saving measures are common in most of the EU member states. In order to integrate EPA-ED into these schemes, some mandatory parts of the scheme can be used: subsidies can be linked to typical measures, which help to improve the energy performance of buildings (e.g. measures on insulation, technical systems using renewable resources, ...). The linking between promoted measures and available measures in the EPA-scheme helps to reduce the gap between economic interests and ecological interests of owners and/or investors.

4.3. Accompanying instruments

FOCUS A: Institutional structure

As quality control and transparency is necessary to provide confidence in the certification scheme, clear institutional structures are quite important for its success.

The institutional structure of an energy performance certification scheme has to include the following:

Training of consultants

Required professional qualification and training of the consultants are to be established. Training courses have to take into account the special needs for energy performance assessment of existing buildings and should be updated on basis of experience made in the scheme and evaluated through data collection and evaluation.

Data management

Data resulting from energy performance certificates have to be collected and evaluated regularly for quality control of the scheme. Additionally, these data provide information about the energy performance of the building stock in a certain region or member state.

Quality control

Quality control can be achieved through setting quality requirements on the level of individual consultants and/or requiring quality control on the assessment process and its results as a whole on the level of a company. In both cases skills of the consultant can be defined and re-checking of certified buildings, through comparison of the energy performance with standard data, and through evaluation of a set of collected data is a valuable approach.

FOCUS B: Promotion of energy saving measures

In order to support improvement of energy performance in existing buildings, energy saving measures have to be promoted both among building owners and businesses involved in renovation of buildings. Promotion of the measures among building owners has already been addressed in terms of financial promotion, but could as well be part of an information campaign.

The following examples show possibilities of promotion of energy related issues in building renovation:

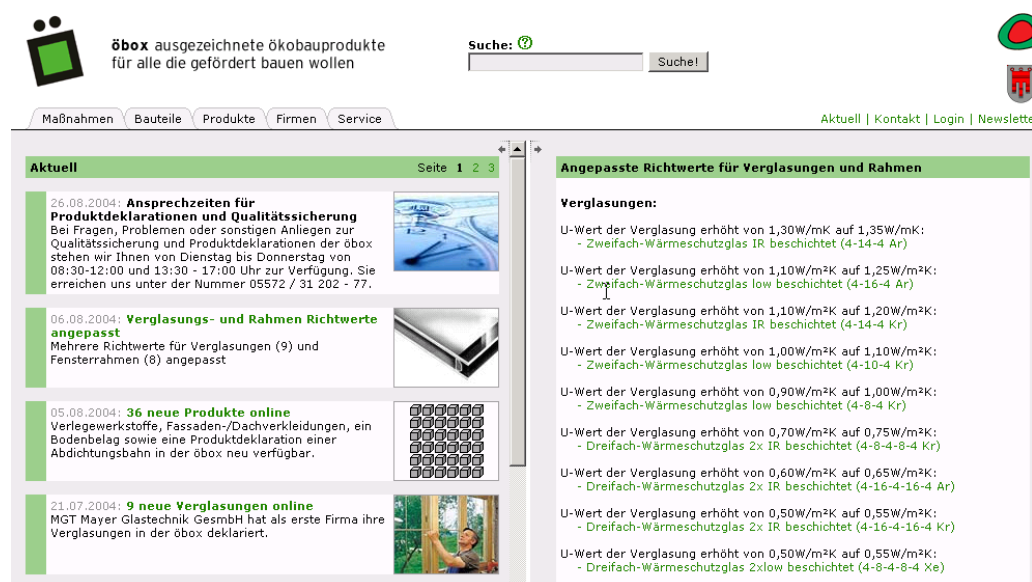
Provision of Information on certification

Mandatory certification has to be made known among building owners and real estate agents through information campaigns. Additionally, information on the certification process, on consultants and on energy saving measures has to be easily accessible for those who have to carry out a certificate and those who benefit from it.

Linkage between research and practice

Platforms and committees in which scientists and practitioners come together are helpful for both sides; for the practitioners information about innovative technologies is provided, scientists have a better picture about the state of the art in a special sector. The *Project Committee Development Renewable Energy Built Environment* in the Netherlands is a communication committee for contractors, housing corporations, Novem and the Project Office renewable Energy with the objective to stimulate the application of on renewable energy in the built environment by the exchange of knowledge. A joint information campaign seeks to promote Renewable Energy Systems in buildings. This reflects strong support of public policy in the building sector. In Austria, there are two local *qualification platforms* of enterprises in the building sector which provide stronger linkage between their members concerning construction processes and also better qualification through further education.

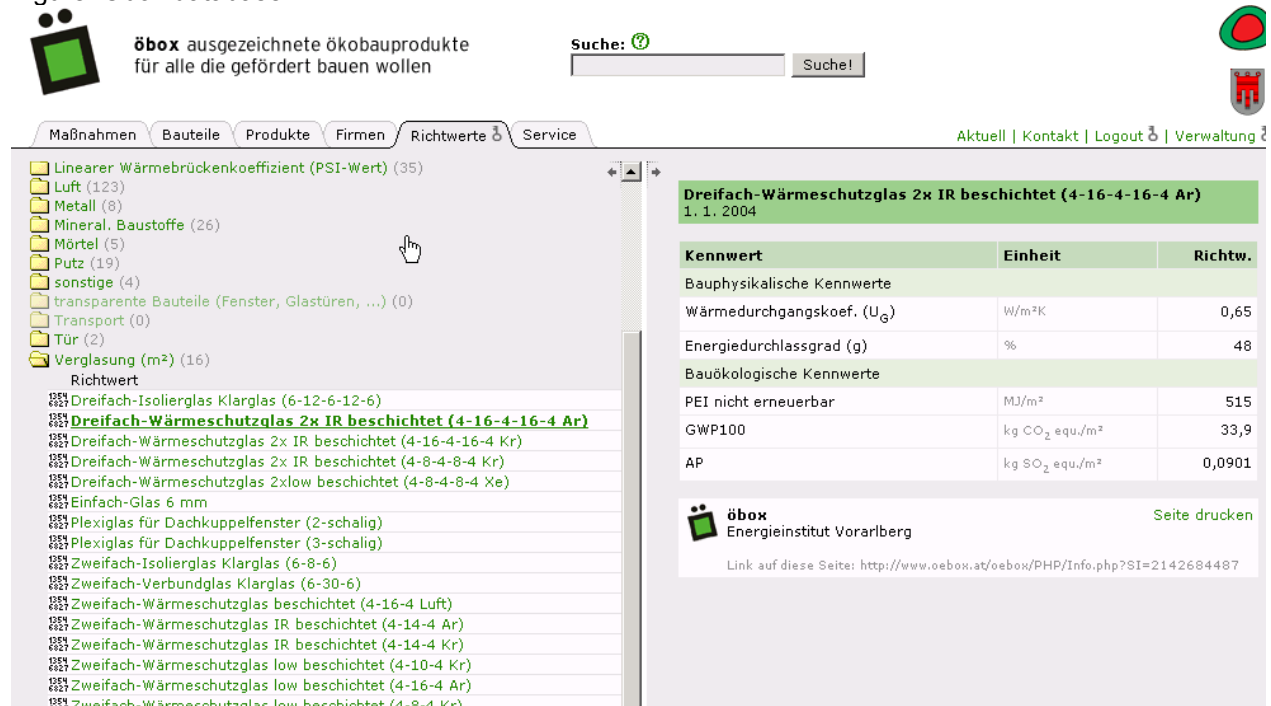
Figure: The Oebox Information System on sustainable construction



The screenshot shows the Oebox website interface. At the top, there is a logo for 'öbox ausgezeichnete ökobauprodukte für alle die gefördert bauen wollen' and a search bar. Below the logo, there are navigation tabs for 'Maßnahmen', 'Bauteile', 'Produkte', 'Firmen', and 'Service'. The main content area is divided into two columns. The left column, titled 'Aktuell', contains four news items with dates and titles: '26.08.2004: Ansprechzeiten für Produktdeklarationen und Qualitätssicherung', '06.08.2004: Verglasungs- und Rahmen Richtwerte angepasst', '05.08.2004: 36 neue Produkte online', and '21.07.2004: 9 neue Verglasungen online'. The right column, titled 'Angepasste Richtwerte für Verglasungen und Rahmen', lists technical specifications for window glazing, such as 'U-Wert der Verglasung erhöht von 1,30W/m²K auf 1,35W/m²K' and 'U-Wert der Verglasung erhöht von 1,10W/m²K auf 1,25W/m²K'. The website also features a 'Suche:' field and a 'Suchen!' button, and a footer with 'Aktuell | Kontakt | Login | Newslette'.

Source: www.oebox.at (only in German)

Figure: Öbox database



öbox ausgezeichnete ökobauprodukte für alle die gefördert bauen wollen

Suche:

Maßnahmen | Bauteile | Produkte | Firmen | Richtwerte | Service

Aktuell | Kontakt | Logout | Verwaltung

Dreifach-Wärmeschutzglas 2x IR beschichtet (4-16-4-16-4 Ar)
1. 1. 2004

Kennwert	Einheit	Richtw.
Bauphysikalische Kennwerte		
Wärmedurchgangskoeff. (U _g)	W/m ² K	0,65
Energiedurchlassgrad (g)	%	48
Bauökologische Kennwerte		
PEI nicht erneuerbar	MJ/m ²	515
GWP100	kg CO ₂ equ./m ²	33,9
AP	kg SO ₂ equ./m ²	0,0901

öbox Energieinstitut Vorarlberg Seite drucken

Link auf diese Seite: <http://www.oebox.at/oebox/PHP/Info.php?SI=2142684487>

Source: www.oebox.at

Voluntary agreements (e.g. Austria, The Netherlands)

Communities can achieve strong promotion of energy saving measures on a local level through voluntary agreements on CO₂ – savings. As in Austria, communities that are members of Klimabündnis – network develop programs for CO₂ - reductions, provide information on energy savings and financial promotion. In The Netherlands, municipalities which are members of BANS – agreement have to fulfil certain conditions concerning energy efficiency of Housings to be eligible to subsidies.

Figure: Website of the information campaign “future house”, energy saving in the building sector



zukunft haus
Energie sparen. Wert gewinnen.

Home | Dena | Kontakt | Impressum | Disclaimer | Sitemap

Suche:

Sie sind hier: Home / Modernisierung

PROJEKTE

1. MODERNISIERUNG
2. Richtig modernisieren
 - Heizung
 - Warmwasser
 - Lüftung
 - Dämmung
 - Fenster
3. NEUBAU
4. FÖRDERUNG
5. THEMA ENEC

Der Onlinerechner Service

Kosten sparen - Wohnwert steigern - Umwelt schonen: Modernisieren rechnet sich gleich dreifach

Besitzen Sie ein Ein- oder Mehrfamilienhaus? Dann werden Sie früher oder später darüber nachdenken, an Ihrem Haus kleinere oder größere Instandsetzungen oder Modernisierungen vorzunehmen. Das ist der beste Zeitpunkt, auch in Energieeinsparung zu investieren. Gut vorbereitet, gewinnen Sie gleich dreifach:

→ Erstens: Sie senken Ihre Energiekosten und machen sich damit unabhängiger von den künftigen Entwicklungen der Preise für Gas, Öl oder Strom.

→ Zweitens: Sollten Sie sich außerdem eines Tages entscheiden, Ihr Haus zu verkaufen oder zu vermieten, gilt geringer Energieverbrauch als wertsteigernd.

→ Drittens: Ein energetisch sinnvoll

Entwicklung des Heizpreises in den

dena
Deutsche Energie Agentur

Seite drucken
Seite empfehlen

BEISPIEL 1
Familie Steinhardt in Diemelsee-Adorf

BEISPIEL 2
Familie Wiemann in Kleinmachnow bei Berlin

SPARPOTENZIALE

Source: www.zukunft-haus.info

5 Conclusions and recommendations

EPA-ED is focused on the requirements for existing buildings and dwellings of the EC directive 2002/91/EC on energy performance for buildings (EPBD). EPA-ED therefore provides a useful set on intake and inspection tools, guidelines, and a software tool for the calculation of the energy performance of buildings.

The “Policy Paper” of EPA-ED tries to give policy makers and stakeholders useful orientation and advice regarding to their efforts on implementation of the EPBD procedures in national and/or regional law.

The conclusions below comprise this objective in a few steps.

Fact-Sheet “Existing Buildings” regarding to EPBD

Regarding to EPBD on existing buildings, you have to be active if ...	
Energy requirements in case of major renovation: :	Total useful floor >1.000 m ² ; in case of an major renovation
Threshold of major renovation:	Total cost higher than 25% of the building value (excluding land value), or Renovation activities, more than 25% of the building shell
Energy performance of buildings EPB	Amount of energy consumption for heating, hot water, cooling, ventilation, and lighting The methodology of calculation of the EPB will be defined by national/regional governments. The EPB can be expressed as a numeric indicator
Energy Performance Certificate	A certificate on the energy performance of a building, including reference values and a list of cost effective energy saving measures that can be taken. Registered experts and consultants; EPC is necessary in case of selling or renting out of a building / dwelling
Date of enforcement	January 4, 2006 (earliest) January 4, 2009 (latest)
Inspection of boilers	Regular for boilers from 20kW to 100kW (fired with non-renewable resources) > 100kW inspection every two years (gas: four years)
One-off inspection for the whole heating installation	> 20kW, older than 15 years
Inspection of boilers includes	advice to the replacement of boilers, other modifications of heating system and alternative solutions
Air Condition	Regular inspection on systems >12kW

The EPA-ED method offers to you:

- **An intake procedure:** How to get in contact with the client, which kind of general information is needed for a successful EPA?
- **An inspection protocol:** This protocol helps you to collect the information and data you will need for doing the EPA.
- **An useful guideline for inspection:** How can difficult data and parameter be collected in existing buildings? Thematic libraries inside the software tool help you to simulate the physical framework of your building.
- **A powerful software tool:** The EPA-ED software fulfils any requirements of the EPBD in order to calculate the energy performance of your building and to prepare information for presentations to your clients.

All of these parts of the EPA-ED toolkit are documented. The documents are available on the project website – www.epa-ed.org.

Policy instruments and other activities in order to gathering momentum with implementation of the EPBD:

- **Regulations:** EPA-ED provides a full calculation tool and assessment scheme to set up national and/or regional regulations. Energy labeling of building is part of the regulation framework, and assists the dissemination of the goals of the EPBD
- **Financial instruments:** Subsidies disposed to the certification costs and selected measures in energy saving help the EPBD process in the start up – period; subsidies disposed to selected measures help stakeholders to navigate their EPBD policies
- **Accompanying instruments – institutional structure:** registration and training of consultants, and collection of data regarding to EPBD ensure the quality of the implementation and updating of the EPBD. The overall EPBD process should be evaluated regular.
- **Accompanying instruments – promotion and communication:** provision of information on certification, linkage between research an practice, voluntary agreements, are parts of comprehensive information strategy. Public relation and communication should be in the inner centre of each implementation of the EPBD.

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Report "Benchmarking for Existing European Dwellings", April 2003; report number: EPA-ED NOA 03-01, Author: Costas Balaras, NOA, Athens, Greece.

Report "Strategy for stimulating RUE and RES in Existing Dwellings", November 2003; report number: OTB 0301, Author: Milou Beerepoot, OTB Research Institute, The Netherlands.

Report "Guide for the use of the EPA-ED method", September 2004, report number: EPA-ED OTB 0402, Author: Jan-Willem Smit, OTB Research Institute, The Netherlands

Report "Intake Procedure", August 2004, report number 040445jo, Author: Gerelle van Cruchten, EBM-consult, Arnhem, The Netherlands

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Brochure "Efficient assessment for the Energy Performance of buildings; September 2004 report number 040446ap Author: ir. A. Poel, EBM-consult, The Netherlands

Websites:

ENERGIE CITIES – www.energie-cities.org

ENPER – www.enper.org

EUROACE – www.euroace.org

DISPLAY CAMPAIGN – www.display-campaign.org

FRAMES – [www.eva.ac.at/\(en\)/projekte/frames/news.htm](http://www.eva.ac.at/(en)/projekte/frames/news.htm)

OPET Building – www.opet-building.net

CEN – www.cenorm.be

EPA-ED – www.epa-ed.org

ÖBOX Austria - www.oebox.at

Danish Energy Performance Certificate - www.elo.dk

Zukunft Haus Deutschland - www.zukunft-haus.info

Project Description

The EPA-ED research project seeks to conceptualise and develop the strategic, organisational and technological framework to deliver a model for assessing the energy performance of existing dwellings at European level. This framework intends to stimulate RUE and RES. The efficiency and success of the energy performance assessment-approach (EPA-approach) depends on the way it fits into practice. Thus, a range of relevant issues have been taken into account - from the economic impact of RUE and RES for inhabitants of existing dwellings to integration of measures into maintenance schedules and - from the effects of RUE and RES on the interior climate in dwellings to the strategic impulse of this approach on a national level.

The energy performance assessment method is being developed making use of existing methods available in the European Countries.

The attention for the energy performance of existing dwellings is just starting in most countries. Energy performance can be greatly improved by rational use of energy (RUE) and the use of renewable energy sources (RES). This RTD research project directly addresses both the SAVE and the ALTENER programme, focussing on RUE in (existing) dwellings, while incorporating RES.

The workplan has been structured in 5 research tasks:

Task 1: Benchmark of European conditions related to existing dwellings

- Benchmark of European conditions related to existing dwellings
- Benchmark of existing policies with respect to RUE and RES in existing dwellings
- Benchmark of building regulations with respect to existing dwellings (both legislative and incentive)
- Benchmark of existing housing market and actors
- Benchmark of the energy market
- Benchmark of building and installations technology in existing dwellings
- Benchmark of energy balance of existing dwellings on a national level
- Benchmark of climate data

Task 2: Strategy for stimulating RUE and RES through a uniform Energy Performance Assessment Method

Task 3: Energy Performance Assessment tool

- Description
- Prototype
- Pilot studies in at least one project in each participating country
- Adaptations of the prototype tool
- Supporting tools: check lists, inspection protocols, guidelines etc

Task 4: Translation into new policies

- Set of tools for tuning, accentuating Member State policies, using the EPA-ED method and tool for existing dwellings.
- Recommendations for the development of RUE, RES policies in countries without such policies.

Task 5: Dissemination

- Website, brochures, manual

Project Partners



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Delft University of Technology

OTB (The Netherlands)
Research Institute for Housing,
Urban and Mobility Studies



ÖÖI (Austria)
Austrian Institute for Applied Technology



Danish Building and Urban Research

DBUR (Denmark)
Danish Building and Urban Research



NOA (Greece)
National Observatory of Athens

Funding Partners

(per country add logos here)

Appendix A

**The Directive on Energy Performance for Buildings,
focussed on aspects regarding to the existing building stock**

The directive contains the following parts (overview):

- Article 1: Objectives of the directive.
- Article 2: Definitions.
- Article 3: Adoption of a methodology
- Article 4: Setting of energy performance requirements
- Article 5: New buildings
- Article 6: Existing buildings
- Article 7: Energy performance certificate
- Article 8: Inspection of boilers
- Article 9: Inspection of air-conditioning systems
- Article 10: Independent experts
- Article 11, 12, and 13: Review, Information, Adaptation of the framework
- Article 14, 15, and 16: Committee, Transposition, Entry into Force

On the following pages you will find important statements of the directive focussed on the goals of EPA-ED. Phrases with core importance for existing buildings are highlighted (red) and underlined.

Article 1
Objective

The objective of this Directive is to promote the improvement of the energy performance of buildings within the Community, taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness. This Directive lays down requirements as regards:

(a) the general framework for a methodology of calculation of the integrated energy performance of buildings;

(b) the application of minimum requirements on the energy performance of new buildings;

(c) the application of minimum requirements on the energy performance of large existing buildings that are subject to major renovation;

(d) energy certification of buildings; and

(e) regular inspection of boilers and of air-conditioning systems in buildings and in addition an assessment of the heating installation in which the boilers are more than 15 years old.

Article 3
Adoption of a methodology

Member States shall apply a methodology, at national or regional level, of calculation of the energy performance of buildings on the basis of the general framework set out in the Annex. Parts 1 and 2 of this framework shall be adapted to technical progress in accordance with the procedure referred to in Article 14(2), taking into account standards or norms applied in Member State legislation.

This methodology shall be set at national or regional level.

The energy performance of a building shall be expressed in a transparent manner and may include a CO₂ emission indicator.

ANNEX: General framework for the calculation of energy performance of buildings (Article 3)

1. The methodology of calculation of energy performances of buildings shall include at least the following aspects:

- (a) thermal characteristics of the building (shell and internal partitions, etc.). These characteristics may also include air-tightness;
- (b) heating installation and hot water supply, including their insulation characteristics;
- (c) air-conditioning installation;
- (d) ventilation;
- (e) built-in lighting installation (mainly the non-residential sector);
- (f) position and orientation of buildings, including outdoor climate;
- (g) passive solar systems and solar protection;
- (h) natural ventilation;
- (i) indoor climatic conditions, including the designed indoor climate.

2. The positive influence of the following aspects shall, where relevant in this calculation, be taken into account:

- (a) active solar systems and other heating and electricity systems based on renewable energy sources;
- (b) electricity produced by CHP;
- (c) district or block heating and cooling systems;
- (d) natural lighting.

3. For the purpose of this calculation buildings should be adequately classified into categories such as:

- (a) single-family houses of different types;
- (b) apartment blocks;
- (c) offices;
- (d) education buildings;
- (e) hospitals;
- (f) hotels and restaurants;
- (g) sports facilities;
- (h) wholesale and retail trade services buildings;
- (i) other types of energy-consuming buildings.

Article 4

Setting of energy performance requirements

1. Member States shall take the necessary measures to ensure that minimum energy performance requirements for buildings are set, based on the methodology referred to in Article 3. When setting requirements, Member States may differentiate between new and existing buildings and different categories of buildings. These requirements shall take account of general indoor climate conditions, in order to avoid possible negative effects such as inadequate ventilation, as well as local conditions and the designated function and the age of the building. These requirements shall be reviewed at regular intervals which should not be longer than five years and, if necessary, updated in order to reflect technical progress in the building sector.

2. The energy performance requirements shall be applied in accordance with Articles 5 and 6.

3. Member States may decide not to set or apply the requirements referred to in paragraph 1 for the following categories of buildings:

- buildings and monuments officially protected as part of a designated environment or because of their special architectural or historic merit, where compliance with the requirements would unacceptably alter their character or appearance,
- buildings used as places of worship and for religious activities,
- temporary buildings with a planned time of use of two years or less, industrial sites, workshops and non-residential agricultural buildings with low energy demand and non-residential agricultural buildings which are in use by a sector covered by a national sectoral agreement on energy performance,
- residential buildings which are intended to be used less than four months of the year,
- stand-alone buildings with a total useful floor area of less than 50 m².

Article 6 - Existing buildings

Member States shall take the necessary measures to ensure that when buildings with a total useful floor area over 1 000 m² undergo major renovation, their energy performance is upgraded in order to meet minimum requirements in so far as this is technically, functionally and economically feasible. Member States shall derive these minimum energy performance requirements on the basis of the energy performance requirements set for buildings in accordance with Article 4. The requirements may be set either for the renovated building as a whole or for the renovated systems or components when these are part of a renovation to be carried out within a limited time period, with the abovementioned objective of improving the overall energy performance of the building.

Article 7

Energy performance certificate

1. Member States shall ensure that, when buildings are constructed, sold or rented out, an energy performance certificate is made available to the owner or by the owner to the prospective buyer or tenant, as the case might be. The validity of the certificate shall not exceed 10 years. Certification for apartments or units designed for separate use in blocks may be based:

- on a common certification of the whole building for blocks with a common heating system, or
- on the assessment of another representative apartment in the same block.

Member States may exclude the categories referred to in Article 4(3) from the application of this paragraph.

2. The energy performance certificate for buildings shall include reference values such as current legal standards and benchmarks in order to make it possible for consumers to compare and assess the energy performance of the building. The certificate shall be accompanied by recommendations for the cost-effective improvement of the energy performance. The objective of the certificates shall be limited to the provision of information and any effects of these certificates in terms of legal proceedings or otherwise shall be decided in accordance with national rules.

3. Member States shall take measures to ensure that for buildings with a total useful floor area over 1 000 m² occupied by public authorities and by institutions providing public services to a large number of persons and therefore frequently visited by these persons an energy certificate, not older than 10 years, is placed in a prominent place clearly visible to the public. The range of recommended and current indoor temperatures and, when appropriate, other relevant climatic factors may also be clearly displayed.

Article 8

Inspection of boilers

With regard to reducing energy consumption and limiting carbon dioxide emissions, Member States shall either:

- (a) lay down the necessary measures to establish a regular inspection of boilers fired by non-renewable liquid or solid fuel of an effective rated output of 20 kW to 100 kW. Such inspection may also be applied to boilers using other fuels. Boilers of an effective rated output of more than 100 kW shall be inspected at least every two years. For gas boilers, this period may be extended to four years. For heating installations with boilers of an effective rated output of more than 20 kW which are older than 15 years, Member States shall lay down the necessary measures to establish a one-off inspection of the whole heating installation. On the basis of this inspection, which shall include an assessment of the boiler efficiency and the boiler sizing compared to the heating requirements of the building, the experts shall provide advice to the users on the replacement of the boilers, other modifications to the heating system and on alternative solutions; or
- (b) take steps to ensure the provision of advice to the users on the replacement of boilers, other modifications to the heating system and on alternative solutions which may include inspections to assess the efficiency and appropriate size of the boiler. The overall impact of this approach should be broadly equivalent to that arising from the provisions set out in (a). Member States that choose this option shall submit a report on the equivalence of their approach to the Commission every two years.

Article 9

Inspection of air-conditioning systems

With regard to reducing energy consumption and limiting carbon dioxide emissions, Member States shall lay down the necessary measures to establish a regular inspection of air-conditioning systems of an effective rated output of more than 12 kW.

This inspection shall include an assessment of the air-conditioning efficiency and the sizing compared to the cooling requirements of the building. Appropriate advice shall be provided to the users on possible improvement or replacement of the air-conditioning system and on alternative solutions.

The following aspects are from particular importance for the organisation, information transfer, and ongoing evaluation of the directive:

Article 10 - Independent experts

Member States shall ensure that the certification of buildings, the drafting of the accompanying recommendations and the inspection of boilers and air-conditioning systems are carried out in an independent manner by qualified and/or accredited experts, whether operating as sole traders or employed by public or private enterprise bodies.

Article 11 - Review

The Commission, assisted by the Committee established by Article 14, shall evaluate this Directive in the light of experience gained during its application, and, if necessary, make proposals with respect to, inter alia:

- (a) possible complementary measures referring to the renovations in buildings with a total useful floor area less than 1 000 m²;*
- (b) general incentives for further energy efficiency measures in buildings.*

Article 15 - Transposition

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive at the latest on 4 January 2006. They shall forthwith inform the Commission thereof. When Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

2. Member States may, because of lack of qualified and/or accredited experts, have an additional period of three years to apply fully the provisions of Articles 7, 8 and 9. When making use of this option, Member States shall notify the Commission, providing the appropriate justification together with a time schedule with respect to the further implementation of this Directive.

Appendix B

EC Directives with relationship to the energy performance of buildings – An Overview.

The information box below provides a complete listing of related directives on energy efficiency of the building sector (Source: EUROACE 2004):

The full range of legislative measures related to energy efficiency in buildings energy use that have been adopted by the European Union since 1992:

- *Council Directive 92/75/EEC on "the indication by labelling and standard product information of the consumption of energy and other resources by household appliances."*
- *Council Directive 93/76/EEC on "to limit carbon dioxide emissions by improving energy efficiency (SAVE).*
- *Commission Directive 94/2/EEC implementing Council Directive 92/75/EEC "with regard to energy labelling of domestic electric refrigerators, freezers and their combinations."*
- *Commission Directive 95/12/EC implementing Council Directive 92/75/EEC concerning energy labelling of clothes washers.*
- *Commission Directive 95/13/EC implementing Council Directive 92/75/EEC concerning energy labelling of clothes dryers.*
- *Council Directive 96/57/EC on energy efficiency requirements for household electric refrigerators, freezers and combinations thereof.*
- *Commission Directive 96/6/EC implementing Council Directive 92/75/EEC concerning energy labelling of household dishwashers.*
- *Commission Directive 97/17/EC of 16 April 1997 implementing Council Directive 92/75/EEC with regard to energy labelling of household dishwashers.*
- *Commission Directive 98/11/EC implementing Council Directive 92/75/EEC concerning energy labelling of household lamps.*
- *Directive 2000/55/EC of the European Parliament and of the Council of 18 September 2000 on energy efficiency requirements for ballasts for fluorescent lighting.*
- *Commission Directive 2002/31/EC of 22 March 2002 implementing Council Directive 92/75/EEC with regard to energy labelling of household air-conditioners.*
- *Commission Directive 2002/40/EC of 8 May 2002 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric ovens.*
- *Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.*

Appendix C

Overview on different activities of implementation of the Directive of energy performance of buildings in several member states of the European Community

The following overview is concentrated on the main aspects of EPBD for existing buildings.

Table: Building Certification in different European Member States

Country	Situation
Austria	Regional standards since 1999 – “Energieausweis”
Belgium – Flemish	It is foreseen that for new buildings that must meet EP-requirements the Dossier-As-Built will get a practical implementation in such a way that the EPD-certification requirements Region are satisfied. For apartments, every single flat will be analysed in new buildings.
Cyprus	Status unknown
Czech Republic	Status unknown
Denmark	A certification scheme exist already but has to be adapted to the new requirements.
Estonia	Status unknown
Finland	No certification scheme in use
France	Certification for houses almost ready. No certification for public buildings
Germany	Standards since 2000 – Energieausweis. In Germany, the ENEC (Energieeinsparverordnung) certification scheme is now in force, although the regulation foresees some form of regulation for certification. The details are under discussion.
Greece	No certification scheme currently in use. A new regulation is near completion by the Ministry for the Environment Physical Planning and Public Works, in accordance to the EPD, and is in the process of public review.
Ireland	No certification scheme in use.
Italy	No certification scheme in use.
Hungary	Status unknown
Latvia	Status unknown
Lithuania	Defined since 2003
Luxembourg	Status unknown
Malta	Status unknown
Poland	Status unknown
Portugal	No certification scheme in use. The new regulation will satisfy the requirements of article 7 of EPD.
Slovakia	Status unknown:
Slovenia	In Slovenia, the “Certificate for thermal characteristics of buildings” has been introduced during 2002 and there are no sufficient practical experiences available yet.
Spain	A voluntary energy certification scheme based on simulation results is in use.
Sweden	Today Sweden does not have any certification of buildings but when a building is sold the Sweden seller are required to present the buildings energy consumption.
The Netherlands	No certification scheme actually in use. The possibilities of transforming the non-mandatory method for EP advise for existing residential buildings into an energy certificate is under investigation at this moment.
UK	Certification scheme already in use for new dwellings but not for other buildings.

Source: ENPER-TEBUG 2003, own completions

Table: Inspection of boilers, and/or air-condition systems

Country	Situation
Austria	Boilers have to be inspected since 2000; the inspection of existing A/C is actually not intended.
Belgium – Flemish	At present there is an still old federal law in force that imposes yearly inspections of oil boilers. New regulations by each of the regions have been under development/discussion for some time, but their present status and exact scope are unclear. The present drafts will probably not yet fully satisfy the EPD requirements. There is no practical initiative as yet to set up inspection routines for air conditioning systems.
Cyprus	Status unknown
Czech Republic	Status unknown
Denmark	Partly applied for boilers. No inspection of A/C
Estonia	Status unknown
Finland	No inspection of boilers or A/C
France	No inspection of boilers or A/C
Germany	A yearly inspection of boilers between 4 and 400 kW is already mandatory in Germany. For air conditioning systems the EnEV only demands a competent maintenance and inspection.
Greece	Mandatory inspection of boilers, The new regulation asks for a mandatory inspection of A/C units
Ireland	No inspection of boilers or A/C
Italy	The Italian EPR already provides inspection of all boilers, but not the inspection of air-conditioning systems. Boilers having a nominal output of less than 35 kW shall be inspected at least every 2 years. Boilers having a nominal output of more than 35 kW shall be inspected at least once a year. The inspection of boilers shall include a measurement of exhaust gas and ambient temperatures, O ₂ , CO ₂ and CO concentrations in the exhaust gases, an assessment of the boiler nominal efficiency, and an evaluation of the conditions of insulation.
Hungary	Status unknown
Latvia	Status unknown
Lithuania	Status unknown
Luxembourg	Status unknown
Malta	Status unknown
Poland	Status unknown
Portugal	Status unknown
Slovakia	Status unknown:
Slovenia	Status unknown
Spain	Applied to boilers. No inspection of A/C
Sweden	Control of ventilation systems including central air conditioning systems are regular done in Sweden every 3-9 years depending on the kind of building.
The Netherlands	New regulation is prepared.
UK	New regulation is prepared.

Source: ENPER-TEBUG 2003, own completions

Table: Content of schemes for existing buildings in different countries (Source: ENPER-TEBUG 2003)

Existing buildings	DK	UK	NL	RU	AT	NO	CH	FR	DE	SI	PT	BE	GR	IL	LT
Inspection	x	x	x	x		x	x				x	x	x		x
Evaluating building plan	x	(x)	x			x	x					x	x		x
Calculation based on collected data	x	x	x		x	x	x	x	x	x	x	x	x		x
Presentation of information to the users	x	(x)	x			x		x	x		x	x	x		x
Presentation based on measured data	x		x								x	x			x
Evaluation of collected information		(x)	x												

Table: Objectives of calculation methods in different countries (Source: ENPER-TEBUG 2003)

Existing buildings	DK	UK	NL	RU	AT	NO	CH	FR	DE	SI	PT	BE	GR	IL	LT	SP
Estimate annual energy requirements	x		x		x		x	x	x	x			x		x	
Compare measured data with "normal" energy requirement	x		x			x		x			x		x		x	
Estimate potential benefits from possible improvements	x		x	x		x	x				x	x	x		x	
Estimate annual energy cost			x					x								
Provide cost-based rating		x	x													

Table: Kind of energy included in schemes in different countries (ENPER-TEBUG 2003)

New and existing buildings	DK	UK	NL	RU	AT	NO	CH	FR	DE	SI	PT	BE	GR	IL	LT	SP
Space heating	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Domestic hot water	x	x	x	x		x	x	x	x		x	x	x	x	x	x
Lights		(x)	x			x		x			x	x	x	x	x	x
Appliances		(x)	x					x			x					
Cooking			x					x			x					
Ventilation and air conditioning	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
Internal gains	x	x	x				x	x		x	x	x			x	x
Efficiency of boilers	x	x	x	x		x		x			x	x			x	x
Summer comfort			x						x							
Solar gains			x				x									
Cooling			x										x			